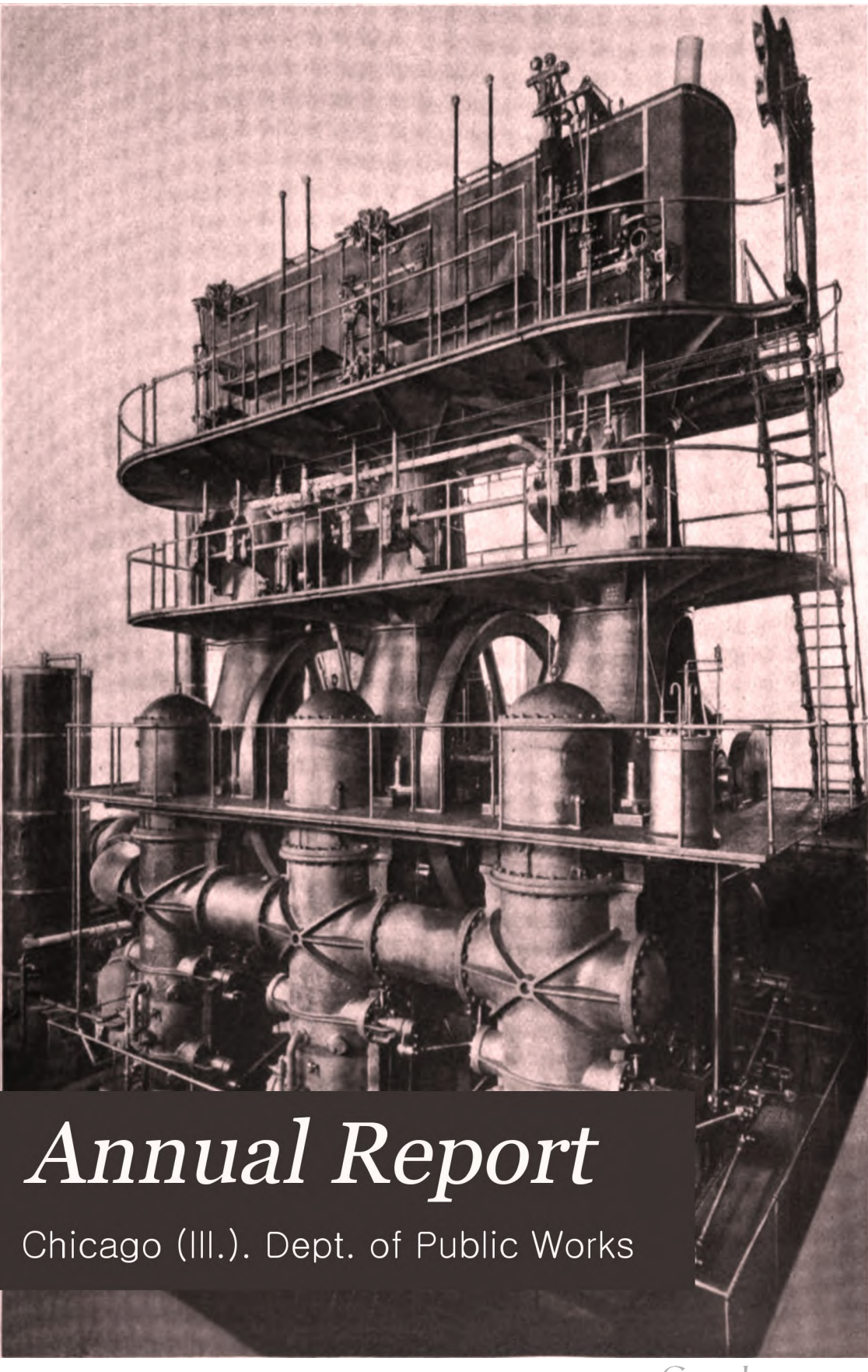
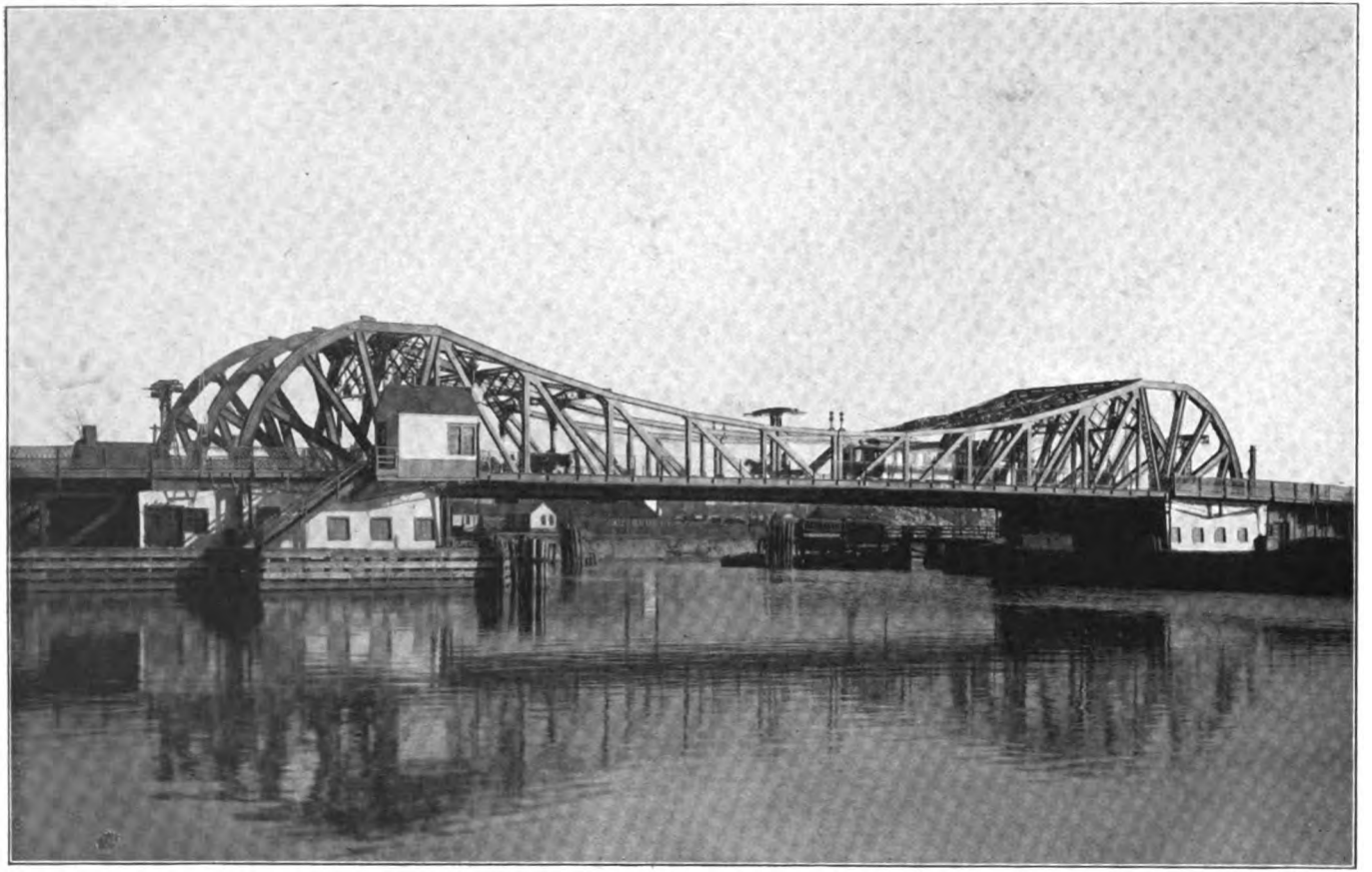


Annual Report

Chicago (Ill.). Dept. of Public Works



NEW STEEL TRUNNION BASCULE BRIDGE AT NORTH WESTERN AVENUE.—SIDE VIEW, CLOSED.—COMPLETED IN 1904.

MAYOR'S ANNUAL MESSAGE

AND THE

Twenty-Ninth Annual Report

OF THE

DEPARTMENT OF

PUBLIC WORKS

TO THE

City Council of the City of Chicago

FOR THE

Fiscal Year Ending December 31

1904

MESSAGE OF

MAYOR HARRISON

Message of Mayor Harrison.

MAYOR'S OFFICE, CHICAGO, April 10, 1905.

To the Honorable, the City Council of the City of Chicago:

Gentlemen—In this annual message, the presentation of which to your honorable body will be the final act of my eight years' service as Mayor of this great City, I may be pardoned if I review the work of the past eight years and call attention briefly to some of the things which have been accomplished.

Before entering upon this discussion I wish to thank my fellow citizens for the high honors they have bestowed upon me. No one knows better than I do that my work as Mayor has been rewarded beyond its merits. My appreciation of this fact has spurred me on to do my best. One thing I can say is that throughout my service the moving influence with me has always been a desire to serve my City to the best of my powers, to fulfill to the last letter every obligation assumed with my office. As the first native-born Mayor of Chicago, as the son of a man whom this City honored again and again, I have felt that all the strength and all the ability with which God has endowed me should be devoted to the duties I have been chosen to perform.

I wish also to extend my thanks to the members of your honorable body and to those other good and high-minded men who, as Aldermen, in the past and during my service as Mayor, have unselfishly and untiringly given of their time and thought to the welfare of the City. Without such aid and co-operation as I have enjoyed at their hands, I know I should have failed in many of my tasks.

During my four administrations I have seen great changes in your body. There are few things in which I take a greater pride than in

the knowledge that I have aided in the great work of placing the personnel of this Council on a plane where it ranks in integrity, ability and devotion to duty with any legislative body in the land. No greater service, in my estimation, can be rendered Chicago than to preserve the present high character of this body; no greater harm can be done it, and because of the effect a deterioration in this body would have on other communities, the general cause of good government, than by unfair attacks and misrepresentation to weaken the general confidence of Chicago in its City Council, to discourage good men from aspiring to seats in it, and to cause our citizens in aldermanic elections to lose sight of honesty and good service in a blind partisan zeal. By dint of hard work and infinite patience, Chicago has secured for itself a City Council in which every citizen can feel an honest pride. Malice and calumny should not be permitted to impair public confidence in this body, nor should an honest difference of opinion subject a tried Alderman to unfair attack nor to intemperate abuse. Chicago has learned the gain to be had of a Council made up of high-minded and honorable men. The past gain to good citizenship and good government has been great; selfish interests must not be permitted to place in jeopardy the benefits promised by a continuation of such aldermanic service as Chicago is enjoying to-day.

TRACK ELEVATION.

In my first campaign, both by the platform on which I accepted my nomination and by my public utterances, I committed myself definitely to the adoption of stringent measures to force universal track elevation within the City limits. Immediately after my election it became possible to make the position of the administration on this subject definitely known and finally understood. The City Council of that year established the precedent of authorizing the Mayor to appoint a special committee on track elevation, a precedent which each succeeding Council has followed. The Track Elevation Committee of 1897, within sixty days after its appointment, reported to the City

Council the ordinance providing for the so-called Sixteenth street track elevation. This ordinance, with some urging on the part of the administration, was finally passed by the Council. The next step was the forcing of its acceptance by the railroads involved. By dint of constant and persistent pressure, one by one the various railroads were brought to agree to its terms, and a precedent was thereby established by which the earnestness of the administration's advocacy of track elevation was shown.

Since then track elevation has made great progress, as may be learned from the following summary:

Ordinances have been passed by the City Council and accepted by the railroad companies for the elevation of roadbeds and tracks from April, 1897, to April, 1905, during my administration, covering the following amount of work:

Total number miles of main tracks to be elevated	106.1
Total number of miles of all tracks to be elevated	520.51
Total number of subways to be constructed.....	386.
Estimated cost of entire work when completed...	$34,770,250

The actual elevation already accomplished under these ordinances from April, 1897, to April, 1905, is as follows:

Total number miles of main tracks elevated.....	70.9
Total number miles of all tracks elevated.....	345.7
Total number of subways constructed.....	303.
Estimated cost of work done.....	$25,350,250

Leaving work to be done under all ordinances that have been passed from April, 1897, to April, 1905, as follows:

Total number miles of main tracks to be elevated	36.01
Total number miles of all tracks to be elevated..	174.81
Total number subways to be constructed.....	83.
Total estimated cost of work yet to be completed.	$15,475,000

Ordinances have been prepared and presented to the City Council for the elevation of the roadbeds and tracks of several railroad companies and referred to the Special Committee on Track Elevation for

its final consideration and recommendation to the City Council for the following amount of work:

Total number miles of main tracks to be elevated.	25.92
Total number miles of all tracks to be elevated...	67.21
Total number subways to be constructed.....	133.
Total estimated cost of work.....	$6,450,000

In connection with this subject matter, I do not feel I would be doing justice if I failed to give full credit for the splendid work in advancing track elevation performed by the City expert on track elevation, John O'Neill, who has practically made his life's work for the past ten years the mastery of this subject and the putting of his ideas in practice. Nor should be forgotten the intelligent, patient and tireless efforts of the chairman of the first Track Elevation Committee which I had the honor to appoint, Adolphus W. Maltby, Alderman of the old Twenty-second ward. These men labored loyally when the idea of track elevation was still in its infancy. The tremendous progress which has been made in removing grade crossings in this City is directly attributable to the work of these two men.

ELECTRIC LIGHTING.

In 1897 the City was lighting a portion of its streets with 1,254 arc lamps. The gradual extension of this system, until it should cover the entire City, seemed to me to promise the greatest possible benefit to the taxpayers.

The first step taken in the development of this idea was the creation of a Department of Electricity. Hitherto the electric lighting plant had been under the direction of the Superintendent of the Fire Alarm Service, who was the head of a bureau under the control of the Fire Marshal. Against formidable opposition I forced the passage by the City Council of an ordinance creating a Department of Electricity, and as the head of that department appointed the present incumbent of the office, Edward B. Ellicott, to whom acknowledgment must be made for the splendid work his department has performed.

During the first year the only funds at the disposal of the depart-

ment were the moneys paid in by the street railroad companies as compensation for the permission to install overhead trolleys granted during the administration of Mayor George B. Swift. At the beginning of 1898 an appropriation was secured for an extension of the electric lighting system, and in each year since, whenever the finances of the City government have permitted such action, like appropriation has been made.

The heart of the City had been fairly well lighted with electricity prior to this time. The administration adopted the policy of extending the system by lighting all of the thoroughfares radiating from the business center into the outlying wards, where the local business thoroughfares have been gradually equipped with arc lamps. It also used the extension of the electric lighting system as a bonus to secure the consent of property owners to the making of street improvements. As a result Chicago to-day has the largest municipal electric lighting plant of any city in the world. Whenever and wherever discussion is had as to the advisability of establishing such a plant, the work of Chicago is cited to show what can be accomplished by public ownership of a street lighting system.

Chicago to-day has 5,700 arc lamps lighted from its own plants; the average cost is $55.16 per lamp per annum.

It might not be out of place to cite by way of contrast the relative figures of the cost of electric street lighting in 1897 and in 1905:

1897:	
Number of arc lamps	1,254
Average cost per city lamp	$ 96.50
Average cost per rented lamp	137.50
1905:	
Number of arc lamps	5,700
Average cost per city lamp	$ 55.16
Average cost per rented lamp	103.00

SMALL PARKS AND PLAYGROUNDS.

In the annual message submitted by me to the City Council for the year 1899 I recommended the establishing of small parks and playgrounds in the congested sections of the City, to serve as places of

recreation for the children and as breathing spots for the adults of the poor. Subsequent thereto authority was granted me by the City Council to appoint a special commission on small parks and playgrounds. This commission was immediately named. It consisted of a mixed body, its personnel being made up both of Aldermen and citizens. As chairman of this first committee, I appointed former Alderman William S. Jackson of the Third ward, who brought to the work both intelligence and enthusiasm, together with a keen sympathy with the spirit of the movement.

In this, as in all other desirable undertakings, the City has been seriously handicapped by lack of funds. Municipal poverty, however, did not prevent the committee from establishing playgrounds in the thickly settled districts. By an economical use of the small appropriation the City was able to make and by appeals to the charitably disposed and to philanthropic owners of vacant property, it was possible for this committee to establish a number of small parks and playgrounds, which have served to provide innocent recreation to numbers of the youth of both sexes, and by providing this recreation have undoubtedly kept many who might otherwise have strayed away in the paths of good citizenship.

Because of the limitations upon the City's power to borrow money, this commission secured the passage by the Legislature of a bill authorizing the three park boards to issue bonds in certain amounts, the proceeds of these bonds to be used in the purchase of small parks and playgrounds. As a result of the passage of this bill the park boards have already purchased the following sites:

South Park Board	14 sites
Lincoln Park Board	3 sites

The special committee is to-day operating nine playgrounds, at which, in the year 1904, thousands of children were furnished with means for healthful and innocent recreation.

It should also be added that this special committee authorized by your honorable body was the first organization to formulate plans for

an outer belt of parks, to girdle the City with a zone of splendid pleasure grounds at a distance of from ten to twenty miles from its heart.

While the City's finances to-day are in such condition that the suggestion cannot immediately be carried out, in the not far distant future this zone of parks will be created, and when this step shall have been finally taken, Chicago will be provided with the most splendid park system of any of the great cities of the world.

PUBLIC GAMBLING.

The desire to gamble seems to be deeply rooted in the human character. Indeed the prevention of this vice causes more trouble to a department of police than any other one thing with which it has to contend. I believe all fair-minded men who have any acquaintance with the matter will agree with me in the statement that during the past eight years Chicago has been freer from this vice than at any other period of its history.

I do not pretend to say that gambling has not been resorted to. Indeed, if the stories we hear be true, the largest gambling games which have been operated during this period have had as their scene some of our most fashionable clubs. It can be said, however, that public gambling rooms, at which such games as faro, roulette, hazard, stud poker, craps and the other favorite games of the professional gambler are played, do not exist. Poker is unquestionably played at certain so-called "clubs," in saloons and in cigar stores in different sections. To prevent the playing of this game of chance, as it has been played, even if it were deemed advisable, would require the withdrawal from active service of a considerable number of men and thus further weaken an already limited Police Department.

Personally, I do not think any great harm can result from the playing of this game as it is practiced in this City to-day. The question might be raised, indeed, whether to prohibit its playing, as it is played, would not be an unlawful infringement upon the personal rights of our citizens, especially if these games were to be prohibited

and the playing of the same game for far larger stakes were not to be suppressed in the great clubs of the City.

The form of gambling, the desire for which seems to be most widely spread to-day, and in the suppression of which the Police Department encounters the greatest difficulty, is that form of gambling which has to do with horse races. The love for this form of gambling has been gradually spreading, until to-day great newspapers in every community seem to find it essential to their success to publish so-called "dope sheets," in which prophecies are made as to the winners of the various races, as well as to publish special editions, in which are heralded to the world the winners of these races, the condition of the tracks, the odds, the riders and all details which interest the student of race horse form.

This mode of gambling is indulged in to-day by means of what is known as the handbook. All that is required to make this handbook is a man, a notebook and a victim; indeed, in many instances even the notebook is dispensed with. It is the most difficult form of gambling against which to secure evidence, for the reason that in many cases the bet is made by word of mouth and no tangible evidence exists. In spite of this fact, by means of a stringent crusade, the handbook evil has been reduced to a minimum.

It has been practically driven from the saloons by means of the revocation of licenses of a large number of saloon proprietors who allowed handbooks to be made on their premises. By the passage of the so-called "ticker" ordinance, the dissemination of racing information by means of tickers has been absolutely ended in this City, forcing the race horse gambler to the use of the telephone to receive racing information and to forward the same to his assistants and subordinates. By the personal pressure brought to bear upon the management of the Chicago Telephone Company, and by means of injunction suits against that company, followed up by the tearing out of telephone switchboards and single telephones, when evidence had been secured of their use for gambling purposes, even this means of communication has been made

most difficult. To-day the percentage of handbook gambling done in this City, compared with what was done but a few years ago, and with what is still being done in other cities of the first class, is exceedingly small.

In following up this crusade I found it necessary last summer to issue stringent orders against the making of bets at the Washington Park race track. The statement has been made that this action on the part of the City government was an injury to the city's business interests. This may be true, but the fact remains that a community may not safely have one law for the rich and another for the poor. If it be unlawful for the saloonkeeper or the cigar dealer to make a handbook, or to permit the making of a handbook in his place of business, it is equally unlawful for the directors of a great social organization like the Washington Park Club to farm out gambling privileges within its inclosure. The charge, indeed, has been made that some of the directors of this great club personally operated the so-called dollar book. Whether this be true or not, the immediate closing up of the Washington Park Club track, as soon as it was definitely understood the police were in earnest in prohibiting the making of bets within the inclosure, shows it was largely to the financial interest of the club to farm out gambling privileges.

As the law prohibited handbook gambling, as well as all other forms of gambling, and as I felt convinced the extent to which handbook gambling was being followed offered a greater menace to general public morals than had existed in our community since the old days of the Louisiana lottery, I gave instructions to the Police Department to use every means to break up this form of gambling in Chicago. The hand of the police, therefore, rested heavily upon the saloonkeeper and the cigar dealer who ventured to violate the law. It seemed to me, to use a homely expression, that "what is sauce for the goose should be sauce for the gander," and that if the poorer lawbreaker were to be brought to account for his offense, the wealthy should not be permitted to violate the same law with impunity.

BRIDGES AND OTHER PUBLIC WORKS.

In 1897 the bridges and viaducts of the City were little better than ruins. By constant pressure the Law Department has finally forced the railroads to agree to the proposition that the duty devolves upon them to keep the viaducts over their various tracks in proper repair. By forcing the railroads to do this work, the viaducts have been put in good condition at no expense to the general fund.

The building of new bridges presented a greater difficulty. The current revenues of the City for years past have been but meager, and the City up to a comparatively recent date has not been permitted to increase its borrowing capacity. As a result it was necessary to secure the co-operation of some other body in order to supplant the old-time center-pier bridges, many of them in a hopeless condition of decay, with modern bridges of the bascule type, required by the federal government.

The idea occurred to me that as the duty of widening and deepening the channel of the Chicago river, in order to provide the requisite flow of water required by the law creating the Sanitary District, devolved upon that board, the removal of center-pier bridges could properly be charged to the same body. By means of a communication to your honorable body, I therefore called public attention to the urgent need of this work as far back as January 29, 1900, with the result that the Sanitary District agreed to remove all center-pier bridges and to erect in their stead bascule bridges along that part of the river which forms a part of the sanitary canal. As a result the following bridges have already been constructed by the Sanitary District:

Taylor street bridge.
Canal street bridge.
Main street bridge.
State street bridge.
Ashland avenue (West fork) bridge.
Randolph street bridge.
Loomis street bridge.
Eighteenth street bridge.

The following bridges are either in process of construction or about to be commenced:

Harrison street bridge.
Twenty-second street bridge.
Polk street bridge.
Dearborn street bridge.

The duty still devolved upon the City of replacing the bridges in the Calumet river, in the North branch of the Chicago river, as well as in the South fork of the South branch. By a careful husbanding of its meager income it has been possible to construct the following modern bridges:

Clybourn place bridge.
East Division street bridge.
Ninety-fifth street bridge.
West Division street bridge.
North Western avenue bridge.

The City to-day is about to commence the construction of the following new bridges:

Archer avenue bridge.
North avenue bridge.
Indiana street bridge.
North Halsted street (canal) bridge.

The means for these new bridges have been provided by the bond issue recently marketed by the City, the ability to sell these bonds having been established by a suit begun by the City and prosecuted successfully before the Supreme Court of the State, in which a decision finally establishing the municipal indebtedness was handed down a trifle over a year ago.

During the past eight years the City has added to its permanent bathing facilities the William Mavor bath, in the Twenty-ninth ward, the Kosciusko bath, in the Sixteenth ward, and the Robert A. Waller bath in the Eighteenth ward. The cost of these three baths was charged against the current revenue of the City. A part of the bond issue already referred to is now being used for the building of new baths in the Fourth, Fifth, Fifteenth, Seventeenth and Twenty-second wards.

It should not be out of place to state that Chicago was the first city in the world to establish free baths. Having been the first city to provide this boon for its citizens, it is certainly but proper that your honorable body should exhaust every means to increase free bathing facilities and to maintain this form of public philanthropy in a manner which will render the greatest possible service to the public.

TUNNEL LOWERING.

For years the City administration has recognized the tremendous damage done to the commerce of the City, and, therefore, to its financial interests, by the three tunnels which serve as obstructions to the navigation of the river by the larger type of vessels plying the waters of the great lakes. The Union Traction Company, it must be remembered, possesses the right to operate street cars in the Washington street and La Salle street tunnels under ordinances which will not expire until February 1, and July 19, 1906, respectively. In other words, were the City to attempt to dispossess the Union Traction Company from these two tunnels, it would be necessary to provide it with other means of bringing its cars into the downtown district. That would mean the necessity of granting to the company the right to string overhead trolley wires in the business center of Chicago, as well as along the principal thoroughfares radiating from that center. It has seemed to me that to give the Union Traction Company the right to string overhead trolley wires along the streets, which the federal court has pronounced as covered by the so-called ninety-nine-year act, would seriously embarrass the City in a settlement of the traction question; indeed, it may be said that with the granting of this privilege the Union Traction Company would be in a position of immunity from attack on the part of the City and would have the means of serving the public in most economical form during the long stretched out period of litigation over its so-called ninety-nine-year rights. It was thought, therefore, that while the damage to the City's commerce because of the existence of these obstructions to navigation was serious, it was still of but a temporary char-

acter; whereas, to add to the value of the ninety-nine-year act rights by granting overhead trolley permits to the Union Traction Company would be seriously to embarrass the City in its dealings with this company for many years to come.

The franchises of the Union Traction Company for the use of the Washington street and La Salle street tunnels will expire, as already stated, in February and July of next year. Two million dollars of bonds have been laid aside, the proceeds to be used by the City for the lowering of these two tunnels at that time. Then the City will hold the whip hand, and will be in position to dictate the terms upon which the Union Traction Company may operate its lines during the period of tunnel lowering.

The City has already prosecuted successfully a suit against the Union Traction Company to compel the lowering of the Van Buren street tunnel, which is the exclusive property of the company. This suit was but recently decided in favor of the City by the Supreme Court of our State, and has been carried to the federal Supreme Court on a writ of error, where an early decision may be looked for.

SALARY INCREASES.

I have put myself on record many times in the last few years by stating it to be my belief that the City Council of Chicago is of as high a type of intelligence and integrity as is practically any legislative body in our land. I may therefore be pardoned if I call attention to one serious offense frequently committed by the members of this body.

It seems that whenever a number of men band themselves together to exact a salary increase, if the number be sufficient to make a formidable show of voting strength, at least a majority of the members of the City Council lack the courage to refuse their demands. As a result of this policy, in the appropriation bill of 1900 your honorable body passed an item raising the salaries of all members of the Police Department, below the grade of lieutenant, in the amount of 10 per cent. In 1900 an ordinance was passed raising the pay of all laborers working

for the City government to $2 per day. In 1902 an ordinance was passed establishing grades in the Police Department and fixing the salaries to be paid in these various grades; and twice your honorable body has passed an ordinance installing the so-called two-platoon system in the Fire Department.

Without entering into a discussion as to whether these various employes have been entitled to the salary increases asked, the fact remains that at no time that these measures have been under consideration has the City been in a financial condition to comply. It has, therefore, been necessary on each occasion for me to interpose my veto as a protection to the taxpayer. As a result of these vetoes the payrolls of the City for salaries alone are approximately $1,200,000 per annum less than they would have been had I allowed these various ordinances to stand. And this increase would have been for the payment of additional salaries alone, without the adding of a single man to the working forces of the City.

To-day the Real Estate Board, the Charter Convention Committee, the Merchants Club, your Committe on State Legislation, as well as a number of representative citizens are laboring with the State legislature to secure a change in the revenue system of the City which will add approximately $800,000 per annum to its revenues. This demand is being made of the Legislature because of the meager finances of the City. The City, because of its present poverty, is unable to add to the number of its police force, to equip with men and machinery the new engine-houses ordered erected in your last appropriation bill, to secure a more sanitary disposition of the City's garbage, to provide better street cleaning; in fact to meet any of the various demands made and justly made by taxpayers. The fact remains that if this $800,000 increase be granted, unless the policy hitherto pursued by your honorable body be radically changed, practically every dollar of this increase will be applied to the raising of salaries of the present employes alone, without adding the slightest improvement to the service rendered to the citizens.

TWO-PLATOON SYSTEM.

At the time the ordinance establishing the so-called two-platoon system in the Fire Department was up for consideration by your honorable body, the statement was made and reiterated on the floor of the Council that a majority of the members of the department did not approve of the proposed change. To learn whether this were the case or not, I have taken a vote of the entire department. The department consists of the following:

Marshals	4
Chiefs of battalions	18
Captains	120
Lieutenants	129
Engineers	198
Pipemen, truckmen and drivers	820
Pilots	10
Stokers	12
Total number of men	1,311

The vote of the department for and against the two-platoon system was as follows:

	For.	Against
Marshals		4
Chiefs of battalions		17
Captains	5	92
Lieutenants	7	86
Engineers, pipemen, truckmen, drivers, etc.	569	328

Making a total of 581 for the system and 527 against it, 203 men not voting.

ILLINOIS AND MICHIGAN CANAL.

As the result of a political attack upon the last State administration a mandamus suit was brought against the Illinois and Michigan Canal Commission restraining it from using certain appropriations made in its favor by the Legislature.

There can be no question in the minds of all fair-minded citizens that great abuses have existed in the operation of this canal, that exor-

bitant funds have been given its management and that these moneys have not been expended in the interests of the general public, but have been squandered with reckless extravagance and in utter disregard of the people's rights. In discussing this question, however, many citizens have gone too far in demanding that the Illinois and Michigan Canal be absolutely abandoned.

In all parts of the world the value of water ways as regulators of traffic rates is thoroughly recognized and appreciated. Indeed, in illustration it may be cited that at the present time the State of New York is spending upwards of $200,000,000 in the rehabilitation of the Erie Canal, constructed but a short time before the Illinois and Michigan Canal. The Illinois and Michigan Canal has served a great purpose in its day; while traffic on it may now be but slight, it must not be forgotten that the means for such traffic exists, offering to the shipper the possibility of competition with the steam railroads; in this way the canal, abandoned by traffic though it may seem to be, still serves to keep down the freight rates charged by these railroads. The Illinois and Michigan Canal was constructed in the interests of the general public; it should be maintained in that interest. By connecting it with the sanitary canal it will serve a useful purpose for many years to come, besides offering in the not too remote future a possible right of way for a ship canal which shall finally wed in commerce the waters of Lake Michigan with the waters of the Mississippi and afford opportunity for light-draft steamships to operate from the gulf to the head of navigation on the great lakes.

WATER RATES.

Twice within the past few months I have addressed communications to your honorable body suggesting reductions in the frontage rates as well as meter rates charged citizens for the services of the Water Department. My suggestion has been that the frontage rates be reduced in the amount of 10 per cent, the present discount allowed when payment is made within the discount period; and that if it were thought

inadvisable to reduce the water rates in too large an amount the discount might be reduced from 10 per cent to 5 per cent, or be cut out altogether.

On meter rates my suggestion has been to equalize the charges between the 10 cents per 1,000 gallons charged to small users and the 4 cents per 1,000 gallons charged to heavy users of water. The discrepancy between 4 cents and 10 cents per 1,000 gallons is altogether too great to be justifiable under any economic theory.

There is to-day a surplus of approximately $1,100,000 in the water fund. Under the recent decision of the Supreme Court it is impossible for the City to utilize this surplus for general appropriation purposes. While it is true great public works in the Water Department still remain to be performed, such as the construction of the Lawrence avenue conduit, the construction of a new pumping station and tunnel in the southern section of the City, the changing over of the old tunnel in the downtown district, and the installation of water meters, the cost of the meters to be paid by the City, proper financiering will easily provide funds for these works.

Under my administration the City at one time had outstanding $2,500,000 of water certificates issued for periods of from ten months to four years. And during my four administrations the City has issued water certificates in a total amount of $4,250,000. The income of the department has been so husbanded as to care for each and every one of these certificates and still leave the splendid surplus now in the fund. Whatever this administration has accomplished, future administrations may readily accomplish, and the necessity for great public works may not justly be pleaded as a justification for the refusal of the City to do justice to its water users.

In discussing the Water Department it might not be out of place to publish the following tabulated statement of the amounts of collections and the salaries paid in the Water Office during the years from 1896 to 1904, both inclusive:

SALARIES AND COLLECTIONS COMPARED, FOR THE YEARS 1896 TO 1904, INCLUSIVE.

ASSESSED RATES, COLLECTIONS AND SALARIES.

Year.	Amount of Collections.	Salaries.
1896	$1,969,490.80	$68,358.94
1897	2,132,205.89	58,256.97
1898	2,325,436.38	73,916.09
1899	2,059,015.63	63,776.86
1900	2,054,634.85	62,394.96
1901	2,149,255.08	55,090.64
1902	1,844,468.55	59,417.67
1903	2,260,808.99.	52,262.34
1904	2,350,011.69	56,225.38

METER RATES, COLLECTIONS AND SALARIES.

1896	$ 935,134.11	$27,043.00
1897	937,654.61	25,232.98
1898	1,087,858.31	34,558.40
1899	1,086,948.44	34,617.37
1900	1,143,533.15	31,066.50
1901	1,197,405.06	28,977.98
1902	1,330,805.29	31,300.15
1903	1,406,989.98	31,075.29
1904	1,577,523.36	33,336.54

TOTAL COLLECTIONS AND SALARIES.

1896	$3,003,692.61	$269,959.69
1897	3,177,706.83	263,145.38
1898	3,489,390.87	279,549.06
1899	3,203,569.71	268,889.15
1900	3,248,411.36	245,363.88
1901	3,397,928.87	233,510.06
1902	3,223,867.55	235,754.05
1903	3,728,493.83	229,082.98
1904	4,000,462.33	236,800.31

From this statement it may readily be seen that economic administration has been the rule in the Water Department.

COMPENSATION FOR SPECIAL PRIVILEGES.

I have always held to the theory that public property is worth to the citizens exactly what private property of the same general character and description is worth to its owner. For that reason from the very

beginning I determined that during my service as Mayor no private use of public property should be allowed without requiring just and adequate compensation to the community for the privilege. This system has been rigidly adhered to throughout the past eight years with the result that the compensation allowed the City for privileges has steadily increased, until to-day it forms no inconsiderable source of revenue for the general purposes of administration.

The subjoined comparative statement of the amount of compensation received by the City during the years from 1896 to 1904 should form instructive reading for the members of your honorable body, as well as for the citizens at large.

COMPARATIVE STATEMENT SHOWING AMOUNT OF MONEY RECEIVED AS COMPENSATION FOR SPECIAL PRIVILEGES GRANTED FROM 1896 TO 1904.

	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.
Switch Tracks	.....	.....	$ 360.00	$ 870.00	$ 1,645.00	$ 3,428.50	$ 5,094.16	$ 7,205.00	$ 8,475.00
Bay Windows	$ 200.00	$ 450.00	1,110.00	3,073.00	3,314.00	5,477.50	6,293.00	6,322.50	6,247 50
Use of Streets	1,952.27	1,952.27	2,202.27	2,702.27	2,904.27	3,213.77	4,883.27	4,921.27	4,921.27
Tunnels and Bridges	6,166.00	6,200.00	6,200.00	6,900.00	8,065.00	13,065.00	13,590.00	14,435.00	14,536.00
Conduits	300.00	300.00	300.00	300.00	312.50	675.00	(1) 13,851.95	1,775.00	2,050.00
Coal Holes	500.00	500 00	500.00	500.00	500.00	561.50	2,256.34	1,436.25	1,325.00
Elevated Sidewalks	.....	.....	.....	300.00	600.00	600.00	750.00	1,252.00	2,625.00
Maintenance of Bridges	1,400.00	1,400.00	1,400.00	4,249.00	4,249.00	9,889.50	9,979.35	4,400.74	7,247.82
Electric Light Franchises	.....	.....	.....	133.13	1,390.14	2,830.75	4,576.12	27,186.25	(2) 45,581.10
Miscellaneous Franchises	.....	.....	.....	.....	.....	.....	.....	.....	.....
Per cent of Gross	.....	.....	.....	56,314.05	63,148.92	87,161.29	117,267.92	137,588.19	(3) 153,295.51
Receipts	41,062.09	42,403.97	46,907.95	.....	.....	.....	.....	.....	.....
Extension of Municipal Electric Lighting System along Right of Way in return for trolley permits	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00
Total	$91,580.36	$93,206.24	$98,980.22	$ 115,341.45	$ 126,128.83	$ 166,402.81	$ 218,542.11	$ 246,522.20	$ 286,304.20

(1). $12,000 one payment for grant of 20 years.
(2 and 3). Reports for 1904 not received; amounts estimated from previous reports. Not due until February 1, 1905 and March, 1905.

In discussing this subject it must be remembered that the theory of compensation is still in its infancy. When the City shall finally be in a position to receive the full amount of compensation due it from every privilege of a quasi-public nature granted within its limits, the receipts from this source will go far toward minimizing the rates of taxation.

IROQUOIS FIRE.

In the closing days of the year 1903 the City was shocked and saddened by a terrible disaster. Almost six hundred lives were lost in the burning of the Iroquois theater. So many charges and countercharges of official neglect have been made in connection with this subject matter, and the knowledge of the general public in reference to it is so limited, that I wish to say a few words by way of personal and official explanation.

In the beginning it should be remembered that in June of 1903 I appointed as Commissioner of Buildings, George Williams, a prominent building contractor of this City. There had been much criticism of the department during the prior years. The charge had been constantly made the department was being used for the granting of favors for political purposes. In order that this charge might not justly be registered against the department during my last administration, immediately after my last election I addressed communications to the Builders' Club, the Western Society of Engineers, and the Illinois Chapter of the American Institute of Architects, asking them to suggest the names of three men whom they would be willing to recommend for the position of Building Commissioner of Chicago. In this communication I stated that while as a Democrat I would naturally prefer the name of a Democrat, still the politics of the individual should be of minor consideration, and that I wished the recommendation to be based upon the individual capacity of the man. Later on other organizations asked permission to suggest names, with the result that the Builders' Club, the Chicago Masons and Builders' Association, the Builders' and Owners' Association of Chicago, the Chicago Master

Steam Fitters' Association, as well as several hundred of the leading architects and contractors of the City, united in the support of George Williams, a Republican, for the position of Commissioner of Buildings.

The only instructions given Mr. Williams at the time of his appointment were to enforce the City ordinances without fear or favor, and after almost two years of service I feel I can say with absolute truth that these instructions have been faithfully observed by him.

Soon after his appointment Mr. Williams learned that many of the theaters of the City were not complying strictly with the requirements of the building ordinances. He therefore assigned inspectors to make a rigid investigation and to prepare a complete report. In the meanwhile a dispute arose over the lack of compliance with the building ordinance of the building afterwards known as the Cleveland theater, then in process of construction, as well as of the Lyric theater. Special criticism was made in reference to their seating capacity, and to the character of their proscenium walls, though other matters were mentioned in which violations were charged.

As a result of a threat on the part of myself to close these and all other theaters which might be found violating the law unless immediate steps were taken to remedy these violations, the following order and ordinance were passed by the City Council on the night of October 19, 1903:

ORDER.

WHEREAS, It has been publicly charged through the press and commonly rumored that serious violations of the building ordinance had been permitted during the construction of some of the downtown theaters; and

WHEREAS, It is commonly known that all the theaters do not conform with the building ordinance with respect to the height of floor above street level and proscenium walls; therefore, be it

Ordered, That any further action against such violations be stayed until the Judiciary Committee reports an amended ordinance.

ORDINANCE.

Be It Ordained by the City Council of the City of Chicago:

SECTION 1. That Section 181 of the building ordinance passed March 28, 1898, and printed on page 2,060 of the Council proceedings for the years 1897 and 1898, be and the same is amended so as to read:

"SEC. 181. All doors in buildings of Classes IV and V shall open outward.

"In buildings of Classes IV and V there shall be a solid brick wall of the same thickness as that called for on the outside walls, or a wall of any other material or materials of equal strength and stability and resistance to fire, between the auditorium and stage; and in non-fireproof buildings this wall shall extend to a height of six feet above the roof. The main curtain opening shall have an iron or asbestos curtain, and all other openings in this wall shall have iron doors."

SECTION 2. This ordinance shall be in force from and after its passage and due publication.

The following order also, was introduced and referred to the Committee on Judiciary:

WHEREAS, It has been publicly charged through the press, and commonly rumored, that some serious violations of the building ordinance had been permitted during the construction of some of the downtown theaters; and

WHEREAS, It is commonly known that all of the theaters do not conform with the building ordinance as to the safety of the public in case of emergency; therefore, be it

Resolved, That his honor the Mayor appoint a special committee, consisting of three Aldermen, City Engineer and the Commissioner of Buildings, to amend the building ordinance, with reference to the construction of theaters, so as to better protect life, and report to this Council within three weeks.

Shortly afterwards the report of the inspectors assigned to examine the theaters was made to Mr. Williams and by him referred to me. This report was transmitted by me to the City Council, November 2, 1903, with the following communication:

MAYOR'S OFFICE, November 2, 1903.

To the Honorable, the City Council:

GENTLEMEN: I beg to transmit herewith a series of reports prepared by the Commissioner of Buildings, showing the failure of the various theaters of this City fully to comply with the building ordinances. The violations are so numerous and so complete that it would be impossible for the City administration to compel observance with the ordinance without closing practically all the theaters of the City. As the matter of revising the ordinances of the City relating to theaters and other places of amusement is now before your Committee on Judiciary, I would suggest the reference of the Building Commissioner's reports to that committee to aid it in the work it has in hand.

Respectfully,

CARTER H. HARRISON,
Mayor.

Naturally suggestion was made that this report be referred to the Committee on Judiciary, which was then considering the entire subject matter.

The Council by its order of October 19, 1903, had stayed the enforcement of the building ordinances, as far as they applied to buildings of Class V. Even if this order had not been passed, the fact that the City Council had directed its Committee on Judiciary to report an amended ordinance would have acted practically as a stay on the department, for it would have been unusual and unwise for the Building Department summarily to attempt the enforcement of those provisions of an ordinance which the Council was at that very time in the act of seeking to amend.

The Committee on Judiciary referred the entire matter to a sub-committee, and I have been advised this sub-committee had practically prepared an amended ordinance, when the ill-fated Iroquois theater burned.

Immediately, regardless of the facts in the case, a cry of vengeance was raised. The newspapers thundered against the administration, forgetting meanwhile that a full copy of the Commissioner's report of the violations of theaters had been furnished them on the 2d of November, 1903, and that they had failed to advise the public of the danger of attending these theaters by the publication of more than a few bare lines. Although the newspapers had been acquainted with the fact that every theater in Chicago was in violation of the law, not one newspaper refused to publish advertisements at the regular office rates, thus encouraging the public to visit them. Only one newspaper in the City even made so much as an editorial mention of these violations.

The fact is, as all honest men will admit, that had the administration on November 2, 1903, followed the course afterwards suggested by its public critics as the proper course for it to have pursued; namely, to revoke the licenses of all of the local theaters and refuse permission to them to open their doors to the public, it would have been hounded

out of the City by the force of public protest. Indeed, after the Iroquois fire, and with full light on the danger attending the operation of theaters, when the City attempted to enforce its amended building ordinance against all of the theaters of the City, at least four of these theaters secured injunctions, one from a local court, the other three from a federal court, restraining the City from closing them; and these theaters operated for months and are still operating in violation of certain terms and conditions of the building ordinances.

When all is said and done the fact remains that the Iroquois theater was probably the safest theater in the world as far as construction, exits, etc., were concerned. The only inflammable material in the theater was the scenery, and it was the burning of this scenery which resulted in the dreadful loss of life.

Up to the time of the Iroquois fire not a city in the United States enforced the rule that scenery should be thoroughly fireproofed. Indeed it was a controverted fact whether scenery could be fireproofed. To-day I firmly believe the greatest safeguard contained in the new building ordinance, and a safeguard upon which I have most earnestly insisted, is the requirement that all scenery of every character and description shall be thoroughly fireproofed before permission shall be given to use it publicly in this City.

POLICE.

During the past three years the ability of the Police Department to cope with the riot and disorder growing out of great strikes has been thoroughly tested. In the summer of 1902 the Stock Yards teamsters' strike brought on conditions which put the department to a severe test. In the following spring a still greater test was applied in the so-called Kellogg Switchboard Company strike. In the fall of 1903 the City Railway strike tried the mettle of practically every member of the department from the chief to the individual patrolman, while in the summer of 1904 the great Stock Yards strike proved conclusively the ability of the Police Department of Chicago, when working under fearless and

efficient management, to cope with any industrial complication which is liable to arise.

Immediately after the second breaking out of the Stock Yards strike I was approached by a high officer of the Illinois National Guard with word to the effect that the Governor of the State stood ready at a moment's notice to furnish all the militia that the City might require in suppressing disorder and preserving the peace. While thanking him for his offer, I expressed an entire lack of fear that the situation would become too serious for the Police Department itself to handle. Events justified this position. The City of Chicago should congratulate itself and should compliment its Police Department, both officers and men, in the highest terms and bestow upon them the most unstinted praise for the magnificent work performed in the preservation of peace during these four great strikes.

HAYMARKET SQUARE.

As a result of an order passed by the City Council upon the request of Alderman John J. Brennan of the Eighteenth ward, appropriation was made a year ago for the necessary funds to institute condemnation proceedings for the widening of West Randolph street, in order to increase the size of Haymarket Square. These proceedings have been concluded and in the not distant future this great public market will be of more than double its present size.

The idea has occurred to me that this extension should be carried even farther west. The extension of Haymarket Square, by the widening of West Randolph street straight through to Union Park, would be a most desirable acquisition for the City. The time is not far distant when the merchants of South Water street will be obliged to give up their present location. Indeed to-day the existence in its present location of this crowded thoroughfare, packed solidly through its entire length from morning until night, forming, as it does, a barrier between the great north and south divisions of the City, must by the very nature of things be regarded as a detriment to public welfare. South Water

street to-day is beginning to run over into its north and south intersecting thoroughfares. Already State street, Dearborn street and Lake street for half a block south of South Water street itself are in almost as congested condition as is that thoroughfare. The time will soon arrive when this great market must find a new scene for its operations, and the idea has occurred to me a better location could not be found than in connection with the enlarged facilities of Haymarket Square.

STREET PAVING MATERIAL.

In other messages to your honorable body I have called attention to what seems to me to be an indisputable fact that the manner in which street paving is provided for in Chicago amounts almost to a waste of the taxpayer's money. Street paving is laid largely according to the whim of a few property owners, many of them at times worked up by the self-interested pleas of paving contractors and their promoters. The City's streets are paved in haphazard fashion rather than by adhering to a scientific scheme of adjusting the character of the pavement laid to the character of the surroundings. To secure a proper scheme of paving Chicago's streets the co-operation of the property owners must be obtained. To-day the average property holder is either opposed to the improvement of his property or insistent upon its improvement with the cheapest possible character of material.

After a careful examination of the entire subject matter, with due regard for the showing made by various pavements during the past eight years, I venture to assert the only proper paving materials for streets with heavy traffic to be dressed granite blocks; for streets with somewhat lighter traffic the so-called creosoted blocks; for light business thoroughfares and the more generally used residence streets, either creosoted block, which is desirable both because of its cleanliness and its noiselessness, or asphalt; for outlaying streets either brick, asphalt or macadam with crushed granite top dressing.

When the grooved rail shall have been generally brought into use many of the present evils from which property owners suffer will be

removed. But even the use of the grooved rail will not make asphalt a satisfactory pavement for a street with heavy business traffic. This fact may readily be seen by a careful examination of State street from Madison street to Randolph street, Adams street from State street to Michigan avenue, and Washington street from State street to Wabash avenue.

In a previous communication I have cited the splendid service given by creosoted block on one-half of the Rush street bridge. This pavement was laid in the fall of 1899; at the same time the other half of the bridge was paved with ordinary pine block. The pine block has already been once renewed, while practically no attention has been paid to the creosoted block half of the bridge. There is not a piece of paving within the limits of the City of Chicago which receives a more arduous test than is given the paving on Rush street bridge. In spite of this fact the creosoted block pavement, which has now been laid for upwards of six years, is to-day in a thoroughly satisfactory condition. And it must not be forgotten that at the time this pavement was laid it was generally understood that on account of the hurry with which the work was completed the creosoting of the blocks was but imperfectly performed. I cannot too strongly advise a more thorough test being given to this pavement, as I believe from such experience as we have had with it that both from the standpoint of looks, cleanliness, noiselessness, and the ability to stand wear and tear, it comes nearer being the perfect pavement than any other which has yet been brought into use. The House of Correction affords splendid opportunity properly to treat the blocks to be used. In this manner not only could paving contractors be supplied with the best grade of creosoted block at the lowest possible figure, thus reducing to the citizen the cost of an exceptional character of street paving, but opportunity would be given to the management of the House of Correction profitably to employ a number of the inmates without entering into competition with free labor.

During my four administrations the following street improvements have been made:

STREET AND ALLEY PAVING IN MILES PAVED.

YEAR.	Asphalt.	Brick.	Cedar.	Granite.	Macadam.	Slag.	Creosoted Block.	Novaculite.	Rock Asphalt.	TOTAL.
1897	10.38	6.08	23.53	0.53	15.52					56.04
1898	8.52	1.70	18.82	6.52	0.62					36.18
1899	11.91	13.01	10.30	1.43	8.79	3.80				49.24
1900	20.66	17.64	10.76	1.47	20.94					71.47
1901	6.65	8.01	2.26	2.25	19.65					38.82
1902	22.60	11.36	2.58	4.57	25.69					66.80
1903	48.88	7.06	1.92	3.55	20.15		0.03	0.28	0.18	82.05
1904	42.63	5.53		4.61	28.99		0.57	1.73	0.89	84.45
TOTAL	172.23	70.39	70.17	24.93	140.35	3.80	0.60	2.01	0.57	485.05

THE TRACTION QUESTION.

It is not my purpose in this message to enter into a prolonged discussion of the traction question. My views have been made known to your honorable body in my various annual messages, as well as in the special message submitted to you January 6, 1902. It may not be out of place, however, to recall briefly a few of the essentials on which I have insisted for the correct settlement of the traction question.

In my message of 1899 I laid down what I called five cardinal points to be considered in connection with an extension of franchise to the existing street railway companies. These points were as follows:

> "Compensation, based upon a percentage of gross receipts, reduction of fare during the crowded hours of the day, a betterment of conditions in the accommodation of the public, *a provision for municipal acquirement of the lines at the expiration of the grant,* and a requirement that before any ordinance granting an extension of franchise shall become operative it shall first be submitted at the next general election to a direct vote of the people and receive popular endorsement."

In this message I stated furthermore:

"While the people do not wish to drive an unfair bargain with the traction companies, they are absolutely and finally opposed to suffering unhealthy and indecent conditions that larger dividends may be earned by the stockholders of these companies, to giving franchises without proper compensation, to paying a five-cent fare during the crowded hours, and to granting any extension of franchise that fails to contemplate *ultimate municipal ownership of the lines.*"

In my annual message of 1900 I stated that public sentiment might be summed up as a demand for:

"1. Compensation to the City based upon a percentage of the gross receipts.

"2. A reduction of fare during the rush hours of the day.

"3. A betterment of accommodations.

"4. A distinct waiver of all claims under the ninety-nine-year act.

"5. A provision for *municipal acquirement of the properties at the expiration of the grant.*

"The first and second points are practically one and the same. When a careful study of the question has shown what compensation the companies can afford to pay, it will devolve upon your honorable body to decide the form in which it is to be paid, whether in straight compensation, in a reduction of fare, or in both forms."

In my annual message of 1901 I referred to the traction question in the following terms:

"The elections of recent date have shown in unmistakable manner the existence of a strong popular sentiment in favor of the municipal ownership of street railroads. In view of the almost unanimous declaration of the voters upon this proposition I cannot too strongly urge upon your honorable body the importance of deferring any grant of franchise to the traction companies until the City shall have obtained enabling legislation by which it will be empowered to own its interurban transportation facilities. If this power is to be obtained by the City from the Legislature, the grant of enabling legislation must ante-

date the grant of extensions. The people have expressed their will. Your honorable body cannot obey the mandate except by serving notice upon the traction companies that until the City shall have received the legislation to which it is entitled and which it deserves, the question of extending the existing franchises must lie in abeyance. Your honorable body will mistake popular sentiment if you fail to give proper heed to the people's mandate and by that failure tie up this municipality in a fresh twenty years of servitude to the traction companies without laying firmly and immovably the foundation stones of municipal ownership."

In my message of 1902 I summed up the essentials of traction settlement as follows:

"An improvement of accommodation which will do away with the present uncomfortable, unwholesome and indecent overcrowding of cars. Adequate compensation for the privileges granted either in the form of a percentage of the gross receipts paid into the City treasury as a trust fund to be expended solely upon the public streets, a reduction of fares, or a combination of both forms. Provision for public ownership of the lines at the earliest feasible date. The simultaneous expiration of all franchises on or before twenty years after the date of grant and the express prohibition of the transfer of a franchise to a foreign corporation. The use of the underground trolley within a certain district bounded by North avenue, Twenty-second street and Western avenue, the realignment of terminals that transportation may be rapid and street congestion as far as possible avoided. The use of modern grooved rails in all paved streets and the paving of the rights of way by the traction companies with asphalt or dressed granite blocks. An universal system of transfers and full publicity of accounts. The establishment of a system of arbitration for the settlement of disputes arising between the traction companies and their employes. A single car service instead of the present train service."

And to these requirements I added:

"Even less open to doubt and argument is the proposition that the people expect and demand a voice in any settlement of

the traction question proposed to be made. The citizens, to whose votes and support our presence here is due, feel an interest so absorbing and so acute in the disposition to be made of their valuable property rights in the streets they cannot be blamed for demanding with practical unanimity and with an insistence which may not safely be denied that no franchise grant shall be made which must not be submitted to popular vote for indorsement or rejection, *if a sufficient number of voters petition for such submission.*"

While in my special message of January 6, 1902, definitely outlining my position on the subject of a franchise renewal ordinance I summed up what I conceived to be the public demand as follows:

"A betterment of existing accommodations with regard to comfort and decency.

"Compensation to the public in return for what the public gives; this compensation to be either a percentage of gross receipts paid into the treasury as a trust fund to be expended solely in the maintenance and care of the public streets and alleys, a reduction of fares, or a combination of both these forms.

"A waiver of all alleged rights under the so-called ninety-nine-year act.

"Provision of the *acquirement by the municipality of the lines at the expiration of the grant.*

"The use of the underground trolley within certain boundary lines and the realignment of terminals in order that transportation may be rapid and the congestion of streets and the overcrowding of cars avoided.

"The simultaneous expiration of all franchises and the express prohibition of the transfer of a franchise to a non-resident or foreign corporation.

"A general system of transfers.

"Publicity of accounts.

"The use of modern grooved rails in all paved streets and the paving of the rights of way either with asphalt or with dressed granite blocks.

"The reference of all extension ordinances to a popular vote of the people for their sanction and indorsement."

From these various statements it is evident that my position on the traction question from the beginning has been consistent and that in each of my various elections the public has well understood the ideas which I insisted upon as necessary to be incorporated in a settlement of this great question. Indeed a casual reading of these statements make it evident that from the beginning I have felt it would be necessary, in view of the complications in which the traction question is involved and in order to clear up the situation as far as it may be cleared, and to provide for a date on which all ordinances should simultaneously terminate, to pass a new ordinance giving a new and definite term of occupancy in lieu of the existing patchwork franchises.

During the early years of my service as Mayor I was bitterly attacked at times because of my refusal to discuss immediate traction settlement, basing my refusal upon what I considered a matter of imperative necessity, the securing of enabling legislation by which the City would be empowered to own and operate street car lines before an extension of franchise should be granted. It was because of this insistence on my part, my absolute refusal in any circumstances to discuss the question of settlement prior to the passage of such enabling legislation that the Mueller bill was finally passed by the Legislature in its session of 1903. After that bill had been passed, and when the City Railway Company had finally agreed to a waiver under certain conditions of its rights under the ninety-nine-year act, I announced my willingness to take up the question of settlement of the franchise extension question, always with the proviso that any ordinance which might be mutually agreed upon by the Council and the companies should be presented for approval to the people. I have always insisted and indeed was the first to insist, that the people to whom the streets belong should be given an opportunity to demand a referendum vote upon so important a matter as the franchise extension question.

When the so-called tentative ordinance was finally drafted it was

referred to the City Council by the Committee on Local Transportation and published in your official proceeding. Its salient features were also published in the daily press. At your meeting of August 24, 1904, I submitted a proclamation which had been issued August 14, 1904, to the general public calling attention to the tentative ordinance and the reasons why I believed it to offer as favorable terms of settlement as it would be possible in my estimation for the public to obtain; I stated that should a petition asking its reference to a popular vote be presented within a given length of time, namely before October 20, 1904, I should use all of my influence to prevent consideration of the ordinance by your honorable body prior to it being submitted for the approbation or disapprobation of the public in a referendum vote. In other words, I announced that in the event an attempt were made to pass this ordinance prior to such a referendum vote I would veto the same and use all my influence to prevent its passage over my veto. I also stated that the failure to present such a petition would in my opinion be held to mean that a majority of the voters approved of the terms of the ordinance, and in that event I would feel the ordinance had met with popular approval and should be passed by the City Council.

Immediately through certain newspapers a vicious attack was made both upon the Committee on Local Transportation, upon many members of your honorable body and upon myself, as having attempted to formulate an ordinance in the interests of the traction companies and against the interests of the public. The charge was further made that in my proclamation I had receded from the pledges I had made to the public on many occasions in the past to afford a referendum vote on any traction extension ordinance which might be presented to the City Council.

I may be pardoned for calling your attention to two facts: First, that under the terms of the Public Opinion Act, a question can be submitted for popular approval or disapproval only upon presentation to the proper officials of a petition signed by twenty-five (25) per cent of the registered voters; and, second, that this so-called silent referendum

was first suggested to me by officers of the Referendum League, who asked that the ordinance enlarging the authority of the Illinois Telephone & Telegraph Company be published and allowed to lie over sixty days prior to its being called up for passage in the City Council, in order that if the general public desired so to do a petition for its reference to a popular vote might be prepared and presented to the Board of Election Commissioners. So little general opposition had been shown to the passage of this ordinance I did not think it necessary to defer its passage for that length of time. The idea suggested itself to me, however, of the advisability of adopting this method of learning whether the people approved or disapproved of an extension ordinance when the same should finally be prepared.

Again, it should not be forgotten that in my proclamation I did not even demand that the full 25 per cent of the registered voters required by the Public Opinion Act should affix their names to the referendum petition to convince me of the desirability of postponing action upon the ordinance. All I demanded was that a petition of a sufficient number of voters showing a genuine opposition to the passage of the ordinance should be prepared and presented. This petition was finally prepared, and I was advised of its existence by means of an affidavit presented to me by Victor F. Polachek, managing editor of the *Chicago Daily Examiner*. I announced to the committee presenting the affidavit that the petition having been prepared, I should exert all of the influence of which I was possessed to prevent any further action upon the ordinance until the same should have been submitted for popular approval at the spring election of 1905.

I consider the tentative ordinance as having been the crystallization in definite form of the various platforms of the Democratic party, upon which I have been re-elected Mayor for three successive terms, as well as of my various pledges made both in public utterances and in messages to your honorable body. It seems to me no cheaper method and no surer method of obtaining a waiver of the trac-

tion companies' rights under the ninety-nine-year act, whatever they may finally be adjudicated to be, could be proposed than that contained in the tentative ordinance, wherein it is agreed that all outstanding franchises of the company should expire in thirteen years, the period figured out as the commuted life of all outstanding franchises. In making this commutation, the only questions considered were the actual miles of track involved. In other words, no greater values in the commutation were given to the tracks of the City Railway Company in State street, from Van Buren to Lake street, than were given the same amount of trackage in the outlying wards.

It is a most inaccurate use of words to style the tentative ordinance a "franchise extension" ordinance. It may with more reason be termed a "franchise reduction" ordinance, for it reduces many of the so-called ninety-nine-year terms to thirteen years. In reality it neither increases nor diminishes the so-called franchises taken as a whole, but gives a new term different in form but mathematically equivalent to the old terms.

It is questionable whether the so-called tentative ordinance, even had it been approved of by a popular vote, would ever have been accepted by the City Railway Company. The terms of this ordinance were so favorable to the City that the large interest in the City Railway Company which is also interested in the Union Traction Company unquestionably would have exerted its every influence to prevent the acceptance by the City Railway Company of an ordinance the terms of which would establish a precedent for a future settlement with the Union Traction Company. The Union Traction Company, as it exists to-day, could not accept an ordinance of the character of the tentative ordinance and maintain any value whatever in its securities. It was probably because of the fear that the City Railway Company might agree to the terms of the tentative ordinance that eastern holders of Union Traction stock invested at a tremendous price in stock of the City Railway Company, thus securing control of that company and putting themselves in a position to dictate the terms

of a possible settlement between the City Railway Company and the City.

At the time the tentative ordinance was prepared, in view of the decision then recently rendered by Judge Grosscup on the validity, scope and effect of the ninety-nine-year act, I was firmly convinced that no method could be or would ever be outlined by which municipal ownership of the traction companies might be obtained as cheaply and at as early a period of time as under that ordinance. Unfortunately the general public has never thoroughly understood its terms. The fact remains that, while possibly in some particulars the tentative ordinance should have been amended, its general terms were of great benefit to the City. If accepted, it would have brought about an immediate general rehabilitation of the company's property, good service would have been afforded the public under proper police regulations, and the City at the end of thirteen years would have been enabled to obtain possession of the entire system at the bare cost of the tangible property. The City cannot buy the properties of the City Railway Company and of the Union Traction Company by mutual agreement at a price at which municipal ownership can be made to pay. Under condemnation proceedings, if they may legally be had, I venture the assertion that a very considerable portion of the period figured on in the tentative ordinance as the commuted life of the City Railway Company's franchises would expire before the City could secure possession of the properties; the damages finally assessed against the City, in all likelihood, would make successful municipal ownership exceedingly doubtful, if not impossible, while during all the period of the long-drawn-out legal battle the present intolerable service would continue to subject street car users to uncomfortable, unhygienic and indecent conditions.

Since the action taken by your honorable body at its meeting of March 20th, whereby the consideration of the validity of the

Act of 1865, or the ninety-nine-year act, was vested in the State Court, the situation has been somewhat altered. Should the State Court differ in its view of the ninety-nine-year act from the Federal Court, the situation may be so altered as to make ill advised the consideration of an ordinance drafted along the lines of the tentative ordinance. In the meanwhile it must not be forgotten that a great city of 2,000,000 souls is enduring surface transportation which subjects its citizens to great discomfort, and which, because of the overcrowding of cars, is a grave menace both to health and to morals.

Prior to July 30, 1903, the date of the expiration of the various street railway ordinances, no steps could be taken by the City to dispossess the companies from the streets. Before this date, namely, on July 18, 1903, the receivers of the Chicago Union Traction Company filed a bill in the Federal Court and procured an injunction forbidding the City from interfering with the possession of the receivers until the further order of the court. This action on the part of the receivers of the Chicago Union Traction Company effectually forestalled the City from taking steps in the State Court against that company and put matters in a deadlock, so that nothing could be accomplished during the pendency of the suit except to negotiate for a settlement with the companies on reasonable terms.

Although every effort was made to bring this matter to a conclusion, the Chicago Union Traction Company steadfastly refused even to negotiate for a settlement on any terms which the City could concede. It was largely on account of the fact that the Federal Court had jurisdiction of this controversy that I favored the so-called tentative ordinance, which I then regarded and still regard as a favorable settlement for the City, in view of all the circumstances, and particularly in view of Judge Grosscup's decision.

With regard to the Chicago City Railway Company, the situation was slightly different. That company did enter into negotia-

tions which at least on the surface seemed to be *bona fide*. If an extension of its ordinances had not been given from time to time, it would undoubtedly have followed the lead of the Chicago Union Traction Company and filed a suit in the Federal Court.

Not until March 20th was I able to institute proceedings in the State Court for the determination of the respective rights of the City and said company. The decree in the West Side Traction case was not formally entered by the court until March 8, 1905. The entry of this decree and the institution of the suit against the City Railway Company in the State Court have for the first time put the City in a position where it has been able to do aught else than negotiate.

The Adams street line of the Chicago Passenger Railway Company expired on April 21, 1904, and steps were at once taken looking toward the establishment of a municipal street railway upon that expired line, with branches, to be extended from time to time, as other lines expired, but this proceeding also was interrupted by an injunction from the Federal Court in a suit which has been fully argued, but for some unaccountable reason not yet decided. After waiting a due and reasonable time for a decision of that case, and finally being advised by a singular public utterance of Judge Grosscup, made in court, that he deemed it unnecessary to decide the case as long as negotiations were pending for a general settlement with the Union Traction Company, I recommended to your honorable body, on February 16, 1905, a modification of the plan first adopted on motion of Alderman Milton J. Foreman, of the Third ward, July 11, 1904, namely: that the City should advertise for the construction of a municipal street railway on this and other streets, possession, however, not to be given until the case had been decided or until the date in the decision fixed as the expiration of the lines. It is on the basis of this plan for the construction of a municipal street railway on Adams street, to be gradually extended into other parts of the

City as existing ordinances expire, that I look for a most hopeful method of actually accomplishing municipal ownership without the payment of large sums of money for disputed and expiring franchise rights.

The first advertisement for bids for this municipal street railway, authorized by your Committee on Local Transportation, at its meeting of March 31, 1905, was published in the official publication of the City, the *Chicago Evening Journal,* in its issues of April 3, 1905.

In a recent conversation with one of the best-known bankers in the United States, the suggestion was made to me that there might be two difficulties in the way of selling Mueller law certificates, even if all legal doubts were solved in their favor:

(1) The mere fact that this kind of security was new to the financial world, and might not, therefore, meet with so ready a sale as bonds issued in the usual way and in the form familiar to dealers and investors.

(2) That Mueller law certificates issued by the City upon a street railway system to be operated by the municipality itself might be regarded with some distrust by conservative investors on account of their fear that the financial success of the enterprise might be hampered by the baneful effect of mingling business with politics.

To one who knows conditions in Chicago, I believe that both these objections are entirely unfounded:

(1st) The triple security which can be given under the provisions of the Mueller law is so far in excess of that which can be given by any private corporation that I believe when this feature is understood by the public these securities will have an even better standing than bonds issued by private corporations.

(2d) Those who are familiar with the admirable civil service law now in force in this City, and who understand that this law must at once apply to every "place of employment" in the municipality, and who have seen the marvelous improvement in the public

service wrought by the effect of this law, will be convinced that in this point alone the municipality has an advantage over private corporations. The City must operate a municipal street railway system on the merit plan, while a private corporation is under no such compulsion. The very fact, however, that the investors from whom the capital for such an enterprise must be secured are ignorant of these facts and raise these objections must be taken into consideration. It has occurred to me that without sacrificing any of the benefits of which I have spoken, certain features may be introduced into the municipal enterprise which will tend to inspire the confidence of the financial world. A corporation could be formed under our existing law for the formation of corporations "not for profit." Under its articles of incorporation and by-laws this corporation could be vested with power to construct, lease, acquire and operate a street railway system in trust for the City of Chicago. The board of directors of this corporation might be appointed by the Mayor, with the approval of the City Council, to serve as trustees of a street railway commission. I believe that if their position was made one of honor and dignity, to which no salary or emolument were attached (as in the case of the school trustees and the proposed park commissioners under the pending consolidation bill), men of the highest possible integrity and commercial standing could be persuaded to make the necessary sacrifice to serve as such trustees out of love for their City. A contract might be made with such a corporation to construct and operate street railways for the City of Chicago, the City issuing to this corporation Mueller law certificates for the actual cost of the construction and securing these certificates by the tangible property and the revenue. Against these certificates this corporation could issue bonds in the usual form. The plan should provide that all the revenues of the system should be devoted: first, to the payment of operating expenses; second, to the payment of interest upon and the formation of a sinking fund to the retirement of the Mueller law certificates; third, the trust to be terminable

and the City to take over the system without any payment whatever when the Mueller law certificates had been retired. Under this plan it would be advisable to provide that the City should furnish the employes for the system from the civil service lists under the provisions of the civil service law.

DAY LABOR.

During the past eight years the City has performed the following pieces of public work by day labor:

The Kedzie avenue pipe tunnel, on which work was commenced November 25, 1898, and completed in March, 1899. This tunnel is 7 feet in diameter and 1,544 feet in length.

Section 3, northwest land tunnel. November 11, 1898, Weir, McKechney & Co. abandoned this work. July 8, 1899, after securing the dissolution of an injunction restraining it from entering upon the work, the City undertook the completion of the tunnel. The work performed by the City under the day labor system consisted of 1,628 lineal feet of tunnel in earth, 419 lineal feet of tunnel in solid rock; the entire section was cleaned out and all shafts domed over and filled; the cost of the City's work was $118,101.02.

Chicago avenue tunnel extension, consisting of 143 lineal feet of 5-foot tunnel, 519 lineal feet of 6-foot tunnel and 960 feet of 7-foot tunnel. The total cost of this work was $41,644.15.

The City also completed the so-called Ross & Ross tunnel, supplying the Sixty-eighth street pumping station with water from the Sixty-eighth street crib.

During the early years of my administration I addressed a communication to your honorable body advising the construction by day labor of the lateral intercepting sewer running from Thirty-ninth street south. At that time the charge was made that this great work, if intrusted to the City, would be used as a part of a political machine, that the good of the public would be lost sight of in the attempt to gain advantage for political workers. On June

6, 1904, this work was completed. The following figures, showing the length and size of the conduit constructed, the cost per foot of the work, the machinery fully paid for on hand at the time of the completion of the work and the lowest bid offered by a contractor at the time the work was advertised for letting, should prove instructive:

SECTIONS G AND H (Thirty-ninth street to Seventy-third street).

Total expenditures G and H		$1,204,956.04
Less rentals and sales		8,210.82
Total cost to City		$1,196,745.22
Contract cost corrected lengths as per bids	$ 898,780.94	
Cost of work not specified and right of way	229,557.08	
	$1,128,338.02	
Six per cent for Engineering and Superintendence	67,700.28	1,196,038.30
Value of plant remaining to City		27,430.00

COMPARATIVE STATEMENT OF COST AND BIDS.

Diameter.	Length.	Bid.	Bid and 6 per cent Supt.	Cost as Specified.	Less.	More.
16 ft. sewer	4278 ft.	$41.19	$43.66	$41.14	2.52	
15¼ ft. sewer	5144 ft.	41.19	43.66	41.14	2.52	
14½ ft. sewer	3347 ft.	41.19	43.66	43.87		0.21
13½ ft. sewer	4802 ft.	32.89	34.87	35.07		0.20
13¼ ft. sewer	4656 ft.	32.59	34.55	33.73	0.82	
12½ ft. sewer	1944 ft.			32.17		
	24166 ft.					

A second piece of sewer was built by day labor in the Illinois Central right-of-way from 39th street to 35th street, known as Section 1.

SECTION 1.

Diameter.	Length.	Cost.	Estimated Cost.
6½ ft. sewer	2523 ft.	$33,899.00	$43,460.00
Cost of right-of-way		4,340.00	not included.

MACHINERY REMAINING AFTER COMPLETION OF SECTION 1.

	Value.
2 Pile drivers	$ 2,400.00
1 Skip derrick	2,000.00
2 Orange peel derricks	5,000.00
1 Orange peel derrick	2,200.00
1 Potter machine	2,200.00
1 Locomotive and 32 cars	4,006.00
2 Locomotives and 38 cars	3,650.00
Rails and ties	2,949.00
Pumps and miscellaneous tools	3,025.00
	$27,430.00

Labor advanced from time of bids 15 per cent.
Material advanced from time of bids 20 per cent.

The Lawrence avenue conduit would have been completed under this system had it not been for the successful legal attack made by a disappointed contractor upon the City's right to perform work, the cost of which exceeds $500, by other method than letting by contract to the lowest responsible bidder. Upon my recommendation, the City again is endeavoring to secure from the Legislature a modification of the law, in order that its hands may be free to engage in great construction work in whatever manner may seem most desirable. In the meanwhile I have felt the completion of the Lawrence avenue conduit might be deferred until the Legislature has acted upon the City's request for an amendment of the law, particularly in view of the fact that in the meantime other necessary portions of this work can be done and the *final* completion of the work be in no way delayed.

The City has already purchased a site for the pumping station to operate this conduit and is about to let the contract for the construction of the building and the installation of the necessary machinery equipment. In short, even should the Legislature heed the wishes of the contractors' ring, rather than the demands of the people of Chicago, there will remain abundant time to advertise the construction of the Lawrence avenue conduit, let the contract and

secure the completion of the work by the time the pumping plant is ready for operation.

STREET PAVING.

At the time of my election in 1897 the streets of Chicago were in a disgraceful condition. In the early days, when the citizens first turned their minds to street paving, the material employed was cedar block, except in the downtown district, where granite or Belgian block was used.

Miles and miles of cedar block were laid in the course of years. In 1897 these pavements had been down for so long a time that practically all were beginning to show the results of wear and tear. In consequence, outside of the downtown district and the boulevard systems, it was practically impossible to find a decently paved street within the limits of the City of Chicago.

In the beginning of my first administration it was necessary, first, to arouse among the citizens a desire that their property should be improved, and next, to persuade them to lay a pavement of a permanent character.

For the first four years of my service it can be said without exaggeration that I was engaged in a constant fight with irate property owners who desired their street paving to be laid of cedar block, rather than of brick or asphalt. Feeling that the use of cedar block paving was a pure waste of money, I set my face firmly against it and announced to many delegations of protesting citizens that the property must either remain unimproved or be improved with a satisfactory pavement. Several ordinances looking to the use of cedar block paving were passed by the City Council and vetoed by me. As a result of this firm position, property owners in different sections of the City were finally brought to favor the laying of brick and asphalt pavements. As soon as these pavements were laid the handsome appearance and cleanliness of the streets so improved served as an inducement to other citizens to follow the

same course, with the result that in the past four years, with all the miles of paving that have been laid, practically no cedar block paving has been permitted within the City limits of Chicago.

The same course has been pursued, as far as circumstances would permit, in reference to the laying of wooden sidewalks. The use of this material for sidewalks had been so general that when the natural decay of the material set in and the sidewalks went to pieces, thousands of damage suits were filed against the City. Some of these suits were genuine; many were fraudulent; but whether genuine or fraudulent, judgments in damages against the City for almost incredible amounts have been piled up and paid. Sentiment in the official and well-informed world, as a natural consequence became practically united against a further laying of plank sidewalks. It was necessary, however, to educate the public to the necessity of using the dearer but more durable sidewalk material.

The principal trouble encountered was the expense of cement and stone sidewalks in the poorer residence districts. In the outlying wards a new difficulty presented itself. The laying of any other than a wooden sidewalk in certain sections, where the difference between the natural level of the land and the City grades required considerable filling, made the cost of cement sidewalks practically prohibitive.

In order not too seriously to embarrass property owners, a compromise was effected in favor of the temporary use of cinder walks in the poorer districts as well as in the outlying sections. These cinder walks ultimately will serve as excellent foundations for permanent sidewalks, and in the meanwhile a walk is provided which will not be a constant menace to the financial welfare of the City.

In the beginning, because of this attitude towards the use of cedar block paving and wooden sidewalks, many of our citizens were unkind enough to accuse the administration of being in league with the contractors engaged in the laying of permanent pavements

and permanent sidewalks. Events, however, have justified the position then taken, and to-day, I believe, the sentiment of the City may be said universally to approve of the course which has been pursued.

PROTECTION OF RESIDENCE DISTRICTS.

Under a strict construction of the State law and the ordinances of the City, when application is made for a saloon license, the officials are permitted to inquire into the character of the applicant, and if his character be good, and if he be able to furnish the required bond, the license petitioned for must be granted as a matter of course.

In the early days of my service as Mayor, I established the rule that saloon licenses should not be granted in strictly residence districts, nor within 250 feet of a church or permanent schoolhouse, unless in the latter case the licenses were asked in a thoroughly established business thoroughfare. This rule has been attacked again and again in the courts. In the majority of instances the courts have recognized the legality of the rule, as being within the discretion allowed the Mayor by the law. As a result it has been possible both to prevent the encroachment of saloons in strictly residence districts and to protect a large number of churches and schoolhouses from close contact with saloon influences.

REMOVAL OF CIVIL SERVICE COMMISSIONERS CLARK AND HOTZ.

As one of my final acts as Mayor I wish to make such amends as are possible at this late date for the action taken by me in 1897 whereby John M. Clark and the late Christopher Hotz were removed from their positions as Civil Service Commissioners. At that time it seemed necessary to me, in view of the declaration of the platform upon which I had been nominated and the assurances I had given my supporters during the campaign of a complete reorganization of the board in case of my election, that this reorganization should take place, even though the summary removal

of these two officials from office were needed to secure it. During the eight years which have since passed the injustice of this act has grown more and more apparent to me, until to-day I feel unwilling to retire from public service without making this tardy recognition of the valuable services rendered to Chicago by John M. Clark and the late Christopher Hotz, and of the poor recognition those services received from me as Mayor.

CORPORATION COUNSEL'S OFFICE.

During the past year the Corporation Counsel's office has represented the City in legal controversies of great moment to the municipality and its people. The traction litigation has undoubtedly been of the greatest interest to the people, and the United States Circuit Court having, on March 8, 1905, entered its final decree in the proceedings instituted in that court by the receivers of the Chicago Union Traction Company on the validity, scope and effect of the act of 1865, commonly known as the "ninety-nine-year act," this litigation has reached so important a stage that it is but proper to review what has been done.

Prior to the year 1903 there were a great variety of theories as to the validity, scope and effect of the act of 1865—the "ninety-nine-year act." Twenty years ago a Corporation Counsel of the City of Chicago, in an opinion to a committee of the City Council, held said act to be valid, as to the ordinances prior to the act. Since that time a mass of reports of special committees to the City Council and opinions of various lawyers, all dealing with the act of 1865, have been placed before the public, but all were so conflicting that when the street railway rights expired July 30, 1903, it developed upon the present Corporation Counsel to consider the entire proposition; to take a position in the matter and array the City forces for the great conflict which was about to begin. Immediately after July 30, 1903, the receivers appointed by the United States Circuit Court in the proceedings instituted by a judgment

creditor against the Chicago Union Traction Company applied to the Commissioner of Public Works of the City of Chicago for permission to construct an overhead electric trolley system on certain important "cable" lines. This right was claimed under authority of an ordinance of February 12, 1896. The Commissioner of Public Works promptly referred the application to the Corporation Counsel's office for consideration. The Corporation Counsel instantly perceived that a surrender here would be fraught with grave consequences; that it was necessary to resist the efforts of the traction company to "trolleyize" its cable lines, and it became, therefore, necessary to consider all the powers and privileges of the Chicago Union Traction Company and of the original companies whose rights and privileges were being exercised by it. That meant, above all things, the consideration of the validity, scope and effect of the act of 1865. The Corporation Counsel rendered his opinion to the Commissioner of Public Works, holding the act invalid, and holding that, even if valid, it did not operate to extend the term of the street railway ordinances. He, therefore, directed that the application of the receivers be denied. This opinion of the Corporation Counsel, for the first time, authoritatively stated the position of the City on the "ninety-nine-year act" in such a manner that it could be presented to the courts for interpretation and adjudication, although prior to the writing of his opinion the position of the City has been frequently stated in communications from the Mayor to the City Council, in committee reports and upon the hustings during political campaigns.

The receivers of the company promptly filed their petition in the United States Circuit Court to compel the City to permit the "trolleyizing" of the cable lines mentioned in their application, and in this preliminary contest the application of the receivers was, in the main, denied by the court.

The main controversy, however, soon came on to be heard, and the Corporation Counsel is to be congratulated on his selection of

special associate counsel for the City, David T. Watson, of Pittsburg, a man whose reputation for profound learning and great legal ability has been demonstrated, not only in this country, but in Europe, as the legal representative of the Government of the United States before an international tribunal. The Corporation Counsel, with the valuable assistance of his associates, carefully prepared the case on behalf of the City, and when the cause finally came on for hearing before Judge Grosscup, the City was fortunate in the able presentation of its case. After a notable hearing, thoroughly covering the entire controversy, the court took the case under advisement, and finally rendered its opinion.

The claims of the receivers in this litigation might be briefly stated as follows:

The receivers of the Chicago Union Traction Company claimed the right in said company to operate under ordinances which the City claimed expired July 30, 1903, and which the company claimed had not expired, and did not expire, until 1958; the extension being claimed under the provisions of the act of the General Assembly of 1865, the "ninety-nine-year act."

The gist of Judge Grosscup's opinion was:

First. The company established a right to the main trunk lines of the north and west divisions of the City as they existed in 1875.

Second. It lost that very large mileage of lines authorized by the City and constructed between 1875 and 1884.

Third. It held, without controversy, the unexpired portions of the many outlying feeders and extensions granted by the twenty-year ordinances passed after 1884 (during the "Yerkes regime"), expiring at different dates.

The preparation of the decrees in the two cases—*i. e.*, the North side case and the West side case—was a matter requiring an enormous amount of detail work, and the contest which ensued with regard to the preparation of this decree was no less important

and much more prolonged than the first hearing. At the conclusion of the contest the court sustained the objections of the Corporation Counsel to the decree presented by the lawyers for the traction companies, and adopted the draft of a decree prepared by the Corporation Counsel, and the same was entered March 8, 1905. The draft of decree in the North Chicago case is now being prepared and will soon be entered.

Since July 30, 1903, the Chicago City Railway Company has operated its lines under temporary extensions. It was necessary to permit this company to operate under temporary extensions or the City would have been compelled to wage a contest with the company similar to that which was then on with the Chicago Union Traction Company. The Chicago City Railway Company evidenced to the City Council a desire amicably to negotiate and settle the entire controversy. Negotiations were had which finally resulted in the preparation of the so-called "tentative ordinance" by the Committee on Local Transportation of the City Council, reported to the City Council August 24, 1904.

The various extension ordinances under which this company operated after July 30, 1903, provided that as a consideration of such extensions, the company should pay to the City of Chicago $100 per car per annum on each and every car operated, regardless of the number of miles traveled by such car, in lieu of the sum of $50 per car per annum theretofore paid by the company under its original ordinances. The company has failed to pay the sum of $100 on each and every car, but computed the amount to be paid by taking thirteen round trips as equivalent to one day's use of one car. This resulted in a financial loss to the City and constituted a failure to observe the consideration fixed by the extension ordinances. It also refused and failed to pay the car license fee on the grip cars operated by it. These facts evidenced to the City that the Chicago City Railway Company did not hold sacred its

obligations, and that it was not proceeding in good faith amicably to negotiate and settle its difficulties with the City.

The company also indicated its position by the filing of a bill in the United States Circuit Court to restrain the City from enforcing the so-called "universal transfer" ordinance lately passed.

As a result thereof, on March 20, 1905, I transmitted a message to the City Council, recommending the adoption by the Council of an ordinance transmitted with said message, repealing the extension ordinance of the Chicago City Railway Company, and directing the Corporation Counsel forthwith to institute proceedings in the State Courts to determine the validity of the "ninety-nine-year act," its scope and effect, and the rights of the Chicago City Railway Company to operate in the streets of Chicago. The ordinance was adopted by a vote of 53 to 1, and the Corporation Counsel, on the same date, filed the bill as directed in the Circuit Court of Cook County. Service was had upon the defendant the same day, and it is confidently believed by the Corporation Counsel that an opportunity has been given the courts of the State of Illinois to pass upon the act of 1865 of the General Assembly of the State of Illinois, which is now and has been for years the "bone of contention" in the conflict with the street railway companies of Chicago.

The Corporation Counsel's office has been engaged in other important litigation with the Chicago Union Traction Company. I refer to the mandamus proceedings instituted on the relation of the City of Chicago to compel the Chicago Union Traction Company and the West Chicago Street Railroad Company, its predecessor, to lower the Van Buren street tunnel. For some time prior to the institution of said proceedings the business interests of Chicago had agitated the lowering of the tunnels with constituted an obstruction to the navigation of the Chicago river. The companies had refused to lower the Van Buren street tunnel at their own expense, and the City was compelled to institute this proceeding. The Cir-

cuit Court of Cook County denied the City's petition, but the Appellate Court of the First District reversed the action of the Circuit Court and held that, as the Van Buren street tunnel was an obstruction to navigation, its owners must lower it to a sufficient depth to allow the free passage of vessels. The railway companies appealed to the Supreme Court of Illinois, but this court lately affirmed the judgment of the Appellate Court. The companies have indicated their intention to perfect an appeal to the Supreme Court of the United States.

In the case of *The Northwestern Elevated Railroad Company* v. *The City of Chicago et al.,* to enjoin the Commissioner of Public Works from interfering with the construction of extensions to platforms along the "union loop," Judge Tuley held that the power to make changes in an elevated structure was not a continuing one, and was exhausted upon the completion of the structure; that the City was not estopped by reason of having granted permits theretofore to make certain extensions, and that the City cannot, for a consideration or otherwise, give over any portion of the public streets to a corporation inconsistent with the use of such streets by the public. As a result of this litigation, the City having filed a cross-bill, therein, it was put in a position where it has been able to compel the Northwestern Elevated Railroad Company to comply with certain general and special ordinances of the City, which it could not theretofore successfully enforce against the company. The City's cross-bill attacks the right of the company to operate in the downtown district and is still pending determination.

Important litigation is pending with the Chicago Telephone Company. The Law Department, in an opinion to the City Council, held that the telephone company must pay three per cent. (3 %) of its gross receipts to the City of Chicago as annual compensation under the terms of its original ordinance in the territory annexed to the City of Chicago at various times since 1889. This the telephone company refuses to do and pays compensation

only upon the gross receipts derived in the territory within the City as it existed prior to the annexation of various other municipalities to it in 1889 and thereafter.

At the present time the City is asking the State's Attorney of Cook County to present an information in the name of the People of the State of Illinois in the nature of *quo warranto* against the company, attacking its right to operate in Chicago, it having failed to pay the proper compensation fixed by its ordinance.

Another case of great importance to the City, and of direct financial benefit to it, was that of Duffy against the City of Chicago, decided by the Appellate Court during the past year and resulting in a partial victory for the City.

On August 29, 1902, the Circuit Court entered judgment for $301,376.08 against the City in the case of Joseph Duffy, a contractor, who constructed a section of land tunnel, to recover money claimed by him to be due on his contract. November 29, 1904, the Appellate Court reversed this judgment, entered a finding of facts and rendered judgment for $137,585.28, a decrease of $163,790.80. The City has appealed from this judgment to the Supreme Court. The Law Department is confident of wiping out this entire judgment, the same as it did in wiping out in the Supreme Court the judgment of the Circuit Court of Cook County in favor of Weir, McKechney & Company, tunnel contractors, for $555,560.22.

The Law Department has, during the past year, tried a number of important cases involving the construction of the Civil Service Act and the powers of the Board of Civil Service Commissioners, many of which lay down new principles, but space will not allow reference to the same. It may be said, however, that the department has been successful in maintaining the integrity of the Civil Service Act.

In 1897 a volume of the City ordinances was published under the title of "The Revised Code of 1897 of Chicago." This edition was, in fact, not a revision, but more of a compilation. The re-

sult has been that it was found necessary to revise and republish the City ordinances. During the past year the general ordinances have been completely revised, and on March 20, 1905, the City Council adopted them. The ordinances are being printed in book form and will be known as "The Revised Municipal Code of Chicago of 1905."

The Law Department is also engaged in preparing a volume containing the most important opinions rendered by the Corporation Counsel and assistants since 1897, at which time a volume of the opinions theretofore rendered by the Corporation Counsel's office was printed. This very valuable book is in the hands of the printer and will soon be issued.

COMPTROLLER'S OFFICE.

Among the more important things occurring during the year in the Department of Finance was the issuance of $5,250,000 4 per cent judgment bonds, to redeem a like amount of judgments against the City of Chicago, bearing 5 per cent interest.

Prompt and more satisfactory disbursement of special assessment funds has been secured for the local improvement bondholders, thereby saving the interest on special assessment taxes to property owners.

There were issued during the year $3,000,000 of permanent improvement bonds. While this greatly increases the available funds for purposes of permanent improvements, by the operation of the Juul law the necessity for levying a sinking fund to take up bonds at maturity, and the levying for payment of interest will decrease the available funds for corporate purposes. This operates to increase the financial embarrassment of the City.

DEPARTMENT OF PUBLIC WORKS.

WATER SUPPLY.

One of the 25,000,000 vertical triple expansion Riedler pumping engines contracted for in 1902 was installed at the Chicago

avenue pumping station during the year. Six 250-horse-power internally fired boilers, replacing the old return tubular boilers, were installed at the Fourteenth street pumping station.

The total amount of water pumped in 1904 was 146,310,498,353 gallons, which is an increase of 8,794,746,397 gallons over the quantity pumped during 1903. On the basis of 1,926,251, as determined by the last school census, the daily per capita pumpage was 203.3 gallons.

The usual amount of repair work to the system was done.

Plans and specifications were prepared for the following additions to the system: Two 40,000,000-gallon vertical triple expansion pumping engines to be installed at the Central Park and Springfield avenue pumping stations; one 20,000,000 horizontal compound pumping engine to be installed at the Sixty-eighth street pumping station; four 250-horse-power boilers to replace the old boilers at the Lake View pumping station. A contract was awarded for a new superstructure of the Lake View crib.

Plans and specifications are also under preparation for four 250-horse-power boilers for the Sixty-eighth street and for four similar boilers for the Harrison street pumping stations to replace old boilers.

WATER PIPE EXTENSION.

Two hundred and forty-two thousand five hundred and ninety-four lineal feet of water mains, varying in size from 4 inches to 36 inches in diameter, were laid during the year. This is nearly twice the amount laid in 1903. Five hundred and forty-one hydrants and 445 valves were placed. There were at the close of the year 1904 a total of 1,978¼ miles of water mains, 20,349 hydrants and 16,095 valves.

BRIDGES AND VIADUCTS.

During the year 1904 new bascule bridges were opened to traffic at West Division street and North Western avenue, over the

North branch of the Chicago river. Both of these bridges were designed and built by the City of Chicago. A bascule bridge, built by the Sanitary District of Chicago, over the South branch of the Chicago river, at Loomis street, was also opened for public use in the year 1904. Plans were prepared and contracts let for substructure and superstructure of a trunnion bascule bridge and for a temporary pontoon bridge at Archer avenue over the South fork of the South branch of the Chicago river. Plans and specifications were also prepared for a trunnion bascule bridge over the North branch of the Chicago river at North avenue, but the contract has not yet been let.

HARBORS.

Twenty permits were issued during the year for the construction of 3,628 feet of new dock on the Calumet and Chicago rivers and Lake Michigan; forty-nine permits were issued for rebuilding 5,443 feet of dock, and eleven permits were issued for repairing 1,649 feet of dock in the Chicago river and Lake Michigan, being a total of eighty dock permits, covering 10,720 lineal feet of docking, yielding $1,752.13 in fees. The United States dredged 609,000 cubic yards from the Calumet river, but did no dredging during the year in the Chicago river or Chicago outer harbor.

The Sanitary District in widening the South branch to 200 feet dredged away several tracts, amounting to 53,500 cubic yards; the South Park Commissioners dredged 508,963 cubic yards from the outer harbor of Chicago and deposited the same in Grant Park area. Private dock owners dredged along their respective fronts to the amount of 48,000 cubic yards, yielding $192 in fees.

There were seventy-one dredging permits issued during the year.

Our commerce by Lake Michigan has fallen off 2,279,936 tons and 1,899 vessels during the year 1904, there being only 12,746,078

tons and 12,904 vessel entrances and clearances in both our ports, as against 15,026,014 tons and 14,803 vessels for the year 1903.

Bureau of Water.

ASSESSOR'S DIVISION.

Contracts were let for laying water service pipes in seventy-eight streets. Estimates for laying water service pipes in seventy-seven streets have been prepared and returned to the Board of Local Improvements.

METER DIVISION.

The increase in the number of meters in use during the year 1904 was 804. There were repaired during the year 3,320 meters, being about 40 per cent of the total number in service. Collections in this division exceeded those for the year 1903 in the amount of $180,166.

COLLECTION DIVISION.

The work in the collection division has been quite satisfactory, considering the increased growth of the City and the consequent increased number of accounts. Work is up to date, having been accomplished without any increase in the force. The collections from assessed rates show an increase of $89,202. The collection of the entire bureau exceed $4,000,000, being an increase over the previous year of $273,000.

While the collections of the bureau have been greater than in any year in the history of the City, the expenses of the collections have been less, being 6½ per cent, as against $6\frac{6}{10}$ per cent for the year 1903. In the year 1892 the per cent of expenses to collections was 13 per cent. The reduction to 6½ per cent demonstrates the efficient business administration of this bureau.

Bureau of Streets.

FINANCIAL STATEMENT.

Appropriation for 1904.

For removal of garbage, street and alley cleaning, repairing improved and unimproved streets and alleys, repairing sidewalks, miscellaneous.	$ 995,695.00
Special appropriation	40,575.00
Removing snow, First ward	60,000.00
Special appropriation for snow removal	14,285.00
Restoration of streets	40,000.00
Maintenance of dumps	41,485.00
Rental ward yards	8,000.00
Corporation Inspectors' salaries	40,000.00
Maintenance of City parks	22,250.00
Office salaries	20,220.00
Obstruction Inspectors' salaries	9,000.00
Office expenses	1,500.00
Engineer, steam roller, etc	1,630.00
Repairing snow dump	3,000.00
Ward Superintendents' salaries	49,800.00
Unpaid bills	1,491.96
Ten extra teams for each ward	45,000.00

Special Appropriations.

Repairing asphalt streets out of reserve	$ 50,000.00
Repairing right-of-way of traction companies	60,000.00
Cleaning right-of-way of traction companies	200,000.00
Widening roadway, West Lake street from Rockwell street to Hoyne avenue	40,000.00
Special ward appropriations	23,360.00
	$1,767,291.96

Disbursements.

For removal of garbage	$ 640,602.50
For street and alley cleaning	274,531.70
Repairing improved streets	31,993.31
Repairing unimproved streets	33,802.56
Repairing sidewalks	32,269.86
Miscellaneous	8,317.00
Removing snow, First ward	74,284.27
Restoration of streets	27,634.25
Maintenance of City dumps	40,997.48
Rental of ward yards	5,830.79
Corporation Inspectors' salaries	29,586.00
Maintenance of City parks	15,541.34

Office salaries	$ 20,220.00
Obstruction Inspectors' salaries	6,797.95
Office expenses	1,430.99
Engineer, steam roller, etc	1,629.50
Repairing snow dump	2,181.14
Ward Superintendents' salaries	49,487.93
Ten extra teams for each ward	45,000.00
Unpaid bills	1,241.96
Repairing asphalt streets out of reserve	50,000.00
Cleaning right-of-way of traction companies	48,030.61
Special ward appropriations	20,636.42
Unexpended balance	306,480.90
	$1,767,291.96

GARBAGE.

During the year 1904 there were removed 1,456,395 cubic yards of garbage, or 289,695 loads, at a cost of $640,602.50. There were 902 garbage complaints, in comparison with 919 during 1903.

STREET AND ALLEY CLEANING.

During the year there were cleaned 17,554 miles of streets and alleys, necessitating the removal of 128,537 loads of street dirt; 1,323,385 lineal feet of weeds were cut out; 354,125 inlets to catch basins were opened and cleaned. The total cost of street and alley cleaning, opening of inlets and cutting of weeds was $274,531.70. Of this amount, $48,030.61 was charged to street car companies for cleaning their various rights-of-way.

Fifty-five thousand six hundred and seventy-six loads of snow were removed at a total cost of $74,284.27. The appropriation for the removal of snow was $60,000, with an additional appropriation of $14,284.27.

The following number of dead animals were removed during the year at no expense to the City:

Horses	4,210
Cows	68
Dogs	14,267
Calves	92
Goats	85
Sheep	94
Colts	71

REPAIRING IMPROVED STREETS AND ALLEYS.

During the year the following repair work was done:

15,617¼ square yards of new cedar blocks were laid.
10,023 square yards of old cedar blocks were relaid.
5,479½ square yards of granite blocks were relaid.
1,382 square yards of macadam were laid.
1,412½ square yards of brick were laid.
435 square yards of asphalt were laid.

In connection with which the following material was used:

577¾ cubic yards of gravel.
1,876 cubic yards of crushed stone.
28,416 cubic yards of cinders and spawls.
50,333 lineal feet of new lumber.
37,376 lineal feet of old lumber.

At a total cost of $31,993.31.

REPAIRING UNIMPROVED STREETS AND ALLEYS.

During the year the following work was done on unimproved streets and alleys:

660,186 lineal feet of grading.
590,597 lineal feet of ditches were opened and cleaned.
490 new and repaired aprons.
1,092 new and repaired crossings.
1,470 new and repaired culverts.
48 new and repaired box drains.
498 general repairs.

In connection with which the following material was used:

270,869 lineal feet of new lumber.
164,195 lineal feet of old lumber.
110 kegs of nails.
14,305 loads of cinders and spawls.

At a total cost of $33,802.50.

SIDEWALK REPAIRS.

During the year the following work was done on sidewalks:

2,094 new and repaired intersections.
16,563 general repairs were made.

In connection with which the following material was used:

295,429 lineal feet of new lumber.
987,839 lineal feet of old lumber.
389 kegs of nails.
2,102 loads of cinders.

At a total cost of $32,269.86.

SPECIAL APPROPRIATIONS.

Ward.	Appropriation.	Amount.	Expended.
5th	For ditching	$ 975.00	$ 881.55
8th	For ditching on 79th street	747.50	675.12
8th	For ditching on Commercial and Anthony avenues	585.00	585.00
8th	For ditching on 103d and 108th streets	390.00	376.50
12th	For repairing Western avenue	500.00	305.25
22d	For repairing sundry streets	500.00	463.00
26th	For ditching	812.50	812.50
26th	For hauling slag	1,625.00	1,624.90
27th	For grading Lincoln avenue	812.50	800.16
27th	For repairing Peterson avenue	500.00	499.88
27th	For repairing Milwaukee avenue	1,625.00	1,625.00
27th	For repairing Grand avenue	650.00	465.42
27th	For ditching in Norwood Park	650.00	650.00
29th	For ditching	1,300.00	1,300.00
31st	For ditching	1,300.00	1,261.00
31st	For improving Western avenue	3,000.00	2,978.09
32d	For repairing culvert on 77th street between Vincennes road and Stewart avenue	350.00	350.00
32d	For ditching	487.50	487.50
32d	For repairing Vincennes road	812.50	812.50
33d	For ditching	650.00	645.61
33d	For repairing Michigan avenue	1,625.00	1,617.00
33d	For repairing 45th avenue	487.50	487.50
35th	For repairing 52d avenue	975.00	932.47

The appropriation for the maintenance of the thirty-two parks under the jurisdiction of this department for the year 1904, was $22,250, of which sum $15,541.34 was expended. All parks improved prior to 1904, were maintained and kept in good condition and the

citizens of Chicago by their increased attendance at these breathing spots testify their appreciation of the benefits to be derived from the keeping up of these parks.

PERMITS.

During the year permits were issued to open improved streets as follows:

People's Gas Light and Coke Company	10,790
Chicago Edison Company	621
Commonwealth Electric Company	21
Chicago Telephone Company	138
Ogden Gas Company	142
Various Corporations	190
Plumbers and sewer builders	1,796
City Departments	1,692
Unimproved Street Opening Permits	3,845
Use of Streets	611
Inspection Permits	34
Manure Vault permits	15
Space permits	323
Miscellaneous	2,601
	22,729

PAVEMENTS REPAIRED BY THE PEOPLE'S GAS LIGHT AND COKE COMPANY ON STREET OPENING PERMITS.

Square Yards, Cedar.	Square Yards, Macadam.	Square Yards, Granite.	Square Yards, Brick.	Square Yards, Asphalt.
68,531.0	28,855.3	5,750.1	2,520.7	1,773.3

PAVEMENTS REPAIRED BY THE CHICAGO EDISON COMPANY ON STREET OPENING PERMITS.

Square Yards, Cedar.	Square Yards, Macadam.	Square Yards, Granite.	Square Yards, Brick.	Square Yards, Asphalt.
2,962	670	8,275	2,080	1,128

PAVEMENTS REPAIRED BY THE COMMONWEALTH ELECTRIC COMPANY ON STREET OPENING PERMITS.

Square Yards, Cedar.	Square Yards, Macadam.	Square Yards, Granite.	Square Yards, Brick.	Square Yards, Asphalt.
4,627	2,741	.....	537	61

PAVEMENTS REPAIRED BY THE CHICAGO TELEPHONE COMPANY ON STREET OPENING PERMITS.

Square Yards, Cedar.	Square Yards, Macadam.	Square Yards, Granite.	Square Yards, Brick.	Square Yards, Asphalt.
5,519	656	195	1,197	798

PAVEMENTS REPAIRED BY THE OGDEN GAS COMPANY ON STREET OPENING PERMITS.

Square Yards, Cedar.	Square Yards, Macadam.	Square Yards, Granite.	Square Yards, Brick.	Square Yards, Asphalt.
1,128	218	.....	115	11

From January 1 to March 8, 1905, the following work has been performed in the Street Department:

Miles of streets and alleys cleaned, including snow, 2,025½, at a cost of about $59,800, of which amount about $10,000 will be collected from the traction companies for cleaning their rights-of-way.

There were removed 6,390 loads of street dirt and 30,890 loads of snow.

Inlets opened and cleaned, 38,575.

There were removed 305,588 cubic yards of garbage, or 60,956 loads, at an expense of $126,319.87.

Bureau of Sewers.

During the year 1904 the following work was done:

Mileage of sewers cleaned	380.9
Number of catch basins cleaned	15,779
Feet of sewers repaired	8,081
Number of manholes repaired	830
Number of catch basins repaired	1,187
Manhole and catch basin covers repaired	5,500
Sewage pumped in million gallons	9,838
Number of house drain inspections, extensions and repairs	4,859
Number of house drain inspections, permits	3,655
Number of house drain inspections, junctions set	451
Number of house drain inspections, council orders	181

During the year 1905 to date the following work has been done:

Mileage of sewers cleaned	95.2
Number of catch basins cleaned	3,945
Feet of sewers repaired	655
Number of manholes repaired	85
Number of catch basins repaired	228
Manhole and catch basin covers repaired	745
Sewage pumped in million gallons	2,111
Number of house drain inspections, extensions and repairs	226
Number of house drain inspections, permits	65
Number of house drain inspections, junctions set	28

A number of much needed repairs have been made and the sewers are now in good condition as to repairs, but owing to the inadequate appropriation we are unable to do any systematic cleaning, confining ourselves to attending to complaints.

If the sewer in Jackson Park avenue is extended south of the railroad tracks at Seventy-ninth street during the summer, the City, by operating the pumping station, will give great relief to Dauphin Park district by taking care of the ditch-water.

INTERCEPTING SEWERS.

During the year ending December 31, 1904, Sections G and H, the main intercepting sewers in the Illinois Central right-of-way, Cornell avenue and Jackson Park avenue, from Thirty-ninth street to

Seventy-third street, were completed by day labor in a satisfactory manner. Section I was also built by day labor, being a 6½-foot sewer in the Illinois Central right-of-way, from Thirty-ninth street to Thirty-fifth street.

A temporary pumping station was built and pumps installed on the lake shore at Thirty-ninth street, and since October the sewage north of Fifty-third street has been pumped into the Thirty-ninth street conduit, relieving the lake of the pollution of the sewage from a population of 150,000 persons.

The work on the substructure of the Thirty-ninth street pumping station, involving the placing of 8,000 cubic yards of concrete, forming channels for lake water and sewage, was completed and the construction of the engine and boiler house was commenced. The corner-stone of this building was laid on January 12, 1905, and the structure of granite and pressed brick is well under way and will be ready for setting the machinery early in the spring. The pumping machinery is built and ready for setting, so that pumps will be regularly started before the summer season and all sewage on the South side north of Eighty-seventh street will have been diverted from the lake to the drainage canal.

The decision of the Supreme Court adverse to the employment of day labor on large work, affirmed in December, has temporarily settled the question of constructing the Lawrence avenue conduit otherwise than by contract.

The Council authorized the purchase of a lot for the pumping station on this conduit near the main intercepting sewers already built in Sheridan road, which will result in much better efficiency than was afforded by the original plan outlined by the pure water commission, which fixed the pumping station at the river, which would have resulted in the main intercepting sewer being constantly submerged. With the station at the Evanston branch of the Chicago, Milwaukee & St. Paul Railway, these sewers will be kept constantly pumped down, giving much better drainage to the whole north shore.

Bureau of Maps.

In the Bureau of Maps there have been 1,955 plats prepared covering an area of 2,033.25 miles; 272 maps and plats for various City officials and departments; there have been verified 505 miscellaneous petitions, electric light, street railways, saloon license protests and house moving petitions. Fourteen thousand nine hundred and ninety-seven people required the attention of the bureau; 10.30 miles of streets were vacated during the year; 10.241 miles of streets were added; 7.11 miles of alleys were vacated; 3.66 miles of alleys were added.

The bureau has made drawings for all bath-houses, which plans were exhibited at the Louisiana Purchase Exposition.

It recommends the convening of streets and alleys committees for the purpose of devising a system to name and number systematically all streets and houses.

DEPARTMENT OF HEALTH.

A total of 2,614 fewer deaths among a population some 60,000 more than that of the previous year; a reduction of 1,224 deaths under five years of age, including 927 children of the "milk-feeding" period of life; the best sanitary quality of the public water supply ever furnished, and as a consequence of the latter, a vanishing death rate from typhoid fever; a successful battle with frequent and continued importations of smallpox are among the features of the year 1904 which the Commissioner of Health reports with justifiable satisfaction.

An important factor in maintaining the constantly improving health conditions of the City has been the substantial completion and effective operation of the South side intercepting sewer system and by means of which Chicago's water supply may now be counted among the best. Since the latter part of September last, the water from all tunnels has been found by the department laboratory to be as good

as the samples taken twelve miles from shore, which is the department standard of purity or "safety." The result is seen in the lowest typhoid fever death rate in the history of Chicago, 1.92 per 10,000 of population, as compared with an average of 3.24 during the previous decennium.

A serious menace to the child-life of the City, early threatened from the "one-daily-delivery" of milk, was, fortunately, offset by the unusually low summer temperature—the coolest in thirty-four years. The action, however, led to increased activity among the various volunteer agencies for improving the quality of the milk supply and caused the Commissioner personally to investigate the conditions of milk production in the country and the methods of shipment to the City. A great improvement has resulted in the former and the railroads are now interested in furnishing better facilities for handling in transit and for speedy transportation, thus "shortening the time from the cow to the baby."

To the improved quality of the milk supply, from these causes, is largely due the reduction of mortality among children of the "milk-feeding period" (one to five years of age) from the number in 1903. The cool summer, however, was a considerable factor in this saving of child life.

Smallpox, which more than once threatened an epidemic spread from repeated importations into the City, has been combated with such vigilance and efficiency that its total mortality is only thirty as compared with forty-seven in 1903. This vigilance and efficiency, made possible by the City Council's emergency appropriation, have prevented any panic or undue excitement from the continued presence of the disease—a presence which must last as long as smallpox remains so widespread throughout the country as it now is.

So, too, with diphtheria: The department supply of the antitoxin was cut off early in the year and the gravest results were apprehended. A personal visit and appeal by the Commissioner to the New York Health Commissioner secured a renewal of former relations and an

abundant supply of the specific from that to the present time. The total deaths from this dreaded disease were only 396, being 218 fewer than for the year 1903, and the fewest since 1878, when the population was less than one-fourth that at present.

Largely through these and similar efforts of the department, Chicago has maintained its record for the highest degree of healthfulness among all cities of more than 300,000 population, notwithstanding, that its per capita expenditure is, as a matter of financial necessity, the lowest among such cities.

BOARD OF LOCAL IMPROVEMENTS.

Special assessments for different improvements have been levied during the year 1904 by this department, amounting to $8,350,029.50, of which amount the

Assessment for paving streets represented	$4,384,522.15
Assessment for sewers represented	1,244,195.18
Assessment for water supply pipe	196,373.10
Assessment for plank sidewalks	105,277.42
Assessment for cement sidewalks	1,587,219.61

the balance being made up of assessments for cinder and stone sidewalks, house drains, water service pipes, etc.

There was actually constructed during the year 84.45 miles of street paving, at a total cost of $3,208,826.56, with different materials, as follows:

Asphalt, 43.02 miles, at a cost of	$2,010,662.49
Macadam, 30.72 miles, at a cost of	658,161.40
Granite block, 4.61 miles, at a cost of	314,069.63
Vitrified brick, 5.53 miles, at a cost of	195,928.88
Creosoted block, .57 mile, at a cost of	30,004.16
Cost of water supply pipes laid	92,916.28
Cost of water service pipes laid	39,346.06
Cost of house drains constructed	29,530.61
Cost of sewers constructed	428,363.89
Cost of sidewalks constructed	480,367.04

of which cement sidewalks constituted 74.51 miles, at a cost of $369,414.62; cinder sidewalks, 49.40 miles, at a cost of $85,813.73; and plank sidewalks, 10.89 miles, at a cost of $25,138.69.

I desire to call your attention to the construction work of the Sidewalk Department, which not only shows that a much greater amount of sidewalks has been constructed during the past year than ever before, but that most of the sidewalks constructed were cement and cinders, indicating that the day of plank sidewalks has almost entirely disappeared.

The most notable great public improvements taken up by the board during the past year are probably the two sewer systems in the Calumet district, one of which is known as the Jackson Park avenue sewer system, which is now under contract and in actual construction, the total cost of which will be over a million dollars; the other known as the Ninety-fifth street sewer system, which has just been confirmed by the County Court, and which will cost between $800,000 and $1,000,000, the work upon which will undoubtedly begin during the year 1905. When these two sewer systems are constructed, the whole territory in the southeastern part of the City, known as the Calumet district, and covering a territory practically bounded by Seventy-third street on the north, the City limits on the south, Ashland avenue on the west and the lake on the east, will be properly sewered, and relieved from the great inconvenience, on account of flood waters, which the inhabitants of that district have been subject to for years.

POLICE DEPARTMENT.

With only 2,316 patrolmen in the service(the lowest number since 1891) the results accomplished by this department are remarkably good, having in many instances surpassed previous years. Seventy-nine thousand and twenty-six charges were brought against persons arrested, not including 369 arrests made for the federal authorities, Sheriff, and Coroner of Cook County, an increase of 1,263 cases over 1903.

Fifteen per cent of these cases were felonies, ten per cent of

these cases were state misdemeanors, seventy-five per cent of these cases were violations of City ordinances.

Twenty-one thousand five hundred and forty-two persons were fined in the police courts, the amount of fines aggregating $393,003.

One thousand four hundred and sixty-three persons were convicted of crimes through the activity of the police. Five hundred and thirty-seven were sentenced to the penitentiary or reformatories and nine hundred and twenty-six to the county jail or house of correction, an increase of 28 per cent over last year.

158 persons were arrested for murder:
33 were convicted (57 per cent increase over 1903).
9 were discharged by the Grand Jury.
21 were exonerated by the Coroner's Jury.
6 were acquitted in the Criminal Court.
27 were released on account of insufficient evidence.
62 cases are pending.
29 murder cases were carried over from 1903 and disposed of this year as follows:
5 were hanged.
11 sent to the penitentiary or reformatories.
11 were acquitted in the Criminal Court.
1 died in the county jail.
1 fled to Vienna, Austria, and is now under arrest for a murder committed there.

The finger print system of identification of criminals, so successful in European cities, has been adopted in the Bureau of Identification, and is proving of value to this branch of the service.

Nine hundred and sixty-eight arrests were made for robbery, of this total one hundred and twenty-five convictions were had.

Three hundred and seventy-five fugitives from justice were handled during the year; ninety-six were traced to and arrested in other cities and returned to Chicago for trial; two hundred and eighty were

arrested in Chicago and turned over to officers from other cities, an increase of 43 per cent over 1903.

Estimated value of property reported stolen, $415,519.83.

Value of lost and stolen property recovered, $436,538.57.

Number of accidents reported, 7,360.

Number of calls for patrol wagons, 70,826; number of miles traveled, 232,835.

Forty policemen in the active service died during the year, two of whom were killed in the discharge of duty and 272 injured in the discharge of duty.

A new police star of better material and improved appearance with the City seal in relief in center was designed and officially adopted as the badge of office of the members of the Chicago Police Department. This star can be distinguished at a glance from any other star in use in this country and elsewhere as far as known.

A nine-pointed star plain and without seal has also been designated for the use of special policemen. All appointments of special policemen prior to January 1, 1903, were cancelled with notice to those special policemen still in the service to call at police headquarters and be reappointed. In future all special policemen are instructed to report in person to the Assistant General Superintendent of Police monthly or as often as may be required.

The preparation and compilation of an up-to-date manual of rules and regulations for the guidance of the department to supersede the antiquated and obsolete manual hitherto in use has just been completed and will be in use in a very short time.

A Bureau of Records has been established, which commenced operations January 1, 1905. It will be in charge of a superintendent who will be a commanding officer selected for his fitness to fill the position. The object aimed at by this institution is the adoption and maintenance of an improved uniform system of blank books and records throughout the entire department.

HOUSE OF CORRECTION.

The Carter H. Harrison medal for distinguished bravery for the year 1902 was awarded to Officer George Mengerson.

The Carter H. Harrison medal for distinguished bravery for the year 1903 was awarded to Officer William V. Blaul.

The Carter H. Harrison medal for distinguished bravery for the year 1904 was awarded to Officer John McGuirk.

There were 11,647 inmates cared for during 1904, with an average daily population of 1,723; the earnings were $101,655.16, the expenditures for maintenance (construction and repairs not included) $183,724.10, an average per capita of thirty cents.

The inmates during the year completed the erection of an 18-foot brick wall, 2,422 feet long, enclosing the west side of the institution, in heavy retaining walls at quarry, containing 1,300 cubic yards of concrete, and erected a modern stone crushing plant with a daily capacity of 600 cubic yards. They added eighty concrete cells in the men's department, remodeling two cell houses for better sanitary effect, and enlarged the capacity of the women's dormitory, which was severely taxed during the year, by building thirty-one additional rooms.

The above work is valued by the City Architect at $53,000 and cost the institution for material $7,500.

California avenue in front of the institution was macadamized with a 40-foot roadway for 1,450 feet of its length, and 2,700 feet of brick sidewalk was laid on California avenue and Twenty-sixth street. New water mains, sewers, electrical devices, additional railroad tracks, etc., have been laid for better sanitation, fire protection and general welfare.

All contracts for labor with the institution expired December 31, 1904, and have not been renewed, as it is expected in a short time that all the inmates will be at work on City account.

The institution has maintained an average of 165 girls under

sixteen years of age in its two Houses of Shelter, which are doing creditable work, while its John Worthy School Department had 938 boys during the year for training and education. With the erection of a new women's building, for which an appropriation has just been made, the institution will be in a better position for effective work.

The facilities of the institution are severely taxed by the increase of population, and before long will require more room; some steps towards anticipating its wants should be taken now. In the event of the establishment of garbage plants, one should be built here in order to do the needful work for the community at a minimum cost, as well as to afford work for the inmates.

The products of the various departments have been utilized by the City in so far as possible, and the institution should be privileged to dispose of its surplus on the open market.

Its record shows improving health conditions, lowered death rate and a reducing percentage of recommitments, while the policy of work for every minute has been strictly adhered to.

FIRE DEPARTMENT.

During the year 1904 the Fire Department responded to 8,928 alarms. The value of property involved was $122,075,301. The loss for the year was $2,950,254, or $112,677 less than in the year 1903. The total insurance involved was $77,234,230.

Of the five new engine-houses built during the year 1903 all were occupied and companies placed in service during 1904. Three new steam fire engines and two aerial hook-and-ladder trucks were received and placed in service. Contracts for five new steam fire engines and three new aerial trucks have been awarded during the year. Thirty-five thousand five hundred feet of hose was purchased at a cost of $31,615, and fifty-five new horses were purchased at a cost of $10,520. The cost of repairs to apparatus for the year amounted to $33,601.45.

I would again suggest the early installation of the high-pressure water system in the congested district and the same for the Stock Yards district, or that the engine companies now located there be duplicated; also the installation of the pipe-line system for the fire boats, as heretofore recommended, the same to be part of the high-pressure water system.

The Fire Department now embraces one hundred engine companies; twenty-eight hook and ladder companies, including one water tower and fifteen chemical engines, and one hose company. There are also five fire boats in service.

The Lambert Tree medal for distinguished bravery for the year 1902 was awarded to Jacob Heisselman.

The Lambert Tree medal for distinguished bravery for the year 1903 was awarded to George J. Thompson.

The Lambert Tree medal for distinguished bravery for the year 1904 was awarded to John Moran.

CIVIL SERVICE COMMISSION.

Applications filed:

Official	4,760
Labor	2,938
Total	7,698

Examinations held:

Official	81
Skilled labor	30
Unskilled labor	2
Total	113

Examinations for original entrance:

Official	53
Skilled labor service	30
Unskilled labor service	2

Examinations for promotion:

Official	28
Total	113

Total number of persons examined in official and skilled labor service about 5,200.

Total number of persons examined in unskilled labor service about 1,700.

Number of certifications	2,187
Number of certifications for reinstatement	1,794

Among the most important promotional examinations were: Librarian in charge of branch library; Assistant Chief Medical Inspector; Chief Engineers for pumping stations; Inspector of Buildings; Board of Education; Assistant Superintendent of Police; Captains, Police Department; Lieutenants, Police Department.

Among the most important original entrance examinations were: Chief Sanitary Inspectors; Assistant Superintendent Municipal Lodging House; building construction engineers; Superintendent water pipe extension; pipemen and truckmen (about 630 candidates), and patrolmen (about 1,750 candidates).

DEPARTMENT OF SUPPLIES.

The report of the business agent shows that there were issued during the year 1904 19,584 orders for materials, supplies and repair work, involving an expenditure of $707,059.92. A comparison with business of the previous year shows an increase of 1,271 in the number of orders issued, and an increase of $53,864.60 in the total sum expended through the department. The average expenditure involved in the year's transaction was $36.10, as compared with $30.21 for the year 1903, showing an average increase of $5.89. The year's business, as thus summarized, included purchases of merchandise for the warehouse maintained by the department, as well as of stationery and office supplies carried in stock in the City Hall. The warehouse stock includes materials and supplies which are in regular and constant use, and which are delivered upon requisition in small lots to the several departments. There were issued during the year 1,861

orders on the warehouse, mostly including lists of small items and representing a cost of $21,382.

The cost of maintaining the Department of Supplies during the year 1904, including salaries, rent of warehouse, equipment and all other expenses, was $15,959.81. During the same period the department received from the sale of scrap iron, old machinery and various waste materials the sum of $8,091.80.

TRACK ELEVATION.

GRAND SUMMARY.

Ordinances have been passed by the City Council and accepted by the railroad companies for the elevation of their roadbeds and tracks from April, 1897, to April, 1905, during the administration of Carter H. Harrison, covering the following amount of work:

Total number miles of main tracks to be elevated.	106.1
Total number miles of all tracks to be elevated..	520.51
Total number of subways to be constructed.....	386.
Estimated cost of entire work when completed...	$34,770,250

The amount of elevation that has been done from April, 1897, to April, 1905, as follows:

Total number miles of main tracks elevated.....	70.9
Total number miles of all tracks elevated.....	345.7
Total number of subways constructed.....	303.
Estimated cost of work done.....	$25,350,250

Leaving work to be done under all ordinances that have been passed from April, 1897, to April, 1905, as follows:

Total number miles of main tracks to be elevated.	36.01
Total number miles of all tracks to be elevated...	174.81
Total number of subways to be constructed.....	83
Total estimated cost of work yet to be completed.	$15,475,000

Ordinances have been prepared and presented to the City Council the elevation of the roadbeds and tracks of several railroad companies and referred to the Special Committee on Track Elevation for

its final consideration before recommending the same back to the City Council for passage for the following amount of work:

Total number miles of main tracks to be elevated.	25.92
Total number miles of all tracks to be elevated...	67.46
Total number subways to be constructed.....	133
Total estimated cost of work.....	$6,660,000

BUILDING DEPARTMENT.

This department has been working under the building ordinance of 1898, with its various subsequent amendments, and has been seriously hampered because of the inadequacy of the ordinances.

To secure a new and revised ordinance has taken one year, with the occasional aid of the architects' and other committees. This ordinance was recently passed by the City Council. It contains four hundred and ninety-three (493) sections, a number of cross-references, and an index containing sixteen hundred (1,600) references.

Among the more important features of it are the new "School Ordinance" and the ordinances governing "Department Stores," "Fire-Proofing," and "Reinforced Concrete Construction."

A new and complete system of records has been instituted, which has not only increased the efficiency of the inspections to an immeasurable degree, but has also placed such a check upon the inspectors that the amount of their work has been increased as follows:

Year 1902—Average monthly inspections for each inspector	70
Year 1903—Average monthly inspections for each inspector	109
Year 1904—Average monthly inspections for each inspector	222
Total number of inspections, 18 inspectors.....	48,192
Total number of inspections per month, 18 inspectors...	4,016
Total number of inspections per month, each inspector..	222
Number of churches inspected.....	819
Number of halls inspected.....	957
Number of schools inspected.....	250
Number of theaters inspected.....	30

Of these, all have been forced to comply in all respects with the requirements of the building ordinance, with the exception of three theaters—running by reason of federal injunction—and the schools, which have been referred to the school board—with their assurance of compliance.

Number of notices for erection of fire escapes served....	987
Number of fire escapes erected and inspected.....	1,104
Suits started to force compliance with ordinance.....	709

The elevator branch of the department has also been greatly increased in efficiency and has added considerably to the revenue of the department.

The number of elevators inspected this year is 3,020 greater than in the preceding year. This, with permits issued for the erection of three hundred and eighty-four (384) new elevators, increases the revenue $6,808.

Number of elevators inspected.....	12,351
Number of permits for new elevators.....	384
Number of notices served ordering repairs.....	2,529

The department has issued for the year building permits to the number of 7,151, as against 6,221 for the year 1903, and 6,099 for the year 1902.

The permits cover a frontage of.....	202,349 ft.
And are for the erection of buildings to cost.....	$44,724,790

The revenue of the department was $13,637.70 over the preceding year.

Total receipts of department.....	$80,212.30
Total expenditures of department.....	63,793.13
Amount turned over to general fund.....	$16 419.17

CITY COLLECTOR'S OFFICE.

The general receipts for the City Collector's office for the year 1904 was $8,123,445.30, as compared to $7,463,767.87 collected during the preceding year, showing an increase in 1904, $659,677.43.

To the credit of the corporate fund, which is available for general

administration expenses, an increase of $419,166.39 is recorded. Of this amount there is a gain of $195,441.96 in the receipts from warrants for collection issued by self-sustaining inspection departments and comptroller's charges for compensation and damages to City bridges. The total amount collected from this source during 1904 amounts to $750,330.67. For this amount warrants to the number of 27,631 were drawn.

The receipts for licenses and permits during 1904 amounted to $4,494,403.48, this being an increase of $208,696.43 over 1903.

Owing to the many public improvements inaugurated during the year in paving, sidewalk and sewer construction, the volume of detail work in handling special assessment rolls was increased about 40 per cent. Additional floor space and office construction is recommended to facilitate this work and for the better accommodation of the public.

BOILER INSPECTION.

Boilers inspected	7,150
Tanks inspected	324
Retorts inspected	88
Jacket kettles inspected	62
Vulcanizers inspected	39
Driers inspected	35
Mangles inspected	12
Evaporators inspected	2
Generators inspected	1
Total inspections	7,719
Number of permits issued for installation of boilers	515
Number of boilers installed	682
Number of notices to make repairs sent	4,311

REVENUE.

Amount of inspection fees	$27,618.00
Amount of permit fees	3,275.00
Total fees	$30,893.00

EXPENSES.

Salaries	$33,362.95
Other expenses	5,439.50
Total expenses	$38,802.45

SMOKE INSPECTION.

Complaints made to department	445
Observations made	16,833
Notices sent	9,962
Suits brought	383
Number of violators called before board and given advice	272
Amount of fines assessed for violation of smoke section of ordinance	$4,185.00

DEPARTMENT OF ELECTRICITY.

The Department of Electricity has closed an eventful year in Chicago's history.

During the year 1904 the electric light system was extended by the addition of 166 2,000-candle-power arc lamps; 66 were discontinued, leaving 100 net additional, and bringing the total number in service at the beginning of the year up to 5,107. In addition to these, 593 arc lamps have been added to the service, the most of these being operated from the new plant at Fullerton avenue and the Chicago river. A little more than 100 miles of wire was placed for overhead lights and about 16½ miles of cable for underground lights; for the latter nearly five miles of conduit was placed, with about 12 miles of duct feet therein; 90 arc lamp posts were erected; 4½ miles of electric light cable were placed in service on account of renewals.

The average cost for maintaining 5,034 arc lamps during the year was $55.16 per lamp.

A new electric light station at Fullerton avenue, the Horatio N. May electric power station, near the Chicago river, has been completed and placed in service during the year. Approximately $75,000 in contracts are outstanding for equipment, which included two 1,100-horse-power vertical cross-compound engines, four 500-horse-power boilers at 225 pounds pressure, superheaters for the same, two 750 k. w. three-phase alternating current generators, with two exciters, and a complete switchboard equipment, condensing system, steam piping, stoker equipment, traveling crane and 500 arc lamps with transform-

ers and regulators, to connect with the switchboards. This will be the most modern and economical municipal lighting station in the United States.

All future extensions to the lighting system must be made with a view of ultimate operation of the lights from the water power now being developed by the drainage board. The existing plants are so arranged that no great changes are necessary to apply such power and still retain the steam power for emergency use. To illustrate how simple and inexpensive the application of the power can be made, so far as stations are concerned, approximate figures have been obtained on the necessary apparatus, which is given as follows:

Rice and Lincoln street station	$16,500.00
Halsted street station	31,000.00
R. A. Waller station	16,500.00
Fullerton avenue station (new)	1,500.00
Total cost to apply power	$65,500.00

The conditions are such that the operation of the stations would not be interrupted for a moment.

The importance of securing this water power for municipal purposes cannot be overestimated. The City Council and civic bodies interested in the furthering of the City's interests have declared for the acquisition of this power by the City, and some efforts have been made to agree upon a price to be paid therefor, but nothing definite decided upon. In the meantime the development of the power is progressing, and within eighteen months should be completed. Unless something is done immediately towards closing a contract and executing the physical part of the work necessary on the part of the City, to make use of the power when ready, it will lie dormant or will be acquired by private interests, and in either case, the City's interests will not be conserved.

The acquisition of this power will settle for all time the important question of street lighting, and the department has conclusive evidence that there is no more potent factor in the reduction of crime

than properly lighted streets and alleys. There will never be another such opportunity to effect a great saving to the City and improve conditions generally as now offered. No obstacle should be allowed to stand in the way of the immediate acquisition of the entire water power, and the execution of that part of the work required to be done by the City, that it may be ready to make immediate use of the power when developed.

In the Bureau of Fire Alarm Telegraph, 193 fire alarm boxes have been placed in front of schoolhouses, 25 in front of theaters, and 34 at other locations, a total of 252 boxes. This is the greatest number placed in service in any one year since the installation of the system in 1865. The total number of fire alarm boxes now in service is 1,689. All the old iron wire has been replaced by copper, leaving only 98 miles to be replaced next year.

There was placed in service during the year 73,956 feet of cable, of which 60,429 feet was for underground extensions and 13,527 feet of repairs and renewals; 1,085 feet was used for miscellaneous repairs.

Ten additional police patrol boxes were installed during 1904, making a total of 1,031 in service; 150 signal boxes were rebuilt and rewired.

Over 5,000 street signs were placed on gas and gasoline lamp heads and on street corners, 2,640 of which were made in our repair shop. The gas mantle lamps were increased by changing 441 plain tips to the mantle tops, making a total of 11,400 mantle lamps. Provisions are being made to change 600 more during 1905.

There was a saving of $3,332.06 because of the cheaper rate obtained for the maintenance of gas mantles.

About 2,000 new automobile licenses have been issued during the year and 1,600 new automobile plates, in addition to the renewal of a great part of those previously issued. The revenue collected therefrom was $6,034; the expense for number plates and stationery has been less than $1,000, leaving a clear net profit of $5,000 for the year.

During the year 29,971 electric motors were inspected, having 150,019⅛ horse-power capacity; 1,950 signs, containing 34 arc lights and 115,721 incandescent lights; 7,077 arc lamps and 398,904 incandescent lamps, exclusive of lamps on signs. The total amount of revenue was $49,121.14, being a net increase for the bureau of over $14,000, largely due to the increased revenues from electric light sign inspection.

The department had credit of $9,451.68 from the sale of power and light and $2,618 was received from electric permits. About $7,000 was taken in from miscellaneous sources.

MUNICIPAL LIBRARY AND BUREAU OF STATISTICS.

The Bureau of Statistics has become an important factor in disseminating correct and comprehensive knowledge of Chicago and its affairs. During the last year 207 letters of inquiry were referred to it by various city departments, and 751 letters addressed to it directly were answered. The office was visited by not less than 4,339 persons, an average of about 14 for each working day. The library of the bureau was increased by 1,737 books and pamphlets and numbers now 7,934 pieces, many of which are of great value and could not be bought. Nearly all of these books were procured without any cost to the City except for postage and express.

The bureau devised an entirely new system of records for the Police Department, which will not only result in increasing the efficiency and discipline of the police force, but eventually bring about an actual saving in the expenditures of the department.

BOARD OF EXAMINING ENGINEERS.

RECEIPTS.

5239 engineers' licenses renewed	$10,478.00
311 water tenders' licenses renewed	211.00
580 engineers' applications filed	1,160.00
110 water tenders' applications filed	110.00
Total receipts	$11,959.00

EXPENDITURES.

Salaries and incidental expenses	$ 9,683.85
Total credit over expenditures	2,275.15

In 1903 the credit by receipts over expenditures showed a balance of $1,623.30.

The above statement shows an increase over 1903 in business to the amount of $651.85.

During 1904 the number of applications examined by the board was 1,066.

OIL INSPECTION.

Oil inspected from January 1, 1904, to December 31, 1904:

501,545 bbls. @ 6c		$30,092.70
Cash turned over to City Collector	$ 9,095.96	
Of which for inspections in 1903, there was	54.06	
Net cash turned over for 1904 inspection	$ 9,041.90	
Maintenance of office, salaries, rent, stationery	9,699.96	
Transportation, etc	1,295.26	
Total expenses for year	$10,995.22	
Amount outstanding pending suit for inspection of gasoline and naphtha	$ 9,531.24	
Amount uncollected, misc. accounts	524.34	
		$30,092.70
Total inspections for 1904		$30,092.70
Total expenses for 1904		10,995.22
Balance		$19,097.48

CITY TREASURER.

The City Treasurer's office shows that there have been received from the several departments (City and County) deposits amounting in the aggregate to $50,232,007.80. Disbursed on warrants issued by the City Comptroller, $47,999,947.04. Water certificates and interest coupons amounting to $537,400, and school bonds and interest coupons amounting to $55,315.24 were retired.

CITY SEALER.

	No. Inspected.	No. Condemned.
Counter scales	9,755	242
Spring scales	6,629	567
Steelyard scales	31	...
Platform scales	6,528	245
Tierce scales / Beam scales	57	...
Dormant scales	1,331	51
Suspension scales	82	61
Beef run scales	....	...
Hopper scales	1,123	...
Three to twenty-ton scales	3,992	203
Twenty-ton up scales	187	6
Stock scales	30	...
Tank scales	36	...
Railroad tank scales	468	37
Dry measures scales	17,199	2,579
Liquid measures scales	14,876	269
Yard measures scales	10,594	34
Total inspections	72,963	4,234
Total number of scales	30,292	1,352
Total number of measures	42,671	2,882

Total collections, 1904	$15,968.25	
Total collections, 1903	15,211.75	
	$ 756.50	Increase.
Total expenditures, 1903	$13,077.31	
Total expenditures, 1904	12,656.87	
	$ 420.44	Decrease.

Number of arrests for violations of ordinances governing this department—62.

Amount of fines imposed	$ 1,112.00
Total collections, 1904	15,968.25
Total expenditures, 1904	12,656.87
	$ 3,311.38
Fines imposed	1,112.00
Over and above expenses	$ 4,423 38

SMALL PARKS AND PLAYGROUNDS.

Nine municipal playgrounds were in successful operation during the year under the direction of the Special Park Commission. One new play center was added to the system, being opened in August, to

the keen delight of thousands of children. The location of the ninth ground is on West Chicago avenue, east of Lincoln street. So much has the attendance overtaxed the area of 200 by 125 feet that efforts are being made to enlarge this playground next year by using adjoining vacant land belonging to the City next to the electric lighting plant.

It is gratifying to report that a public utility corporation has been actuated by the public spirit to which I appealed in my annual message for 1901, by granting for three years the free use of vacant land along the right-of-way of the Northwestern Elevated Railroad Company for playground purposes. The sites are located at Orleans street and Institute place, where a playground is already in operation, and on Orleans street, north of Schiller street, on the old Alexian Brothers' Hospital property. On the latter ground, 500 by 101 feet in area, the Special Park Commission proposes to establish a playground next year. With this playground in operation, the most congested district of the North side will be well equipped with playgrounds, when supplemented by the small parks to be established by the Commissioners of Lincoln Park.

The insecure tenure of several municipal playgrounds suggests the advisability of the City Council appropriating part of the unexpended balance of the permanent improvement bond issue for the purchase of playground sites. Notice was served in December by the owners of the Jones playground site on Plymouth court to vacate the property. As the City had not ever a lease on the land, it will be necessary to abandon that First ward playground. Several playgrounds are held merely by short term leases, terminable in most cases by the serving of a sixty-days' notice.

In addition to the operation of the municipal playgrounds, the Special Park Commission and one of its members, Mr. Clarence Buckingham, have assisted in the establishment of playgrounds on the West side. One is located on Armitage avenue, opposite Francisco avenue, in connection with the Armitage Avenue Settlement, and the

other is at Washtenaw avenue and Lexington street, the latter being an athletic field, under the care of Alderman Scully.

Out of the $1,000 fund which was provided by the City Council for summer playgrounds under control of the Vacation School and Playground Board the first public playground in the Ghetto district of the Ninth ward was established on West Twelfth place, between Canal and Clinton streets. From the same fund a playground was opened on West Van Buren street, near Aberdeen street, in connection with the Forward Movement Social Settlement. Assistance was rendered the playground at Twenty-fifth place and Wallace street, conducted by the pastor of All Saints Church as a public enterprise.

The Commissioners of Lincoln Park are at work on three of the four small park sites recommended by the Special Park Commission two years ago. An agreement has been reached for the purchase of the House of Good Shepherd property at Orleans and Elm streets, for $100,000. This will be the first site acquired. The other sities are on Oak street, between Gault court and Milton avenue, and the tract bounded by Vine, Gardner, Vedder streets and the Schiller School property.

In order to bring to a speedy issue the question of validity of the West side small park bond act a test suit, in the form of an injunction proceeding, was started by a friendly taxpayer with the approval of the Special Commission. This case and another parallel one are now on appeal before the Supreme Court and a decision is expected any time. The West side people have been patiently waiting for breathing spaces and recreation grounds, and it is to be hoped they will get what they need without further vexatious delay.

Ten of the fourteen parks and squares which are being established by the South Park Commissioners, largely upon the initiative and recommendations of the commission appointed by me five years ago, were provided this winter with skating ponds and toboggan slides. This is a needy addition to Chicago's recreation facilities. After a year's delay, the South Park Commissioners adopted the recommenda-

tion of the City Commission in selecting the tract bounded by Forty-fifth and Forty-sixth places, Princeton avenue and the Fort Wayne Railroad, for the Thirtieth ward small park site.

A special report relating to a metropolitan or outer belt park system was completed by the City Commission and ordered published. This project has always met with my earnest approval. In view of the fact that the City Commission had authority, under the Council's resolutions of November 6, 1899, to prepare reports on park needs, both within and outside the City, I do not believe this rural park work should be relegated to any body more recently organized, and lacking in composite representation. The Special Commission is now fully representative of both the City and County, and fully competent to carry the project it originated to a successful conclusion.

Respectfully,

CARTER H. HARRISON,
Mayor.

CITY EXECUTIVE OFFICERS

EDWARD F. DUNNE,
MAYOR.

JOHN F. SMULSKI,
CITY ATTORNEY.

F. W. BLOCKI,
CITY TREASURER.

ADRIAN C. ANSON,
CITY CLERK.

THE CITY COUNCIL.

1905–1906.

1ST WARD.
John J. Coughlin.
Michael Kenna.

2D WARD.
Thomas J. Dixon.
George F. Harding, Jr.

3D WARD.
Wm. J. Pringle.
Milton J. Foreman.

4TH WARD.
John A. Richert.
James M. Dailey.

5TH WARD.
James J. McCormick.
Charles Martin.

6TH WARD.
E. C. Potter.
Linn H. Young.

7TH WARD.
Bernard W. Snow.
F. I. Bennett.

8TH WARD.
John H. Jones.
P. H. Moynihan.

9TH WARD.
Henry L. Fick.
A. J. Harris.

10TH WARD.
Rudolph Hurt.
Thomas F. Scully.

11TH WARD.
Peter L. Hoffman.
Edward F. Cullerton.

12TH WARD.
Joseph Z. Uhlir.
Michael Zimmer.

13TH WARD.
James R. Considine.
Melvin P. Riley.

14TH WARD.
William D. Maypole.
Daniel V. Harkin.

15TH WARD.
Albert W. Beilfuss.
J. L. Smith.

16TH WARD.
Stanley H. Kunz.
John M. Nowicki.

17TH WARD.
William E. Dever.
Lewis D. Sitts.

18TH WARD.
Michael C. Conlon.
John J. Brennan.

19TH WARD.
Fred D. Ryan.
John Powers.

20TH WARD.
Nicholas R. Finn.
J. C. Patterson.

21ST WARD.
Robert R. McCormick.
Otto Reese.

22D WARD.
Michael D. Dougherty.
John H. Sullivan.

23D WARD.
Robert Schmidt.
Charles Werno.

24TH WARD.
George K. Schmidt.
Albert Hahne.

25TH WARD.
Alfred D. Williston
Winfield P. Dunn.

26TH WARD.
Peter Reinberg.
William F. Lipps.

27TH WARD.
Hubert W. Butler.
Henry J. Siewert.

28TH WARD.
Walter J. Raymer.
Adolph Larson.

29TH WARD.
Thomas Carey.
Peter A. Wendling.

30TH WARD.
John J. Bradley.
John Burns.

31ST WARD.
W. J. Roberts.
Patrick J. O'Connell.

32D WARD.
Joseph Badenoch.
Henry F. Eidmann.

33D WARD.
Ernest Bihl.
William C. Hunt.

34TH WARD.
Jonathan Ruxton.
Joseph F. Kohout.

35TH WARD
Thomas M. Hunter.
Frank L. Race.

NEW STEEL TRUNNION BASCULE BRIDGE AT NORTH WESTERN AVENUE.—END VIEW.—COMPLETED IN 1904.

Department of Public Works

CITY OF CHICAGO

F. W. BLOCKI

COMMISSIONER

WM. L. O'CONNELL

DEPUTY COMMISSIONER

HEADS OF BUREAUS

City Engineer,	JOHN ERICSON
Superintendent Bureau of Sewers,	WM. E. QUINN
Superintendent Bureau of Water,	H. O. NOURSE
Superintendent Bureau of Streets,	M. J. DOHERTY
Superintendent Bureau of Maps and Plats	CHAS. J. BUHMANN
Superintendent Bureau of Street and Alley Cleaning,	F. W. SOLON
Department Bookkeeper	HUGO RASPER

PAST COMMISSIONERS OF PUBLIC WORKS.

WATER BOARD.

1851–54—John B. Turner, Prest., Horatio G. Loomis, Alson S. Sherman.
1854–56—James H. Woodworth, Prest., John C. Haines, George W. Dole.
1856–58—George W. Dole, Prest., Orrington Lunt, John C. Haines.
1858–60—George W. Dole, Prest., Orrington Lunt, Noah Sturtevant.
1860–61—Orrington Lunt, Prest., Edward Hamilton, Benjamin Carpenter.

SEWERAGE BOARD.

1855–59—Wm. B. Ogden, Prest., James D. Webster, Sylvester Lind.
1859–61—James D. Webster, Prest., Sylvester Lind, Philip Conley.

Water and Sewerage Boards merged May 6, 1861, into

BOARD OF PUBLIC WORKS.

1861–63—Benjamin Carpenter, Prest., John G. Gindele, Frederick Letz.
1863–65—Francis C. Sherman, Mayor, *ex-officio* member of the Board.
1863–67—John G. Gindele, Prest., Frederick Letz, Orrin J. Rose.
1867–69—Aug. H. Burley, Prest., Wm. H. Carter, John McArthur.
1869–71—John McArthur, Prest., Wm. H. Carter, Redmond Prindiville.
1865–69—Wm. Gooding and Roswell B. Mason, members of the Board in matters pertaining to the cleansing of the river.
1869–71—Wm. Gooding and Edward B. Talcott, members of the Board in matters pertaining to the cleansing of the river.
1871–73—Wm. H. Carter, Prest., Jas. K. Thompson, Redmond Prindiville.
1873–76—Redmond Prindiville, Prest., Louis Wahl, Jas. K. Thompson.

Board of Public Works abolished September 18, 1876, and on the same date there was established by the City Council

THE DEPARTMENT OF PUBLIC WORKS.

1876–78—Monroe Heath, Mayor, Acting Commissioner.
January 7 to May 18, 1879—E. S. Chesbrough.
May 19, 1879, to October 18, 1881—Charles S. Waller.
October 19, 1881, to February 4, 1882—Carter H. Harrison, Mayor, Acting Commissioner.
February 4, 1882, to January 31, 1886—DeWitt C. Cregier.
February 1, 1886, to June 28, 1886—Carter H. Harrison, Mayor, Acting Commissioner.
June 28, 1886, to April 11, 1887—W. H. Purdy.
April 12, 1887, to April 15, 1889—George B. Swift.
April 16, 1889, to April 27, 1891—W. H. Purdy.
April 28, 1891, to December 24, 1892—J. Frank Aldrich.
December 24, 1892, to April 25, 1893—E. Louis Kuhns, Acting Commissioner.
April 25, 1893, to November 21, 1894—Hiram J. Jones.
November 21, 1894, to November 28, 1894—John A. Moody, Acting Commissioner.
November 28, 1894, to April 8, 1895—John McCarthy.
April 8, 1895, to July 20, 1896—William D. Kent.
July 20, 1896, to April 15, 1898—Joseph Downey.
April 15, 1897, to May 21, 1901—L. E. McGann.
May 21, 1901, to May 24, 1905—F. W. Blocki.

ANNUAL REPORT

Commissioner of Public Works

CITY OF CHICAGO

1904

COMMISSIONER'S REPORT.

OFFICE OF THE COMMISSIONER OF PUBLIC WORKS,
CITY HALL.

To the Honorable, the Mayor and Common Council of the City of Chicago:

GENTLEMEN:—I herewith submit the Twenty-ninth Annual Report of the Department of Public Works for the year ending December 31, 1904, giving the work in detail of the various bureaus comprising said department:

BUREAU OF ENGINEERING.

WATER SUPPLY.

There are in the system eight large pumping stations and two small ones. Lake water is supplied from five intake cribs. Thirty-eight miles of tunnels convey the water from the cribs to the stations.

The number of pumping engines available is thirty-six, having a total capacity of 530,000,000 gallons per twenty-four hours. The total amount of water pumped during the current year was 146,310,498,353 gallons, the supply per capita per day being 203.3 gallons, based on a population as determined by the latest school census. This was an increased pumpage over that of 1903 of 8,794,746,397 gallons.

In previous reports made to your Honorable Body I particularly called attention to the enormous waste and leakage of water, and recommended that, in order to prevent a great deal of this leakage and waste, meters should be installed. Wherever it was possible under the present City water ordinance to compel property owners to place meters we have done so.

In order to insure the placing of more meters I respectfully recommend that your Honorable Body amend the present City water ordinance so that the City should place the meters and keep them in repair at its expense. The money to pay for this expense should be appropriated from the water fund, a certain amount to be spent each year.

In accordance with an order passed by your Honorable Body on October 13, 1902, I instructed the City Engineer to present a plan for the in-

stallation of meters with all necessary information as to cost, etc., which plan, etc., will be found at the end of the report of the Bureau of Engineering.

I also instructed the City Engineer to secure the services of the Pitometer Company of New York to conduct a series of tests with the pitometer, to ascertain the flow of water in the large mains at different points in the Chicago water works system. The report of said company, together with a report by J. H. Spengler, Assistant City Engineer, on the water works system of Chicago, will also be found at the end of said report of the Bureau of Engineering.

The work on the remodeling of the Chicago avenue pumping station, including the installation of three new 25,000,000 gallon vertical triple expansion engines, including necessary foundations, suction tunnels, etc., progressed satisfactorily. One engine was completed and is in service. The total cost will be about $400,000.

A new boiler plant was installed in the Fourteenth street pumping station at a total cost of $95,000.

A contract was let for an additional 40,000,000 gallon engine for each of the Central Park avenue and Springfield avenue pumping stations. The total cost will be about $178,500.

In order to meet the demand for more water in the district supplied by the Sixty-eighth street pumping station, plans and specifications were prepared for an additional engine at said station of a capacity of 20,000,000 gallons.

In order to accommodate this additional engine, which will be placed at the north end of the station, a contract for an addition to the station was let at a cost of $19,875.

Plans and specifications were also made and bids asked for the placing of four 250-horse-power boilers, with necessary appurtenances, etc., to take the place of boilers Nos. 1 and 7 at the Lake View pumping station.

In order to improve the water works system, new boilers should be installed at the Harrison street and Sixty-eighth street pumping stations; a new 3,000,000 gallon pumping engine should be installed at the Washington Heights pumping station in place of the 400,000-gallon pump; an additional well and pump should be installed at the Norwood Park pumping station, and a system of large water mains should be laid in Hyde Park and other low pressure districts in connection with the installation of the new pumping engines.

There should also be constructed a water pipe tunnel under the North branch of the Chicago river at Montrose boulevard; the reconstructing of the cross-town water tunnels from Peck court and Lake Front to the Har-

rison street pumping station, and from the Chicago avenue pumping station to the Harrison street pumping station; the beginning of work on the new South side land-and-lake tunnel, and the commencing of work on extension of the Chicago avenue tunnels to the Carter H. Harrison crib.

Plans and specifications were made for a new superstructure for the Lake View crib. The cost of this work will be about $70,000.

WATER PIPE EXTENSION.

By the extension of feeder mains for the supply of Jefferson and Austin, which was commenced June 21st and completed December 23d, connection was made with the system of small City mains in Austin, thereby increasing the pressure from 16 pounds to 23 pounds at that place.

The 36-inch pipe having been laid in Oglesby avenue from the Sixty-eighth street pumping station to Seventy-ninth street, and connection having been made with the pumping station and with the 36-inch main in Seventy-ninth street, completed the laying of the feeder main for the supply of West Pullman.

The extension of 16-inch mains in Belden avenue from North Halsted street to Racine avenue, and in Forty-third street from Greenwood avenue to Cottage Grove avenue, gives a material increase of supply and pressure to the districts through which they pass.

During the year there were laid 242,594 lineal feet of water mains, varying from 4 inches to 36 inches in diameter; 541 hydrants and 445 valves were placed, and 18,996 feet of mains lowered, in connection with which the service pipes were lowered wherever necessary from the main to the curb.

At the close of the year there were in all a total of 1,978 $\frac{1878}{5280}$ miles of water mains, 20,349 hydrants, and 16,095 valves.

During the year 7,345 leaks and complaints were reported and received prompt attention.

Under the ordinance passed by your Honorable Body on January 4, 1904, providing a more equitable method wherewith to pay and discharge the water special assessment refunds and water pipe extension certificates heretofore issued by the City of Chicago and now outstanding, whenever a receipt for the payment of such special assessment has been presented to this department, a survey of the pipe laid is immediately made to ascertain the revenue derived by the City, as the City ordinance provides that the pipe laid must pay a permanent annual revenue of at least ten cents per lineal foot. If such pipe shows the required revenue, a voucher for a refund of ninety per cent of the amount assessed is at once transmitted to the City Comptroller, who issues a certificate bearing 3½ per cent interest, payable in thirteen years from the date of the taxpayer's receipt. In a great

many cases where the revenue derived is not quite ten cents per foot, taxpayers have been advised to request another survey after an intermission of several months, and this has proved very satisfactory, as the second survey oftentimes showed the required revenue by reason of additional houses having been built.

When the pipe laid by special deposit pays a revenue of five cents or ten cents per lineal foot, as provided in the old water pipe extension certificates, such certificates have been exchanged, on presentation, for new certificates, bearing 3½ per cent interest, payable in thirteen years from the date of such special deposit.

As such certificates are an outstanding obligation against the water fund I respectfully recommend that they be retired as soon as possible before expiration, provided there is sufficient money in the water fund to take them up.

BRIDGES AND VIADUCTS.

The new bascule bridge over the river at West Division street was opened to traffic June 4th. The cost of this bridge amounted to $256,320.52, of which amount the Chicago Union Traction Company paid $138,221.95, making a net cost to the City of $118,098.57.

The new bascule bridge at North Western avenue over the North branch was completed and opened to traffic November 22d. This bridge cost a total of $303,998.14. The length between trunnion supports is 205.6 feet, and the width of the channel is 168 feet. It has two roadways, 18 feet in width, and two sidewalks, each 8 feet in width, the width over all being 60 feet.

A bascule bridge was built by the Sanitary District of Chicago over the South branch of the Chicago river at Loomis street.

Two short steel bridges were built on Eggleston avenue crossing the lagoons at Auburn Park at a cost of $3,960.

Plans and specifications were prepared for new bascule bridges at Archer and at North avenues. I respectfully recommend that new bridges be built during the coming year at South Western avenue, at Torrence avenue, at Indiana street and at North Halsted street (Canal) or Chicago avenue.

In addition to these new constructions, there has been an unusual amount of work done in repairing and reconstructing the old bridges and viaducts. The repairs to viaducts in most instances were made by the railroad companies occupying tracks underneath the structures, and where not made by said companies were made by the City and the expense was charged to such companies.

RIVERS AND HARBORS.

Eighty permits for dock work along the Chicago and Calumet rivers were issued, involving the construction of 3,628 feet of new docks, the rebuilding of 5,443 feet and the repairing of 1,649 feet. Twenty-seven permits were issued for dredging in the river, covering approximately 48,000 cubic yards. The Sanitary District continued dredging, removing about 53,500 yards. The United States Government removed from the outer harbor and Calumet river about 609,000 cubic yards.

In the Calumet harbor the breakwater extension was practically completed for its length of 2,500 feet under the supervision of the United States Government. The City dredged away 1,500 cubic yards of an obstructing sand bar from the east draw of Fullerton avenue bridge at a cost of $487.50. The City rebuilt the dock at the foot of Monroe street at a cost of $1,266.30.

ARCHITECTURE.

Plans and specifications were prepared for engine houses at Michigan avenue and Fourteenth street; 6017-19 State street; Diversey and Fairfield avenues; 928 Rosemont avenue; 1635 West Sixty-ninth street; 4714 Elizabeth street, and for an addition to Hook and Ladder Company No. 12 at 1245 West Thirteenth street.

The fire engine house at Chicago avenue and St. Clair street was completed during the year at a cost of $19,975.

A Vessel Dispatcher's office was built at Lake street and the river at a cost of $2,413.

Plans were prepared for an addition to the repair shop at Ashland avenue near Twenty-second street.

Plans were made for two public bath-houses, one to be located at 193-95 Gault place, and the other to be located at 2830-40 South Halsted street.

The plans and specifications for the intercepting sewage pumping station at Thirty-ninth street and the lake were also completed.

BUREAU OF STREETS.

GARBAGE.

During the year there were removed 1,456,395 cubic yards of garbage, or 289,695 loads, at a cost of $640,602.50. There were 902 garbage complaints which were attended to, as compared with 919 complaints during 1903.

On account of the antiquated and objectionable method used by the City in disposing of its garbage, which method is due to the small amount

of money allotted by your Honorable Body for this purpose, I beg to call your attention to my report for the year 1903, in which I advocated the adoption of a modern method of disposing of the City's wastes, by the building of incineration or reduction plants. Should either one of these methods be adopted, a much better service could be given the City. It is expected that your Honorable Body will take steps during the coming year to bring about this end.

STREET AND ALLEY CLEANING.

It is a well-known fact that we never can have well-cleaned streets until we have good pavements, and it is impossible to have good pavements until we prevent the continual tearing up of these pavements. With good pavements the cost of cleaning can be reduced to a minimum. As all paving is done under the supervision of the Board of Local Improvements, I have refrained from recommending any kind of material. It may not be amiss, however, to say that most of the streets in the downtown district should be repaved by special assessment.

I also respectfully recommend that an appropriation be made by your Honorable Body for the purpose of constructing 18-foot roadways, composed of crushed stone, on the following streets, to wit: Western avenue from Seventy-first to Ninety-fifth streets, Ninety-fifth street from Western to Kedzie avenues, Vincennes road from 107th to Seventy-ninth streets, Halsted street from Seventy-first to 103d streets, State street from Eighty-seventh to 103d streets, Cottage Grove avenue from Niney-fifth to 103d streets, Ninety-fifth street from Stony Island avenue to Ontario avenue, Torrence avenue from 105th to 127th streets, Western avenue from Belmont avenue to the City limits on the north; California avenue from the limits to Devon avenue, Granville avenue from Ashland to Kedzie avenues, Lincoln avenue from Central Park to Higgins avenues, Norwood avenue from Bryn Mawr to the City limits, Milwaukee avenue from Higgins to Sixty-fourth avenues, North avenue from Forty-eighth to Sixtieth avenues, Chicago avenue from Fortieth to Forty-eighth avenues, Central Park avenue from North to Chicago avenues, and Central Park avenue from Twelfth to Madison streets. This would amount to about 57 miles of roadways and would cost about $375,000.

The main destruction to our pavements is on account of the openings made in them for underground work. I wish to reiterate what I have stated in previous reports to your Honorable Body, that a system of subways or conduits should be built by the City in which should be placed all underground work. If subways are to be built in the downtown or business district for the transportation of cars, provision for this underground work

could be made in connection therewith. There should also be built in this district sewers of a sufficient size as an aid to carrying off a great deal of the filth by flushing.

I wish to call your attention to the fact that the money appropriated by your Honorable Body for street cleaning purposes is not sufficient to properly pay for cleaning the present paved streets. Outside of the down-town district and some of the main arteries leading to and from the down-town district, on account of this small appropriation, the department is only able to clean outyling streets twice a year, in the spring and in the fall.

With the money at hand it has been impossible to give the best of service, especially in view of the fact that the cost of removing street dirt becomes greater each year on account of the long hauls. The department has, however, disposed of a great deal of this dirt by using such space as was available between sidewalks and curbs and the filling in of streets that were below grade. The dirt has also been dumped into sidewalk space on account of the absence of walks or where walks were in a dangerous condition, thereby preventing many accidents and suits against the City. In many instances where this filling was done citizens were glad to avail themselves of the opportunity for putting in foundations for building cement or stone walks.

There were cleaned 17,554 miles of streets and alleys, which necessitated the removal of 128,537 loads of street dirt; 1,323,385 lineal feet of weeds were cut, and 354,125 inlets to catch basins were opened and cleaned. The total cost of this work amounted to $274,531.70, of which amount $48,030.61 was charged to street car companies for cleaning their various rights of way.

Forty-five thousand six hundred and seventy-six loads of snow were removed at a total cost of $74,284.27. The appropriation for the removal of snow was $60,000, with an additional appropriation of $14,284.27.

Eighteen thousand eight hundred and eighty-seven dead animals were removed during the year, without a cent of expense to the City.

During the summer the Citizens' Street Cleaning Bureau organized for the purpose of cleaning the streets and alleys in the district between Madison and Van Buren streets from LaSalle street to Michigan avenue, with the exception of State street, which they were to care for from Van Buren street to the river on the north. For cleaning this district from June to December 31st, they were allowed by the City $12,500, or an average of $14 per mile. I am informed, however, that the average cost per mile for the work done by said Citizens' Bureau amounted to at least three times the amount allowed by the City.

Fifty thousand dollars were spent during the year for asphalt repairs,

being the full amount of the appropriation made for this purpose. This amount was far from sufficient to pay for necessary repairs to asphalt streets in various portions of the City under reserve.

Summary reports are compiled at the end of each week from reports made daily by the ward superintendent of each ward of the amount of work done and the number of men and teams at work. By reason of these reports and the testimony given by the ward superintendents in suits for damages against the City, the City has been enabled to win over eighty per cent of suits tried in recent years, as it was able to show that barricades had been placed and maintained as soon as notices were given either by citizens or by police reports.

In the repairing of improved streets and alleys 34,349¼ square yards of pavement were laid, with different kinds of paving materials, at a total cost of $31,993.31.

Thirty-three thousand eight hundred and two dollars and fifty cents were spent on unimproved streets and alleys in grading, opening and cleaning ditches, building and repairing aprons, crossings, culverts and box drains, and making general repairs.

The work done on sidewalks during the year amounted to 2,094 new and repaired intersections and 16,563 general repairs, at a total cost of $32,269.86.

During the year special appropriations amounting to $21,360, were made for ditching, repairing, and grading sundry streets, etc., in the Fifth, Eighth, Twelfth, Twenty-second, Twenty-sixth, Twenty-seventh, Twenty-ninth, Thirty-first, Thirty-second, Thirty-third, Thirty-fourth and Thirty-fifth wards, of which amount there was expended $20,636.45, leaving an unexpended balance of $723.55. This is shown in detail in the report of the Bureau of Streets.

During the year 140,348.4 square yards of various kinds of pavement were repaired by different corporations under street opening permits issued to them.

During the year 582 house moving permits were issued, for which fees to the amount of $1,665 were received.

Fifteen thousand five hundred and forty-one dollars and thirty-four cents was expended in the maintenance of thirty-two small parks under the jurisdiction of this department.

TRACK ELEVATION.

Ordinances have been passed by the City Council and accepted by the railroad companies for the elevation of their roadbed and railway tracks

from May 23, 1892, to April 6, 1905, covering the following amount of work:

Total number miles of main tracks to be elevated.....153.23
Total number miles of other tracks to be elevated.....746.33
Total number of subways to be constructed..... 567
Total estimated cost of entire work when completed.$48,910,250

Amount of elevation that has been done from May 23, 1892, to December 31, 1904, as follows:

Total number miles of main tracks elevated.....82.84
Total number miles of other tracks elevated.....425.19
Total number of subways constructed.....360
Total estimated cost of work done.....$28,725,250

Leaving work to be done under all ordinances that have been passed from May 23, 1892, to April 6, 1905, as follows:

Total number of miles of main tracks yet to be elevated.. 70.39
Total number of miles of other tracks yet to be elevated..321.14
Total number of subways yet to be constructed..... 216
Total estimated cost of work yet to be completed....$20,185,000

BUREAU OF WATER.

INSPECTION DIVISION.

During the year house-to-house inspections were completed in the First, Fourteenth, Fifteenth, Sixteenth, Seventeenth and Thirty-first wards, making a total of 136,546 inspections. The general assessment account will have been increased over that of the year 1903 by $60,633.80.

ASSESSORS' DIVISION.

Contracts were let for laying service pipes in seventy-eight streets. Estimates for laying water service pipes covering fifty streets were prepared for the Board of Local Improvements.

METER DIVISION.

More meters have been placed during the year than any previous year, the number being 804 net; 3,320 meters were repaired. The net collections by this division from all sources were $1,603,111.86, being an increase over the year 1903 of $180,166.67.

SHUT-OFF DIVISION.

The efficiency of the Shut-off Division as a medium to enforce the payment of taxes and compliance with the provisions of the water ordinance has been largely increased during the past year. Instead of only once, during 1904, every ward has been visited twice within the legal shut-off period, viz., thirty days before the expiration of the current term. A staff of special investigators was employed to aid in the settlement of a large number of complicated claims for water taxes and numerous property owners were induced to place shut-off boxes in front of their properties. Nearly two hundred service pipes were traced, whose location did not show or showed incorrectly on the City maps, and besides performing other valuable work two hundred and twenty-seven service pipes were cut to enforce the payment of delinquent taxes.

BUREAU OF SEWERS.

Two million ten thousand nine hundred and fifty feet of sewers were cleaned during the year at a cost of $34,945.31; 15,779 catch basins were cleaned at a cost of $49,377.10, and $35,091.87 were expended in opening inlets to catch basins, attending complaints, etc., making a total expense of $119,414.28. In addition to this amount $1,469.62 were expended for miscellaneous bills, tools, supplies, etc.

There were expended for repairs of sewers, manholes and catch basins a total of $77,952.77.

Ten thousand one hundred and three complaints were attended to during the year.

Two hundred and six thousand five hundred and forty-two feet of sewers of various diameters, with catch basins, were built by special assessment, private contracts and City day labor at a cost of $591,402.39.

Sewage pumped during the year by the six sewage pumping stations amounted to 9,838,000,000 gallons, which does not include 4,413,000,000 cubic feet of water pumped into the river by the Fullerton avenue station.

INTERCEPTING SEWERS.

Sections G and H, being the intercepting sewer on the Illinois Central Railroad right-of-way, Cornell avenue and Stony Island avenue, from Thirty-ninth street to Seventy-third street, commenced in 1901, was completed in June. This work, 4.58 miles in total length of sewers, from 16 feet to 12½ feet inside diameter, was built by day labor. The conclusion

of the work enables the comparison of the relative cost of the work by contract and day labor. The cost in detail for the work by contract under the bids of August, 1899, and by the expenditures for the work by day labor gave the following totals:

Total expenditures G. and H		$1,204,956.04
Less rentals and sales		8,210.82
Total cost to City		$1,196,745.22
Contract cost corrected lengths as per bids	$ 898,780.94	
Cost of work not specified and right of way	229,557.08	
	$1,128,338.02	
Six per cent for engineering and superintendence	67,700.28	1,196,038.30
		$ 706.92
Value of plant remaining to City		27,460.00
Tangible benefit to City		$ 28,136.92

This shows that day labor work may be carried on economically by the City, notwithstanding the fact that the cost of labor advanced from the time of the bids fifteen per cent and material twenty per cent.

In addition to the foregoing the 6½-foot sewer from Thirty-ninth street to Thirty-fifth street was built this year by day labor, and the main sewers on the lake shore between Thirty-fifth and Fifty-first streets are in partial operation, discharging the daily flow of sewage into the Thirty-ninth street conduit.

The concrete work for the pump wells and water channels for the Thirty-ninth street pumping station, at the shore line of Lake Michigan, has been completed and the building is in process of erection. This building will be of granite and pressed brick, with a tile roof, and when completed, with the machinery in place, all sewage north of Eighty-seventh street will be diverted from the lake. At the present time a temporary pumping plant is in operation discharging the sewage from a population of about 150,000 persons into the Thirty-ninth street conduit and so to the river at Halsted street, thus removing about 8,000,000 gallons per day of polluting matter from the lake.

The Supreme Court in October affirmed the finding of the lower courts, that the City was not empowered to do work in excess of $500 cost otherwise than by contract. This prevents the construction of the

Lawrence avenue conduit by day labor as proposed by the City, and steps have been taken to do the work by contract.

A lot has been purchased on Lawrence avenue at the crossing of the Chicago, Milwaukee & St. Paul Railway for the location of the pumping station in lieu of that originally recommended at the river by the Pure Water Commission. This will make the intercepting sewers of the North Shore sewers of free delivery instead of submerged sewers, and will greatly benefit the drainage of this district.

The following is a list of the contemplated improvements to be made during the coming year: On the South side—the completion of the Thirty-ninth street pumping station with machinery in operation, the construction of the Sixty-third street sewer, and the reversal of sewers in Fifty-first, Fifty-third, Fifty-sixth, Seventieth and Seventy-third streets. On the North side—the construction of the Lawrence avenue pumping station, with machinery for the same; construction of the Lawrence avenue conduit and open cut, and intake.

The installation of machinery at Lawrence avenue and the connection of Sheridan road sewers to the pumping station will not be completed until the spring of 1906.

BUREAU OF MAPS.

During the year 2,231 plats of various kinds were completed by this bureau. Miscellaneous petitions to the amount of 505 were verified; 14,997 persons required the services of an employe of the bureau; 10.30 miles of streets were vacated during the year and 10.241 miles added; 7.11 miles of alleys were vacated and 3.66 miles of alleys added. At the present time there are in the City 2,805.981 miles of streets and 377.49 miles of alleys.

SMALL PARKS AND PLAYGROUNDS.

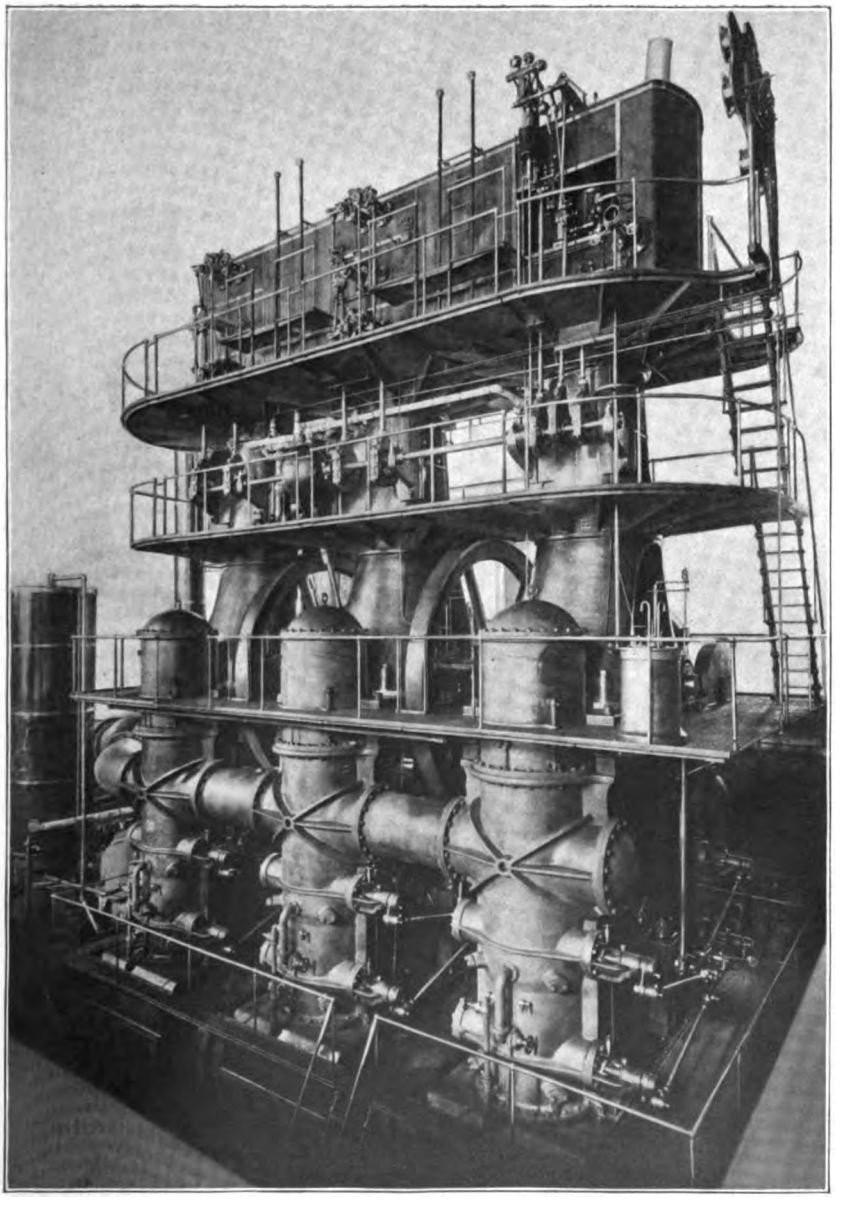
Nine municipal playgrounds were in operation during the year under direction of the Special Park Commission appointed by his Honor, the Mayor. One new playground was opened in August on West Chicago avenue, near Lincoln street. Three-year leases were executed by the Northwestern Elevated Railroad Company, granting the City free use of two playground sites along the company's right-of-way. One is located at Orleans street and Institute place, where a playground is already established. The other comprises the vacant part of the old Alexian Brothers' Hospital property on Orleans street, north of Schiller street, on

which the commission is planning to open a recreation place next year. The popularity of the municipal playgrounds is demonstrated by the fact that there was a total attendance of 1,015,000 persons at the nine grounds during the year. Of the $20,000 appropriated by the Council $10,717 was spent for salaries and labor in connection with the playgrounds and $5,700 for construction work, supplies, repairs and equipment. A more detailed report of the commission's work will be found in another part of this volume.

Respectfully submitted,

F. W. BLOCKI,

Commissioner of Public Works.



TWENTY MILLION-GALLON RIEDLER PUMP, CHICAGO AVENUE PUMPING STATION.

ANNUAL REPORT

Bureau of Engineering

CITY OF CHICAGO

1904

JOHN ERICSON,
City Engineer

CITY ENGINEER'S REPORT.

Chicago, January 1, 1905.

HON. F. W. BLOCKI,

Commissioner of Public Works.

DEAR SIR:—I have the honor to submit herewith the annual report of the Bureau of Engineering for the year ending December 31, 1904:

The work of the various divisions of the bureau, which from year to year is assuming greater proportions, has been progressing without any serious interruption, and the general public has been served as well as the limited finances and conditions would permit.

WATER SUPPLY.

During the past year there were more complaints received of insufficient water pressure in certain districts of the City than for several years past. In many such cases it was found that the trouble was caused by defects in the service pipes leading from the mains to the buildings, and by the keeping of faucets continually open in cold weather; but, when considering the still rapid growth of the City, the great annual addition to the water pipe system, and the steady increase in the per capita consumption, it is but to be expected that, without a continuous adding to the pumping capacity, the pressure will naturally decrease. Contracts for some additional pumps, which have been recommended for several years, have now been awarded, and when these shall have been installed the situation will be considerably improved for a few years at least. It is much more necessary, however, that steps be taken to reduce the great leakage and waste of water which is known to exist and regarding which I made special investigations and reports in 1901 and 1902.

During the past year there were tests made in certain districts by means of the Cole-Flad Pitometer, the results of which tests tend to verify the accuracy of the conclusions arrived at by other methods as regards these losses of water.

I believe that there is a limit to the present method of increasing the pumping capacity continuously, and, if steps are not taken to stop the ever increasing waste and leakage of water, a way to do which has

been pointed out in the above referred to special reports, the City some day will find itself in an embarrassing situation.

There was an increased pumpage in 1904 over that of 1903 of 8,794,746,397 gallons, the total number of gallons pumped being 146,310,498,353. Based on a population as determined by the latest school census, the quantity of water pumped was equivalent to 203 gallons per capita per twenty-four hours. The average operative cost of pumping this water per million gallons per foot head was 4.43 cents, or almost exactly the same as the cost reported for the year 1903, irrespective of the fact that certain increases in salaries were granted for the year 1904 to a considerable number of employes of the pumping stations. If salaries had remained the same as during the year 1903, the cost per million gallons per foot head would have been 4.36 cents as against 4.42 cents for the year 1903.

The quality of coal used during the year 1904 was the same as that used the year previous, or Illinois and Indiana bituminous. A comparison made would indicate that if so-called smokeless Eastern coal could be obtained at a price not to exceed 20 per cent over and above the cost of the Western product, there is more economy in the use of the former than the latter. The difficulty in obtaining the higher grade coal at all times and the considerable increase in the cost of the same lately is, however, a sufficient reason for adopting the policy of the last two years of using Western coal.

The results as shown above, although satisfactory, could be made still more so under certain conditions. Previous to the changing of the bookkeeping system by Haskins & Sells, this bureau had a system whereby it was possible for the City Engineer to ascertain daily the operation in detail of each pumping station. This is not possible under the changed system. Although this change from a bookkeeper's point of view may have seemed advisable, it was from an engineering point of view a great mistake. The enormous magnitude of the water works system and the work of other divisions over which the City Engineer has supervision make it a practical impossibility for him to give his personal attention to the various matters as closely as is desirable and necessary to obtain the best results. This fact makes the necessity of special daily reports of operation more apparent. I am also firmly of the opinion that if a competent and educated mechanical engineer familiar with the designing of pumping engines were employed to assist the City Engineer in the supervision of the many pumping stations, a considerable improvement could be obtained.

The following recommendations are made to improve the water works system:

That new boilers be installed at the Harrison street and Sixty-eighth street pumping stations.

That an additional 20,000,000-gallon pumping engine be installed at the Sixty-eighth street pumping station.

That a new 3,000,000-gallon pumping engine be installed at the Washington Heights pumping station in place of the old 400,000-gallon pump.

That an additional deep well and pump be installed at the Norwood Park pumping station.

That a system of large water mains be laid in the Hyde Park and other low-pressure districts in connection with the installation of the new pumping engines.

That recommendations made in former reports, but not yet acted upon, be carried out as soon as possible.

WATER PIPE EXTENSION.

The work done by this division during the year has exceeded that of previous years. A considerable amount of large pipe has been laid expeditiously and at low cost. There were laid in all 242,594 lineal feet of pipe, or nearly double the amount laid in 1903.

The extension of larger mains has been of considerable importance to the system, and is more fully described further on in this report.

This division although increasing its efficiency year by year, can be still further improved if adequate means are provided for this purpose.

The various district and main pipe yards should be provided with modern appliances for the handling of heavy material and for this purpose a general reconstruction is necessary. In this manner much of the labor now employed at these yards can be dispensed with.

Automatic recording pressure gauges should be placed at various places in the system. The resulting records will be quite valuable in determining future extensions of mains and for various other purposes.

The setting of additional valves on the mains in the downtown district is again strongly advocated, and it is hoped that a special appropriation for this purpose may be made this year.

An average of twenty-five leaks and complaints were attended to daily by this division in addition to the heavy construction work.

WATER WORKS SHOPS.

The work done at the water works shops is becoming more important year after year, the increase being especially marked during the past year, as may be seen in the comparative statement. Extensions to the building and the purchase of additional tools are recommended.

BRIDGES.

Both the designing, the construction and the repairing divisions of this branch of the bureau have been quite busy during the year. Considerably more work could have been turned out by the designing division, were it not for the lack of proper room. Some of the draftsmen are placed in one place, some in another. The drafting rooms are scattered on several floors, and a close supervision over the work is, under the circumstances, difficult. In order to expeditiously perform the great amount of work laid out for this branch, suitable offices and drafting rooms should be provided.

The most important structures turned over to the use of the public during the year were the West Division street and the North Western avenue bridges. Both are constructed on the designs developed in this bureau during the past few years, and which have proven to be very economical and satisfactory. With these two bridges, five of the same type are now in use, and it is a notable fact that the cost of the maintenance and operation of same is considerably less than for other bascule bridges in use.

Improvements have been made from time to time in the designs, and the City of Chicago will in these bridges have some very serviceable and durable structures.

The Sanitary District of Chicago has also during the year completed and turned over to the City a bascule bridge at Loomis street, built on the designs furnished by the Scherzer Rolling Lift Bridge Company.

A great amount of important work was done by the repairs and maintenance division, which is all enumerated further on in this report.

HARBOR.

A further falling off in our lake commerce of 2,279,936 tons, or nearly one-seventh of the lake tonnage of 1903, is discouraging, to say the least. The number of vessels in our lake carrying trade decreased 1,899, a considerable fleet lost in one year. This state of affairs strongly emphasizes the necessity of the lowering of the transportation tunnels, where the cause for these losses is principally to be found.

A report submitted to you by me on October 3, 1904, shows some methods and the cost of doing this work comparatively cheaply and expeditiously.

A resumé of some of the most important work done during the eight years that I have had the honor of serving the City of Chicago as City Engineer may be of interest.

WATER SUPPLY.

	1896.	1904.	Increase.
Yearly pumpage.	93,018,376,018 gals.	146,310,498,350 gals.	53,292,122,335 gals.

This represents an increase of about 56 per cent.

There have been eleven new pumping engines installed during this time, representing a capacity of about 205,000,000 gallons daily. In addition there have been some alterations made to some of the older pumps, increasing their capacity. A new deep well and pump were also installed at Norwood Park. Contracts have just been let and are about to be awarded for three additional pumping engines that will further increase the water supply by 100,000,000 gallons daily. Two new engines are ready to be installed at Chicago avenue pumping station as soon as the foundations can be constructed. The boiler plants in most of our stations have been remodeled.

WATER PIPE SYSTEM.

	January 1, 1897.	January 1, 1905.	Increase.
Water Mains....	8,929,610 feet.	10,445,218 feet.	1,515,608 feet. or $287\frac{348}{5280}$ miles.
Hydrants.....	17,375 "	20,349 "	2,974 feet.
Valves.....	12,907 "	16,095 "	3,188 "

BRIDGES.

The following bridges and viaducts under the jurisdiction of the City of Chicago were built from 1897 to 1904, both inclusive:

A.—BRIDGES:

1. Built by the City of Chicago.
   - *a.* Trunnion bascule bridges:
     - Clybourn place bridge.
     - East Division street bridge.
     - Ninety-fifth street bridge.
     - West Division street bridge.
     - North Western avenue bridge.
   - *b.* Temporary bridges:
     - Canal street pontoon bridge (removed).
     - East Division street pontoon bridge (removed).
     - North Western avenue pontoon bridge (removed).
     - Blackhawk street bridge (substructure only; superstructure moved from West Division street).

2. Built by the Sanitary District.
   Taylor street rolling lift bridge (Scherzer).
   Canal street rolling lift bridge (Scherzer).
   Main street rolling lift bridge (Scherzer).
   State street rolling lift bridge (Scherzer).
   Randolph street rolling lift bridge (Scherzer).
   Loomis street rolling lift bridge (Scherzer).
   Ashland avenue (West fork) bascule bridge (Page).

B.—VIADUCTS:
   Wells street viaduct.
   Canal and Sixteenth streets viaduct.

The work done by the various divisions of the Bureau of Engineering during the year 1904 will be described in detail under their respective headings:

DIVISION OF WATER SUPPLY.

PUMPING STATIONS.

OPERATION AND MAINTENANCE.

MR. GEORGE F. SAMUEL, Assistant Engineer in Charge.

FOURTEENTH STREET PUMPING STATION.

HUGH MARTIN, Engineer in Charge.

Four pumping engines were worked continuously at this station during the year, three Allis vertical triple expansion engines of a capacity of 15,000,000 gallons each in twenty-four hours and one Lake Erie vertical triple expansion engine of 30,000,000 gallons capacity in twenty-four hours.

No. 1 engine was given a thorough overhauling. New piston rods, piston rings and springs and one new set of crank brasses and a new 6-inch throttle valve were placed on this engine. All connecting rod and shaft brasses were taken out and oil grooves recut, pins trued, brasses refitted and replaced, and all steam jacket pipes renewed. Steam cylinders, steam receivers, throttle valve and all jacket pipes were covered with asbestos fireproof covering. The main pump plungers were packed with square braided flax packing, six new 2-inch quick open valves were put on, and the by-pass pipes renewed. The main pump valves were overhauled and all defective valves and springs replaced.

No. 2 engine was in continuous service during the entire year. No repairs were made on this engine except to pack plungers of main pumps with braided flax packing.

No. 3 engine had the steam cylinders, steam receivers, throttle valve, and all jacket pipes covered with asbestos fireproof covering. A new frame for walnut lagging was placed and the lagging was replaced and varnished. The main pump plungers were packed with square braided flax packing. The main pump valves and springs were overhauled and all defective valves and springs replaced.

No. 4 engine.—During the month of January the nuts on the piston head end of the piston rods came loose. It was necessary to remove the top cylinder head and steam chest to remove the old nuts and place new nuts on piston rods. New brass sleeves were placed on the condenser pump and boiler feed pump rods and the discharge plate of the condenser pump was refaced. A new 10-inch Bundy steam separator was placed on the steam supply pipe from the engines to the boilers. The main pump plungers were packed with square braided flax packing.

Buildings.—All the slate on the engine-room roof was removed and renailed with copper nails and copper snow hooks placed on roof. New gutters and down spouts were placed on the engine and coal room roofs.

The granite paving blocks in the alley west of the station were taken up and a new concrete foundation laid, and blocks relaid. A new oak plank platform was placed on the team scale. A new 9-foot pine board fence was placed in the alley at the west end of the station and in the yard at the north end of the station. The walls and roof of the engine-room were painted.

Twenty-five thousand five hundred and fifty-five baths were given during the year in the public bath operated at this station under the Bureau of Engineering.

SIXTY-EIGHTH STREET PUMPING STATION.

THOMAS REYNOLDS, Engineer in Charge.

At this station six pumping engines have been working continuously during the year, four 12,000,000-gallon Gaskill engines, one 14,000,000-gallon Holly and one 12,000,000-gallon Worthington horizontal high-duty engine. Since June the south pump has been operated against a water pressure of 60 pounds per square inch for the purpose of giving an increased head on the main supplying the West Pullman district. The head against the pumps supplying the Hyde Park district was about 40 pounds.

The No. 1 and No. 5 Gaskill pumps were fitted with new valves in place of the old Troy valves at a cost of about $1,200 per pump. These new valves have nearly double the area of the old ones, and the capacity of these pumps was increased about 20 per cent, or from 12,000,000 gallons

to 14,500,000 gallons daily. A new coal shed with a capacity of about 1,400 tons was erected east of the tracks. This is to be used for storing a reserve supply of coal in case of any interruption to the usual delivery by railroad.

There has heretofore been some cause for complaint on account of smoke from the stacks at this station, owing to the use of old style furnaces and boilers that had to be forced to their full capacity to maintain the water pressure during the periods of greatest consumption. It is expected that this smoke nuisance will be entirely done away with during the coming year, as the eight old boilers in the south end of the boiler-room will be replaced with new ones of larger capacity and improved furnaces, while the furnaces of the eight boilers in the north end of the boiler-room were equipped with the Jackson smoke-preventing device, which has resulted in doing away with smoke from these furnaces.

The principal repair work, in addition to the above, was as follows: No. 1 Gaskill engine was thoroughly overhauled and put in good condition by putting in fifteen hundred new pump valves, four new bucket valves, eight new foot valves, new brasses on both ends of left low-pressure piston rod, putting in two sets of metallic packing on the left low-pressure piston rod, and painting the engine. No. 2 Gaskill engine had a new gib in left low-pressure rod and lost motion taken up all around. No. 3 Gaskill engine had new gib put in crosshead end of left low-pressure piston rod and lost motion taken up. No. 4 Worthington engine: Put on new oil pump, put in one new compensating cylinder, and overhauled the Westinghouse air compressor and bored out accumulator cylinder. No. 5 Gaskill engine was overhauled and fifteen hundred new pump valves and forty 5-inch foot valves were put in. New brasses on both ends of the air pump rods and on both ends of the two low-pressure rods were put in. No. 6 Holly engine: Packed both plungers, faced up twelve pump valve seats, and repainted pump end.

TWENTY-SECOND STREET PUMPING STATION.

MARTIN MAHONEY, Engineer in Charge.

The four 15,000,000-gallon beam engines, two of which were installed in 1877 and two in 1884, were in use during the year. A new cylinder head that was ordered last year was fitted and put in place on the No. 50 engine, and new piston rings were put in the high-pressure cylinder, and new sleeves put on the valve stems. A new plank floor was put in the coal shed in the rear of the building, and a new concrete floor put in the boiler-room and in the coal-room adjoining the boiler-room, and a new board

fence was put around the station grounds. The roof of the boiler-room was painted both inside and outside.

The public baths operated in connection with this station furnished baths to 32,136 persons during the year.

CHICAGO AVENUE PUMPING STATION.

WILLIAM J. BURNS, Engineer in Charge.

At the close of the year 1903 there were six pumping engines in operation at this station, viz., the 1853 single beam engine with a nominal capacity of 7,500,000 gallons in twenty-four hours, the 1857 single beam engine with a capacity of 13,000,000 gallons in twenty-four hours, the 1867 double beam engine with a capacity of 18,000,000 gallons in twenty-four hours, the 1872 double beam engine with a capacity of 36,000,000 gallons in twenty-four hours and two horizontal Gaskill engines of 12,000,000 gallons capacity each.

Plans having been made and contracts let for the replacing of the old beam engines with three new vertical triple expansion engines, the 1853 and 1857 beam engines were first removed to make room for one of the new engines, which it was intended should be put in operation before the use of either of the other beam engines was discontinued. For a report on the installation of the new engines see report on Division of Water Supply, Construction. The old 1853 engine has been in continuous operation for fifty years and was the first pumping engine owned and operated by the City of Chicago, water having previously been furnished by a private concern known as the Chicago Hydraulic Company. A cut of this engine is shown on another page. This venerable piece of machinery was known to the engineers at the pumping station as "Sally." It was a vertical beam condensing engine with a steam cylinder 44 inches in diameter and a stroke of 9 feet with two single-acting pumps of 34 inches diameter and 5½ feet stroke. The length of working beam was 30 feet and the diameter of the flywheel 24 feet, and weighed 12 tons. The engine and boiler cost $24,500. Steam was used at 30 pounds pressure.

The 1867 and 1872 beam engines and the No. 1 and No. 2 Gaskill engines were operated almost continuously during the entire year, with the exception of a short time on account of changes and necessary repairs.

During the month of May the No. 2 Gaskill engine was shut down to be overhauled and all pins, guides and brasses were fitted up. Two new quarter-box brasses were put in, and two new brasses were put on the high-pressure beam pins, and all pump valves and seats were examined. Eight new seats and three hundred and fifty valves were put in. Both plungers were packed and eight valve seats and three hundred and fifty new

valves were placed in the pumps. A bad steam leak between steam jacket and low-pressure cylinder was repaired by drilling, tapping and screwing in six 5-8-inch copper plugs and calking the heads. Two new gaskets were put in the low-pressure cylinder heads.

During the time the engine was being overhauled, painters cleaned and painted the engine.

During the month of November the No. 1 Gaskill engine was shut down to be overhauled. All pins, guides and brasses were fitted up. One new 6-inch steel pin was put in the beam of high-pressure connecting rod. Four air pumps were bored out and four air pump buckets fitted up. New steel pins were put in the air pump cross-heads. New pins were put in four boiler feed pumps, the plungers turned up and fitted, also the glands bushed. Two steel pieces, ½x1x22 inches, were fitted, and riveted to the top and bottom of three quarter-box brasses. Two new brasses were put on the high-pressure connecting rod. All pump valves and seats were examined and six new valve seats and three hundred and eighty-five valves were put in the pumps. The air pumps were given eight new valves. A new copper coil was put in the heater to replace the old flue heater, which was beyond repair. The brass pipe on pumps and cylinders for indicators, which had been leaking, was replaced with new pipe. New black walnut lagging was put on the cylinders and steam chests. This engine also, while being overhauled, was cleaned, painted and varnished.

February 14th at 4 P. M. the 1872 engine cracked the 36-inch discharge main near the engine. The crack was ½-inch wide and 72 inches around the circumference of pipe. Repairs were made by calking a strip of lead ½x72 inches into the crack and a 3-8-inch steel patch was then fitted over and held in place with forty-eight ⅝-inch patch bolts. This work was done on the inside of the main. Two 1x5-inch steel bands were put around the outside and lead poured under them and calked. Six 1-inchx4-foot steel bolts were run through to the next coupling flange to prevent the main from opening up again.

August 23d the north working beam on 1872 engine became loose on the center pin and worked over south against the pillow block. To make repairs it became necessary to raise the beam up eighteen inches out of the pillow blocks in order to get out the two steel keys. The beam weighs 23 tons, and with the electric crane the beam was raised up eighteen inches and centered again on the pin. The old keys were taken out and two new ones were put in. While these repairs were being made the south half of the engine was kept running continuously.

The 1867 engine received slight repairs during the year.

A new 36-inch gear wheel was put on the electric crane to replace a broken one, and a new steel guide was put on the coal crusher engine, and a new sprocket wheel put on the driver engine to replace a broken one.

Ten new steel teeth were put on the crusher drum.

Boiler No. 10 (Holly) received one new steel sheet on the bottom at back end, also new feed water and blow-off connections. Hawley furnace No. 1 received seven new tubes. Six new bottoms were put on the ash hoppers. Twelve new 3½-inch pop safety valves were placed on the six Scotch boilers to replace the old pop valves, which were found to be unsafe for the increased boiler pressure of 180 pounds.

A 12-inch reducing valve was placed in the steam pipe leading from the Scotch boilers to the Gaskill engines to reduce the pressure from 180 pounds on the boilers to 70 pounds for the Gaskill engines.

The boiler feed pumps were changed from the front to the south side of the chimney to make room for the building of the Schmidt superheater. A 4-inch tee was placed in the 4-inch cold water main in the boiler-room. Six 2½-inch check valves were put in the feed water line. Six 2½-inch gate valves were also placed in the feed water line, both to replace old valves. Hawley furnace No. 5 received new tubes in two lower rows. Hawley furnace No. 4 received six tubes. A 2½-inch reducing valve was placed in steam pipe to reduce the pressure from 125 pounds to 30 pounds. A new skylight was built on the boiler-room roof. The coal bunkers were scraped and given two coats of paint inside and out.

The old leaky corrugated iron roof over the Holly boiler-room was replaced with a new corrugated iron roof, which was given two coats of paint. The water spouts and tarred roof on Holly engine-room were repaired. The Holly engine-room and all windows and doors including the scale house were painted.

Two wires were strung across the building between the Crane girders to hang arc lamps to furnish light to the Riedler engine. The old cement shed which stood on the drive in front of the building was removed.

Lake View Pumping Station.

Fred D. Parker, Engineer in Charge.

Four pumping engines have been working at this station during the past year, one 14,000,000-gallon Holly pump, two 12,000,000-gallon Gaskill pumps, and one 5,000,000-gallon Worthington pump.

The No. 1 Gaskill pump, which has plungers working in a solid ring, without adjustable packing, was overhauled and new plungers were put in and the packing rings trued up. This engine, which has been

running since 1888, was found to be in very good condition, one of the rings being worn about 3-16 of an inch out of true and the other one somewhat less. The old Troy valves, about 1,400 in number, were taken out and replaced with new valves having double the area and increasing the capacity of this pump 20 per cent, so that it can now be used to pump 14,500,000 gallons daily.

Other repairs were made as follows: No. 1 Gaskill pump: New brasses were put on the right hand high-pressure short rod, new cross head-pins were put on the four air pumps and four boiler feed pumps, and the pump was repainted and left in good working condition. No. 2 Gaskill pump was repainted and minor repairs made. No. 3 Worthington pump: A new set of rubber valves was put in the water end and the pump was repainted. No. 4 Holly pump: A new quadruple feed oil pump was attached and two new sets of brasses were put on the low-pressure short rods. The pump was repainted. New rubber valves were put in the water end where necessary, and some minor repairs were made.

Boilers: Some minor repairs were made on boilers Nos. 1 to 7, inclusive, but as these boilers and furnaces have outlived their usefulness and are to be replaced with new ones during the coming year, only such repairs were made as would enable the old boilers to be used until the new ones could be put in.

Building: The walls and roof of the engine-room were newly painted on the inside and the woodwork varnished. The walls of the building were oiled on the outside and the walls of the boiler-room were whitewashed on the inside and the woodwork was painted.

Harrison Street Pumping Station.

William Sullivan, Engineer in Charge.

The two 15,000,000-gallon Allis pumping engines installed in 1890 have been in constant use during the year, and are in good condition. The No. 1 pump has been in continuous operation with the exception of occasional shut-downs which amount to a total of about twelve days for the year. The No. 2 pump was running continuously with the exception of time taken to shut down for repairs amounting in all to about six days.

A new 6-inch throttle was put on engine No. 1. New valves were put on the air pump of engine No. 1 and four new lockers for engineers and steamfitters were put in. Six plungers on the main pumps were packed. The bilge pumps were rebuilt by putting in new piston rods, new valves in water end, new packing rings and bushing glands on piston rods. The valves and valve seats were faced. The basement was

whitewashed and all pipes in the basement were painted. The boiler-room was whitewashed and the pipes in the boiler-room were painted. The boiler feed pumps were repaired by putting a new sleeve in the water end of one and new valves in both. One new 42x60-inch cast iron blow-off basin was set in place. The driveway in the rear of the station was repaved with brick. The engine-room ceiling and walls were repainted.

It is proposed to replace the six old 60-inchx20-foot horizontal tubular boilers with new and larger ones during the coming year.

Central Park Avenue Pumping Station.

Fred Giblow, Engineer in Charge.

The three 20,000,000-gallon pumping engines at this station are of the Henry R. Worthington high-duty, vertical, duplex, direct-acting triple expansion type making a total capacity of 60,000,000 gallons per twenty-four hours.

The six boilers are of the Scotch marine, internally fired type having the Hawley down-draft furnace attached, and are also equipped with water purifiers and two high-pressure boiler-feed pumps.

Engines Nos. 1 and 2 were in almost continuous operation during the year, being shut down only occasionally to make minor repairs, such as packing, etc.

In July a crack developed in one of the intermediate cylinders, outside steam jacket wall on No. 2 engine, which necessitated a stopping of the engine for two days. In order to keep this engine in service the steam jacket system had to be cut out entirely from this cylinder. After this was done the engine was again started, and is still in operation at the present time. The Worthington Company has a new cylinder on the ground ready to put in place of the cracked one whenever convenient.

During the year the two intermediate cylinders on No. 3 engine cracked. These cylinders were removed in October by the Henry R. Worthington Company and replaced with new ones.

The piston rods of No. 3 engine were trued up and lapped. Eight sets of vertical double ring metallic piston rod packing were put on No. 3 engine. The valve motion on No. 3 engine was thoroughly overhauled; all pins were trued up and the rods were bushed at both ends with phosphor bronze metal. One Crandall mechanical lubricator was placed on No. 2 engine. This device feeds oil to the intermediate and low-pressure cylinder valve stems.

During the year all water plungers were packed, air pump rod brasses were cut down and fitted, compensating plunger was packed, and

new discharge valves were put in the air pump. All piston rods, rams and valves were repacked.

The east boiler feed pump received a thorough overhauling, eight brass sleeves were placed over plungers, and one new piston rod was made for same.

In November the electric light engine crank shaft was trued up, and the flywheel hub was rebored and bushed. In December one new crank shaft was made for the coal conveyor engine, also two new worm gears placed on the shaft. During the year twelve new brass tubes were put in the condensers.

In December a new platform scale was put in the boiler-room. In July three coal chutes were made and put in the coal bunkers. During the year several superheater coils burst and were replaced by the Worthington Company.

A cement walk was laid around the building, and the driveway east of the building was paved with brick. The grounds were graded east of the building as far as the driveway. Fences made of iron tubing were put around the lawn. The boilers were painted with a coat of graphite paint.

Some of the work necessary to complete this station is as follows: The wet well should have an upper floor connecting same with the engine platform, and ventilators should be put over the engine and boiler-rooms.

Springfield Avenue Pumping Station.

Daniel Sullivan, Engineer in Charge.

The three 20,000,000-gallon pumping engines at this station are of the Henry R. Worthington, high-duty, vertical, duplex, six-cylinder, direct-acting, triple expansion type, making a total capacity of 60,000,000 gallons per twenty-four hours.

The six boilers are of the internally fired Scotch marine type, with the Hawley down-draft furnace attached. They are also equipped with feed-water purifiers, auxiliary feed-water heaters, and two high-pressure boiler feed pumps.

The station is also equipped with an electric crane of fifteen tons' capacity, an electric light plant, two bilge pumps, also a complete coal handling apparatus consisting of a 500-ton coal bunker, coal conveyor, and ash handling machinery, a crusher and engines to operate the same.

During the year the covering damaged by the rain, while the roof was off of the boiler-room, was replaced where damaged and is now in good shape. All the furnace linings in the boiler furnaces were overhauled and put in good condition by the City bricklayers and a new

header was put in the furnace of No. 5 boiler in place of the one blistered.

The switch track for coal at the station was raised at the west end of the track, thereby avoiding the trouble we have had by cars breaking the bumping post. A new concrete sidewalk was built in front of the station, and the lawn around the station was raised with six inches of black soil and also leveled, graded and rolled, all ready for seeding.

The crusher engine attached to the coal conveying plant was thoroughly overhauled, a new piston and piston rod having been put in, also a new connecting rod complete, a new cylinder head and new teeth in crusher rolls.

The large bilge pump at the station was overhauled, new piston rods, new frames, and new stuffing boxes with screwed stuffing box nuts in place of glands, having been put in.

The boiler feed pumps were overhauled, the valves reseated in the water ends, and new links and pins placed in the valve motion.

The Henry R. Worthington Company furnished a new intermediate cylinder in place of the one cracked and patched on No. 1 engine.

The arc lamps in the station were overhauled and incandescent lines and circuits were put in good order.

The steam headers attached to feed water purifiers were all changed, and, instead of being connected up to the steam drums, are now connected direct to the boilers. The City painters finished painting the inside of the station. The engines, boilers and all auxiliaries are at present in very good running condition.

Washington Heights Pumping Station.

John E. Thome, Engineer in Charge.

The pumpage at this station for the past five years has been as follows:

Year.	Water Pumped in Gallons.	Year.	Water Pumped in Gallons.
1899	107,715,577	1902	157,162,182
1900	118,195,177	1903	243,656,345
1901	139,052,594	1904	252,930,403

This increase has been at the rate of 11.86 per cent per annum. The maximum daily pumpage in 1904 was 1,092,385 gallons. If this rate of increase is maintained the annual and the maximum daily pumpage for the next five years would be as follows:

Year.	Annual Pumpage, Gallons.	Max. Daily Pumpage, Gallons.	Year.	Annual Pumpage, Gallons.	Max. Daily Pumpage, Gallons.
1904	252,930,000	1,092,000	1907	422,120,000	1,822,400
1905	300,000,000	1,295,200	1908	500,700,000	2,162,000
1906	355,860,000	1,536,400	1909	593,910,000	2,564,000

The elevation of the prairie at 103d and State streets is+20.

The elevation of the prairie at 104th street and Stewart avenue is+40.

The elevation of the prairie at Ninety-ninth street and Western avenue is+95.

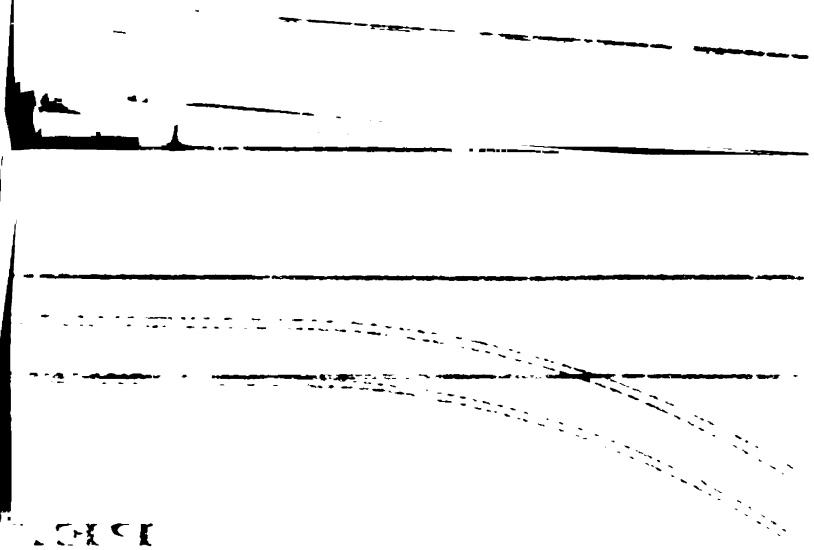
This station is now equipped with one 1,000,000-gallon pump and one 400,000-gallon pump and is without any reserve capacity, except that afforded by the water tower and tank, although the capacity of the large pump could be increased to 1,500,000 gallons daily by putting in new boilers that could be used for 100 pounds steam pressure. From these figures it appears quite desirable to provide additional pumping facilities as early as possible. As there is such a difference of elevation between the prairie at the proposed site for the new pumping station at 104th street and Stewart avenue and the territory in the vicinity of Western avenue and Ninety-ninth street, it will probably be found desirable to continue the Washington Heights station as a high-pressure station after the proposed new south tunnel and pumping station are in operation.

A new 24-inch main was laid on Vincennes avenue from the pumping station to 104th street and a 12-inch main on 104th street from Vincennes avenue to the water tower. The station has been wired and electric lights put in to replace the kerosene lamps formerly in use. Circulating pipes were put in both boilers and the furnaces were repaired. No. 1 pump was provided with new springs and valves. The storage capacity of the coal-room was increased by raising the windows about two feet. The fence in the rear of the station was rebuilt.

Norwood Park Pumping Station.

Nels Sampson, Engineer in Charge.

This station is supplied with water pumped from an artesian well by a deep well pump having a capacity of 300,000 gallons daily. A reserve supply is had from a second well from which water is raised by an air compressor to a cistern from which it is pumped by a Deane duplex pump. The reserve supply is not much in excess of the maximum daily pumpage, and will soon need to be increased. The maximum pumpage for one day was 216,000 gallons. The deep well pump was taken up and overhauled and put in repair by putting in new valves and a new cut-off rod. The smokestack and roof of the station were repainted, and the doors and windows were repaired.



The elevation of the prairie at 103d and State streets is +20.

DIVISION OF WATER SUPPLY.

CONSTRUCTION.

J. H. SPENGLER, Assistant City Engineer in Charge.

CHICAGO AVENUE PUMPING STATION.

Although the capacity of the four old vertical beam engines, together with the pumpage from the two horizontal compound Gaskill engines, was sufficient for this section of the City, the age and the cost of fuel to maintain the amount of steam necessary for these low-pressure types has caused them to be discarded for three modern high-pressure triple expansion pumping engines. Two of the old beam engines were in a badly wornout condition and a third has proven very unreliable. The combined capacity of the three new pumps will be that of the four old ones, 75,000,000 gallons.

The contract for designing, furnishing and erecting the new engines was let October 13, 1902, to the Allis-Chalmers Company on a bid of $266,000. The first of these engines was installed during the year, taking the place of the two old single-acting pumps in the center of the building, the removal of which was completed on January 29th. The erection of this first pump was started July 2nd, and on September 28th steam was turned on for the first time. Prior to October 12th the pump was not run continuously, but from that time to November 26th it was given a thorough trial and necessary adjustments were made. At the close of the year the engine was in condition to be run continuously for the twenty-four hours each day. A superheater, designed by the Providence Engineering Company, was built in the new boiler-room, and the contractors for the engines placed the necessary intake screens and guides in three of the tunnel shafts adjacent to the building from which the connecting tunnels supply water to the new pumps. The contract for the engines did not include the building of the foundations necessary.

The contract for the foundations for the first engine was let to William McCarthy at a cost of $28,838. The work consisted in removing existing foundations of the 1853 and 1857 engines, furnishing and driving necessary sheeting, enclosing the new engine pit and retaining the present walls of engine-room, the sinking and building of a 7-foot shaft and 5-foot tunnel, and the building of the concrete foundations for the new pump and its appurtenances. Although it was intended that work on the new foundations should begin shortly after signing the contract, August 15, 1903, delays in building and remodeling of the tunnel system at this station prevented work from starting until February 1, 1904. The 5-foot connecting tun-

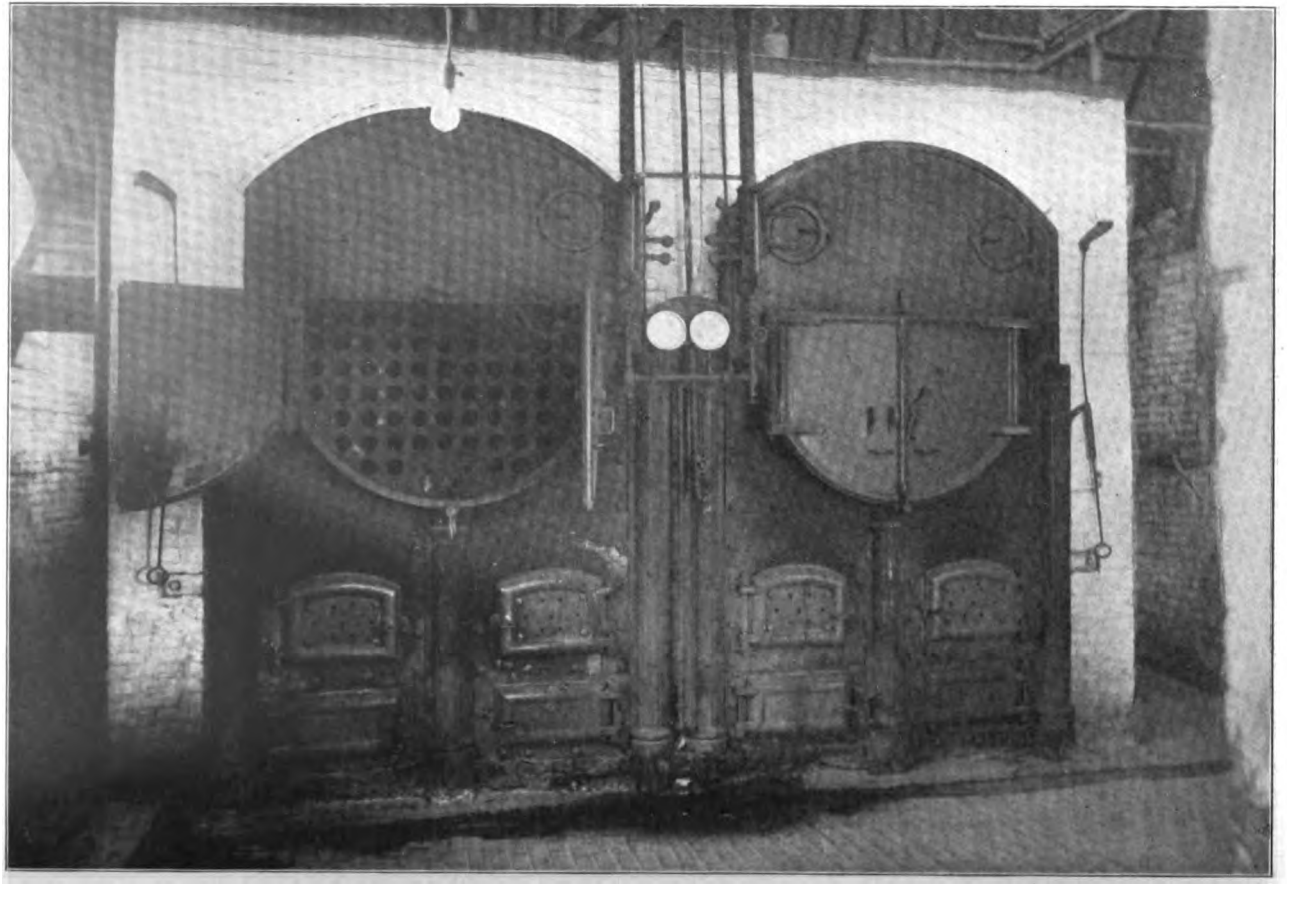
nel leading from the suction end of the engine to the shaft outside of the station was 71.85 feet long. It has an 8-inch concrete lining within a 1-8-inch steel shell 6 feet 4 inches in diameter and 60 feet long, bolted together in forty separate sections. The elevation of the top of the tunnel is 29.58 feet below Chicago datum. The bottom of the suction well at the engine pit is 32.80 feet below Chicago datum, having the same elevation as the bottom of the tunnel at this end. The contract for these foundations was completed on July 2, 1904, having taken about five months' time.

During September the Water Pipe Extension Division laid 36-inch water mains from the delivery pipe of the new engine to connect with the stand pipe in the water tower, as well as the old 36-inch water mains at present in service. The old 24-inch mains between the water tower and the west entrance to the station were first taken up and replaced by the 36-inch pipes. From a 36x36-inch Y opposite this entrance the line of pipe connecting with the old 36-inch mains for the 1872 engine was then laid. Near this connection and 36 feet south of the water tower a 36-inch Rensselaer gate valve with a 6-inch by-pass was put in. This work was finished on September 21st.

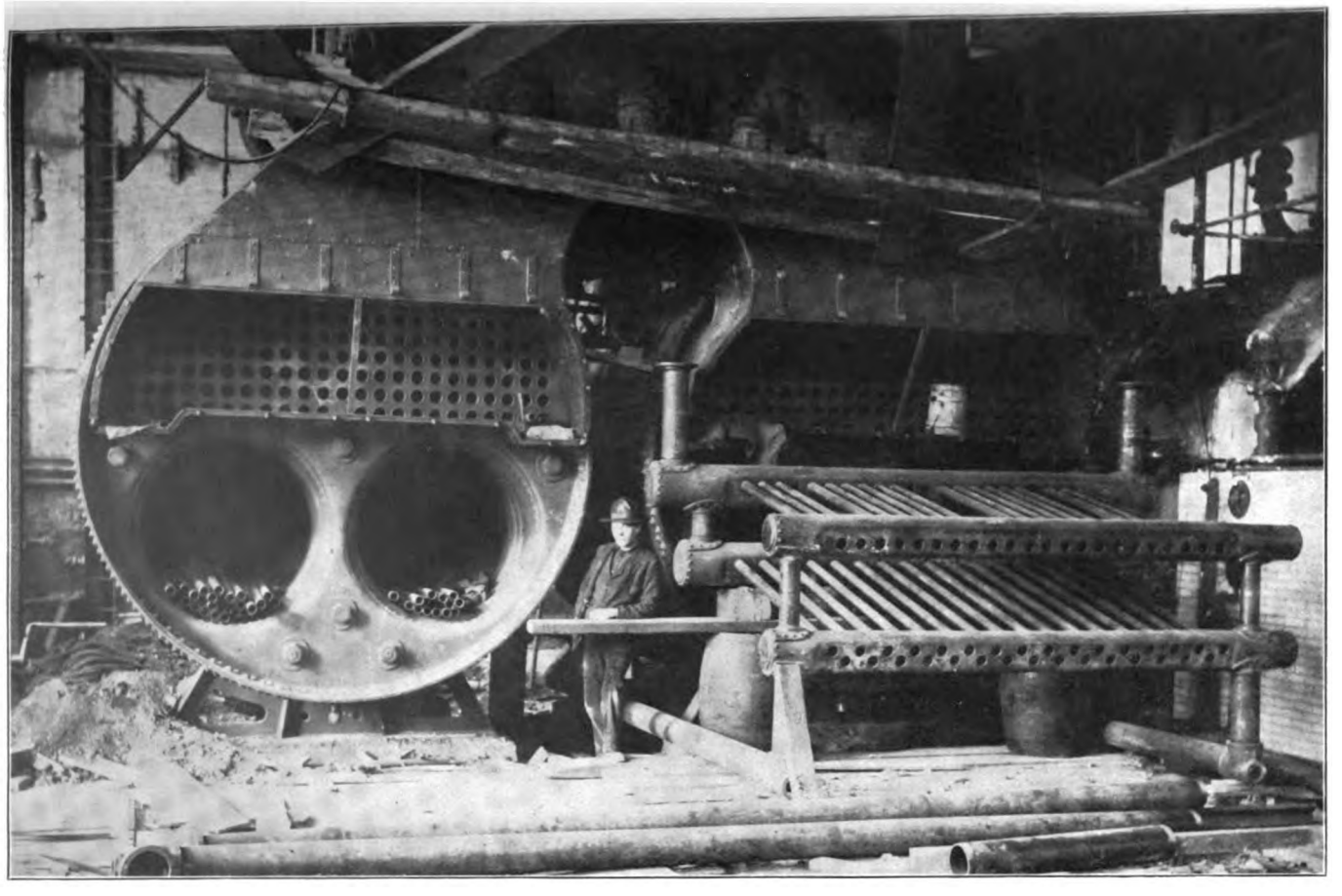
The remodeling of the tunnel system was completed during the year. After having practically finished the work involved in remodeling this tunnel system, through an agreement between the contractors and the City, certain connections were made by day labor furnished by the City.

On account of the difficulty of pumping out the existing 6-foot tunnel from well "H" in Pearson street to well "J" on the Lake Shore Drive, it was found necessary to place a bulkhead in well "H" and fill the same with clay. On account of a settlement in the excavation of the tunnel close to shaft No. 1, it was found necessary to put the west wall of the station on jacks. The existing tunnel was then pumped out and proper connection made with shaft No. 1, thus practically completing the remodeling of the tunnel system and by which means water is at present furnished to the new engine from the Carter H. Harrison crib.

As the old 4½-foot tunnel connecting the gate chamber in the rear of the station with the wet well of the 1853 and 1857 engines was to be abandoned, it was decided to cut off all further communication with the gate chamber by a heavy brick bulkhead built in the tunnel. The bulkhead is 4½ feet thick and lies directly under the line of the steel sheeting of the east side of the new engine pit. A timber bulkhead was also built into the lining of the tunnel two feet back from the eye at the gate chamber. This was put in to allow the filling of the chamber with clay at some future date. This work was done between March 28th and April 4th. To avoid the future shutting down of the new middle engine and the delay



TYPE OF OLD TUBULAR BOILERS REMOVED FROM FOURTEENTH STREET PUMPING STATION AND REPLACED WITH INTERNALLY FIRED SCOTCH MARINE BOILERS SHOWN ON OPPOSITE PAGE.



A Battery of Two 250 H. P. Internally Fired Scotch Marine Boilers, 10 Feet 6 Inches in Diameter. Six of These Boilers were Installed at Fourteenth Street Pumping Station in 1904.

that would be caused while making the tunnel connection for the new north engine, 25 feet of the necessary 5-foot connecting tunnel leading from the shaft to the suction well in the engine-room was completed from well "J" and a cast iron bulkhead built into the concrete lining of the tunnel. When the third new engine is put in place connection will be made at the point where the bulkhead is, and the bulkhead will be removed by a diver.

Owing to settlement in the walls of the building in the vicinity of the tunnel connection made to well "J," it became necessary to cut out a portion of the basement walls at this point and put in jack screws. Charles H. Rector & Company, contractors for this work, began cutting out the walls on January 8, 1904. Before excavation for the other engine foundations can be made the walls on the east, south and north sides will be similarly supported in order to provide for any possible settlement. The bulkhead and clay that had been placed in well "H" were removed by October 6th. Necessary gates were then opened and water was obtained from the Carter H. Harrison crib to supply the new engine. Mr. E. P. Scott is in local charge of this work.

FOURTEENTH STREET PUMPING STATION.

On January 13, 1904, in accordance with the authority of the City Council, a contract was let to The S. Freeman & Sons Manufacturing Company of Racine, Wis., for a new boiler plant to be installed in this station at a total cost of $95,000. The specifications provide for the furnishing and erection of six internally fired, horizontal, return, tubular boilers, each to be of 250-horse-power, all to be fitted with automatic stokers, and including a complete coal conveying plant with coal storage bins and all necessary appurtenances, each boiler to be equipped with one Baragwanath live steam purifier. This plant takes the place of the nine tubular boilers, which have been in service for about thirteen years, the three Babcock & Wilcox boilers which were installed in 1897 to remain in service.

The construction of the subway for the coal and ash conveyor was started March 14, 1904, and was the first work performed in connection with the installation of the new boiler plant. Excavation was begun on the west end of the boiler-room in front of the existing Babcock & Wilcox boilers, and, as the contract required that no interference should obtain in connection with the operation of the boilers in order to run the four pumping engines at all times, the work of constructing the subway was divided into five different sections, averaging about 33½ feet in length.

Foundations for the coal storage bins and boilers were built as the work progressed under the contract. No sheeting was necessary so far as the excavation for the subway was concerned. When the excavation for the crusher

pit was under way, however, a stratum of water-bearing sand was opened about 12 feet below the grade of the alley, and it became necessary to use heavy frames and sheeting to preserve the sides of the excavation, which was carried down to an elevation of+1.17, allowing for a concrete floor 12 inches in thickness.

The first battery of the two new boilers was installed to take the place of the three tubular boilers west of the stack. This new battery was put in operation July 13th. The second battery was put in operation October 10th, and the third battery was practically ready for operation at the close of the year.

The crusher pit and subway were in readiness for the installation of the coal conveyor and machinery about the middle of October.

Riveting of the last part of the coal storage bins, each bin to have a capacity of 150 tons, was completed December 7th. The three water tube boilers are still in good condition, and will be operated in an emergency in connection with the new boiler plant. The installation of the coal conveying plant was started October 19th, and work was completed December 10th. The boilers were equipped with Hawley furnaces and the spouts leading from the bins to the furnaces are provided with Richardson coal scales, each having a capacity of 1,000 pounds. At the close of the year the work required by this contract was practically completed.

In connection with the installation of this new boiler plant a 9-inch sewer was laid through the center of the boiler-room for its entire length. A new concrete floor is being laid in order to complete the work as designed.

SIXTY-EIGHTH STREET PUMPING STATION.

On account of the continued demand for more water from this station, plans and specifications were prepared for an additional engine having a capacity of 20,000,000 gallons per day. Contracts will shortly be let for this work, and in order to accommodate this additional engine, which will be placed in the north end of the station, a contract for an addition to the station was let to John Larson on December 10th, the cost of same being $19,875. On account of the bad condition of the six south boilers in this station it became necessary to provide new boilers, and plans for same were made. The specifications provide for the installation of four 250-horse-power internally fired, horizontal, return, tubular boilers with necessary stokers.

LAKE VIEW PUMPING STATION.

Plans were made and bids asked for for the placing of four 250-horse-power boilers of the internally fired, horizontal, return, tubular type

fitted with stokers and necessary appurtenances, these new boilers to take the place of existing boilers Nos. 1 to 7.

SPRINGFIELD AVENUE AND CENTRAL PARK AVENUE PUMPING STATIONS.

On account of the increased demand for water from these stations, plans and specifications were gotten up providing for the placing of one vertical, triple expansion engine of a capacity of 40,000,000 gallons per day for each station. The contract for this work was let to the Henry R. Worthington Company on December 13th, contract price being $178,500.

WATER WORKS SHOPS.

MR. JAMES GARVEY, Superintendent.

During the year the capacity of the shops was taxed to its utmost in order to keep up with the demands for repairs made by the various divisions of the bureau and other departments of the City. The principal work done covered repairs on bridges, pumping stations, water pipe extension, meters and hydrants, and the building of new hydrants and valves.

A new water meter testing plant was installed at a cost of about $5,000, with the result that we shall soon be prepared to handle and test meters more expeditiously and satisfactorily.

One new lathe of a modern type was added to the equipment of the shops. A new cement floor was laid in the engine-room, and all steam and water pipes throughout the plant were repaired and rearranged. The electric lighting system was entirely remodeled. Team scales were given a general repairing and new foundations for same were built. New appliances for loading and unloading heavy castings were put in place. Machinery, shafting and belting were overhauled and repaired. Large additions were made to the stock of bridge patterns. Patterns for castings applying to West Division street, Eighteenth street and Loomis street bridges were received from the Sanitary District.

The work in the meter testing department of the shops is increasing rapidly, the number of meters tested during the current year being 1,468 as against 863 in 1903. There was a great demand for hydrants and valves, the output for the year being 752 as against 454 in 1903. Four hundred and sixty valves were built, being an increase of 108 as compared with 1903. The cost of the manufacture of hydrants and valves has been materially reduced within the last three years, and as a result, with the new equipment and rearrangement of machinery, the cost of this work will be further reduced.

The following statement will show in detail the number of hydrants

and valves manufactured during the year, and also a comparative statement of the number of hydrants and valves built, hydrants repaired, and meters tested for 1903 and 1904:

HYDRANTS.	Single Hydrants.	2½-inch Double Hydrants.	3½-inch Double Hydrants.	4-inch Double Hydrants.
On hand January 1, 1904.....	14	.....	2	2
Manufactured in 1904.....	79	664	.....	9
Total.....	93	664	2	11
Shipped during 1904.....	88	634	.....	5
On hand January 1, 1905.....	5	30	2	6

VALVES.	4-inch.	6-inch.	8-inch.	12-inch.	16-inch.	24-inch.
On hand January 1, 1904.	19	33	15	11	2	1
Manufactured in 1904...	59	275	92	26	3	5
Total.....	78	308	107	37	5	6
Shipped during 1904	67	291	101	32	5	5
On hand January 1, 1905.	11	17	6	5	0	1

Comparative statement of Hydrants and Valves built, Hydrants repaired and Meters tested and repaired, years 1903 and 1904.

			Increase.
Hydrants all sizes built.....	1904	752	
Hydrants all sizes built.....	1903	454	298
Valves all sizes built.....	1904	460	
Valves all sizes built.....	1903	352	108
Hydrants all sizes repaired.....	1904	445	
Hydrants all sizes repaired.....	1903	318	127
Meters repaired and tested.....	1904	1,468	
Meters repaired and tested.....	1903	863	605

Water Tunnels in Use.

While some changes were made in the tunnel system at the Chicago Avenue pumping station, the mileage remains the same as reported in the annual report for 1903, as follows:

5 feet diameter, length.....	18,835 feet
6 feet diameter, length.....	44,170 feet
7 feet diameter, length.....	61,396 feet
8 feet diameter, length.....	51,695 feet
10 feet diameter, length.....	22,699 feet
Total.....	198,785 feet or 37.7 miles.

TABLE "A"—MONTHLY PUMPAGE IN GALLONS, 1904.

MONTH.	14th Street Pumping Station.	68th Street Pumping Station.	22d Street Pumping Station.	Chicago Avenue Pumping Station.	Springfield Avenue Pumping Station.	Central Park Avenue Pumping Station.	Harrison Street Pumping Station.	Lake View Pumping Station.	The City as a Whole.
January	2,061,760,496	2,110,495,370	1,819,296,000	1,805,212,670	1,401,659,870	1,836,223,450	999,874,727	980,834,772	13,015,357,355
February	2,289,825,045	2,086,025,745	1,742,840,600	1,671,266,090	1,517,309,550	1,805,818,130	939,577,310	958,062,057	13,010,724,527
March	2,464,924,347	1,931,274,420	1,763,858,000	1,713,230,415	1,477,930,420	1,566,634,830	996,037,186	949,294,487	12,863,184,105
April	2,281,181,344	1,803,741,890	1,329,553,400	1,568,260,870	1,338,836,700	1,539,270,640	968,800,482	845,797,006	11,675,442,332
May	1,947,461,247	1,837,580,810	1,501,094,800	1,622,085,115	1,209,461,580	1,770,149,780	989,131,647	930,290,629	11,807,255,608
June	2,014,297,155	1,963,669,900	1,719,299,200	1,540,982,900	1,354,200,690	1,508,257,230	757,192,760	1,001,385,164	11,859,284,999
July	2,242,231,834	2,022,248,020	1,764,508,600	1,708,422,190	1,387,807,220	1,528,157,400	956,368,978	980,075,350	12,584,819,592
August	2,143,412,629	2,015,151,890	1,731,834,200	1,671,652,025	1,289,557,260	1,737,375,950	997,064,252	926,759,217	12,512,807,423
September	2,064,468,948	1,938,481,050	1,541,593,000	1,427,585,230	1,191,108,280	1,723,709,490	969,297,987	941,799,427	11,798,043,412
October	2,148,986,846	1,832,920,340	1,504,571,200	1,585,636,985	1,289,295,010	1,426,809,760	1,002,049,111	919,521,068	11,709,790,320
November	1,856,826,783	1,750,866,400	1,521,341,200	1,568,612,995	1,444,424,360	1,210,054,600	972,385,084	830,731,682	11,155,193,104
December	1,967,749,621	1,981,790,438	1,858,341,600	1,570,884,055	1,445,998,230	1,275,740,900	1,006,140,499	930,094,830	12,036,735,173
Totals	25,483,126,295	23,274,246,273	19,796,131,800	19,448,831,540	16,347,584,170	18,928,202,160	11,553,870,023	11,194,645,689	146,028,637,950
Total Pumpage Washington Heights									252,930,403
Total Pumpage Norwood Park									28,930,000
Grand Total									146,310,498,353

TABLE "*B*"—OPERATION OF PUMPING STATIONS DURING 1904.

	Fourteenth Street Pumping Station.	Sixty-eighth Street Pumping Station.	Twenty-second Street Pumping Station.	Chicago Avenue Pumping Station.
Bituminous coal, tons	19,782$\frac{1734}{2000}$	21,128$\frac{1874}{2000}$	18,592$\frac{1300}{2000}$	20,039$\frac{640}{2000}$
Price of bituminous coal, per ton	$2.88	$2.38	$2.76	$2.85
Cost of coal on hand January 1, 1904	$ 1,522.09	$ 868.33	$ 644.60	$ 615.72
Cost of coal delivered during 1904	57,353.60	51,444.26	52,055.71	58,009.18
Total	$58,875.69	$52,312.59	$52,700.31	$58,624.90
Cost of coal on hand January 1, 1905	1,893.63	2,045.75	1,438.79	1,574.35
Cost of coal burned during 1904	56,982.06	50,266 84	51,261.52	57,050 55
Cost of coal for baths, shops, etc	635.70	97.78	2,420.72	1,243.83
Cost of coal for operation	56,346.36	50,169.06	48,840.80	55,806.72
Salaries	41,334.75	46,746.98	37,206.45	48,058.82
Cost of oils, waste and grease	1,968.62	1,932.92	1,070.74	2,091.59
Cost of miscellaneous supplies	6,745.45	7,642.33	4,677.39	6,448.82
Total cost of operation	106,395.18	106,491.29	91,795.38	112,405.95
Repairs to buildings, pumps, engines and boilers	11,211.87	10,310.35	9,683.18	11,769.10
Cost of new work charged to repairs	5,680.00	8,955.00	2,350.00	6,330.00
Cost of new work charged to construction	47,237.78	78.32	.....	146,751.21
Cost of operation, maintenance and construction	170,524.83	125,834 96	103.828.56	277,256.26
Cost of coal for baths, shops, etc	635.70	97.78	2,420.72	1,243.83
Cost of coal on hand January 1, 1905	1,893.63	2,045.75	1,438.79	1,574.35
Total	$173,054.16	$127,978.49	$107,688.07	$280,074.44
Cost of coal on hand January 1, 1904	1,522.09	868.33	644.60	615.72
Total expense incurred in 1904	171,532.07	127,110.16	107,043.47	279,458.72
*Total gallons pumped during the year	25,483,126,295	23,274,246,273	19,798,131,800	19,448,831,540
*Per cent of pumpage of City as a whole	17.4	15.9	13.6	13.3
Greatest amount pumped in one day, gallons	(Feb. 17) 81,225,908	(Feb. 16) 75,918,050	(Dec. 14) 64,556,800	(Jan. 24) 63,040,735
Least amount pumped in one day, gallons	(Jan. 17) 43,960,032	(Nov. 6) 46,592,480	(Jan. 24) 37,909,600	(Feb. 16) 38,525,700
*Average pumped per day, gallons	69,626,028	63,590,836	54,093,256	53,138,884
Average head against pumps, in feet	107.7	116.9	97.2	101.1
Cost of fuel pumping 1,000,000 gallons one foot high	2$\frac{87}{100}$c	1$\frac{84}{100}$c	2$\frac{88}{100}$c	2$\frac{86}{100}$c
Total operative cost of pumping 1,000,000 gallons one foot high	3$\frac{91}{100}$c	3$\frac{91}{100}$c	4$\frac{77}{100}$c	5$\frac{79}{100}$c

*Except Norwood Park and Washington Heights Pumping Stations.

TABLE "*B*"—OPERATION* OF PUMPING STATIONS DURING 1904—CONTINUED.

	Springfield Avenue Pumping Station.	Central Park Avenue Pumping Station.	Harrison Street Pumping Station.	Lake View Pumping Station.	The City as a Whole.
Bituminous coal, tons	12,308$\frac{1888}{2000}$	13,814$\frac{189}{2000}$	8,986$\frac{288}{2000}$	9,197$\frac{284}{2000}$	123,850$\frac{690}{2000}$
Price of bituminous coal, per ton	$2.54	$2.50	$2.69	$3.00	$2.69
Cost of coal on hand January 1, 1904	$ 420.87	$ 307.13	$ 128.12	$ 394.07	$ 4,900.93
Cost of coal delivered during 1904	31,630.58	34,478.83	24,709.86	27,966.05	337,648.07
Total	$32,051.45	$34,785.96	$24,837.98	$28,360.12	$342,549.00
Cost of coal on hand January 1, 1905	849.23	300.56	697.61	750.47	9,550.39
Cost of coal burned during 1904	31,202.22	34,485.40	24,140.37	27,609.65	332,998.61
Cost of coal for baths, shops, etc	24.95	78.46	10.07	11.26	4,522.77
Cost of coal for operation	31,177.27	34,406.94	24,130.30	27,598.39	328,475.84
Salaries	28,094.54	33,655.16	24,604.93	29,876.44	289,578.07
Cost of oils, waste and grease	1,617.43	1,969.80	1,158.83	1,611.83	13,421.76
Cost of miscellaneous supplies	1,906.28	2,643.42	3,280.48	3,481.36	36,825.53
Total cost of operation	62,795.52	72,675.32	53,174.54	62,568.02	663,301.20
Repairs to buildings, pumps, engines and boilers	9,331.25	7,486.84	6,381.64	8,445.24	74,618.97
Cost of new work charged to repairs	3,050.00	2,630.00	1,084.00	3,350.00	33,429.00
Cost of new work charged to construction	803.30	959.64	....	....	195 830.25
Cost of operation, maintenance and construction	75,980.07	83,751.30	60,640.18	74,363.26	972,179.42
Cost of coal for baths, shops, etc	24.95	78.46	10.07	11.26	4,522.77
Cost of coal on hand January 1, 1905	849.23	300.56	697.61	750.47	9,550.39
Total	$ 76,854.25	$ 84,130.32	$ 61,347.86	$ 75,124.99	$986,252.58
Cost of coal on hand January 1, 1904	420.87	307.13	128.12	394.07	4,900.93
Total expense incurred in 1904	76,433.38	83,823.19	61,219.74	74,730.92	981,351.65
*Total gallons pumped during the year	16,347,584,170	18,928,202,160	11,553,870,023	11,194,645,639	146,028,637,950
*Per cent of pumpage of City as a whole	11.2	13.0	7.9	7.7	100
Greatest amount pumped in one day, gallons	(Mar. 26) 56,032,330	(Feb. 12) 67,369,500	(Feb. 16) 32,859,764	(June 20) 37,096,230	(Feb. 26) 461,185,324
Least amount pumped in one day, gallons	(Apr. 24) 35,140,780	(Nov. 13) 27,602,600	(June 11) 13,618,661	(May 8) 25,659,816	(Nov. 6) 340,939,816
*Average pumped per day, gallons	44,665,530	51 716,400	31,567,951	30,586,464	398,985,350
Average head against pumps, in feet	98.7	99.6	96.8	100.1	103.4
Cost of fuel pumping 1,000,000 gallons one foot high	1$\frac{83}{100}$c	1$\frac{83}{100}$c	2$\frac{16}{100}$c	2$\frac{46}{100}$c	2$\frac{18}{100}$c
Total operative cost of pumping 1,000,000 gals. one foot high	3$\frac{89}{100}$c	3$\frac{78}{100}$c	4$\frac{78}{100}$c	5$\frac{59}{100}$c	4$\frac{43}{100}$c

* Except Norwood Park and Washington Heights Pumping Stations.

The preceding tables give detailed information as to pumpage, expenditures, etc. Table "A" gives the monthly and annual pumpage at the various stations. Table "B" gives the more important figures relating to quantities and expense. The appended diagram shows the daily pumpage at each station, separately and combined, with the head pumped against, as well as the temperature of the water.

LAKE CRIBS.

TWO-MILE CRIB.

CARL JACOBSON, Keeper.

Owing to the protracted and unusually low temperature that prevailed during January and February, there was some difficulty in keeping the opening in the breakwater surrounding the crib from being closed up by the ice that was piled up by the winds from the east and northeast. This floating ice was piled up by the winds in a solid mass from the bottom of the lake to a height of 40 feet above the lake level. The tugs were used, however, whenever the weather conditions would allow it to break to and around the crib, so that the water supply was maintained uninterrupted.

The following repairs were made: A new cement floor was laid, and a bridge was built from the crib to the breakwater, and the outside of the crib was painted.

FOUR-MILE CRIB.

JOSEPH COSGROVE, Keeper.

The City carpenters repaired the lighthouse and the screens on the well house and dwelling, and built a new storage shed on the breakwater. The roof over the house was repaired, and the inside and outside of the house and the well house, shed and lighthouse were painted. Some new flues were put in the No. 1 or west boiler, and the turbine wheel was repaired. A new 16-foot rowboat was purchased and sent to the crib.

CARTER H. HARRISON CRIB.

GILBERT JOHNSON, Keeper.

New screens were put on doors and windows. The rooms on the upper floor were all painted and the woodwork varnished. The pumps, boilers and the steel cylinder in the well were painted. New linoleum was put on the floors of the kitchen and dining-room. Part of the concrete covering over the pantry was taken up and relaid. A new 16-foot rowboat was purchased and sent to the crib.

SIXTY-EIGHTH STREET CRIB.

WILLIAM HUNCHE, Keeper.

The City carpenters repaired the breakwater and roof over the shed and built a new wardrobe. The outside of the house and shed and the inside of the engineer's room, the stairs and ironwork in the well room, and the steam pipes were painted. A new 16-foot rowboat was purchased for the crib.

LAKE VIEW CRIB.

PATRICK GRIFFIN, Keeper.

Plans were made and a contract is about to be let for tearing down and rebuilding the superstructure of this crib during the coming year. Some repairs were made in order to keep the crib in service until it could be replaced. The lighthouse and breakwater were repaired, and the lighthouse and boat repainted, and the smokestack was repaired.

DIVISION OF WATER PIPE EXTENSION.

MR. W. A. LEVERING, Superintendent. MR. JOHN POWELL, Assistant Superintendent.
MR. GEORGE WHEELOCK, Engineer

The ending of the year 1904 has brought to a close a very busy season for the Division of Water Pipe Extension.

The work has been exceptionally heavy on account of the quantity and size of pipe laid, about 25 per cent of pipe being from 12 inches to 36 inches in size, and there has been nearly double the amount of pipe laid this year over 1903.

In the extension of the feeder mains for the supply of Jefferson and Austin 14,061 feet of 36-inch pipe were laid in North avenue from Springfield avenue to Austin (North Sixtieth) avenue; 10,629 feet of 24-inch main in Austin avenue from North avenue to Madison street, and 2,149 feet of 12-inch main in North Fifty-sixth avenue from North avenue to the Chicago, Milwaukee & St. Paul Railway. The laying of these mains was commenced June 21st and completed December 23rd. Connection was made with the system of small City mains in Austin, thereby increasing the pressure from 16 pounds to 23 pounds at that point.

There were 4,065 feet of 36-inch pipe laid in Oglesby avenue from the Sixty-eighth street pumping station to Seventy-ninth street, and connection was made with the pumping station and with the 36-inch main in Seventy-ninth street. This completed the laying of the feeder main for the supply of West Pullman, which work was started in 1903.

The installation of the new engine at Chicago avenue pumping station required the remodeling of the discharge mains. The two 24-inch mains were taken up and replaced with 36-inch mains.

The extension of the 16-inch mains in Belden avenue from North Halsted street to Racine avenue, and in Forty-third street from Greenwood avenue to Cottage Grove avenue gives a material increase of supply and pressure to the districts through which they pass.

Considerable trouble has been experienced in the Washington Heights system of pipe from a water ram in the mains caused by the discharge pipes being too small. To obviate this trouble 176 feet of 24-inch main were laid in Vincennes avenue from the station to 104th street and 222 feet of 12-inch main laid in 104th street from Vincennes road to stand pipe. Since these mains were laid there has been no complaint of breakage and leaks on account of water ram.

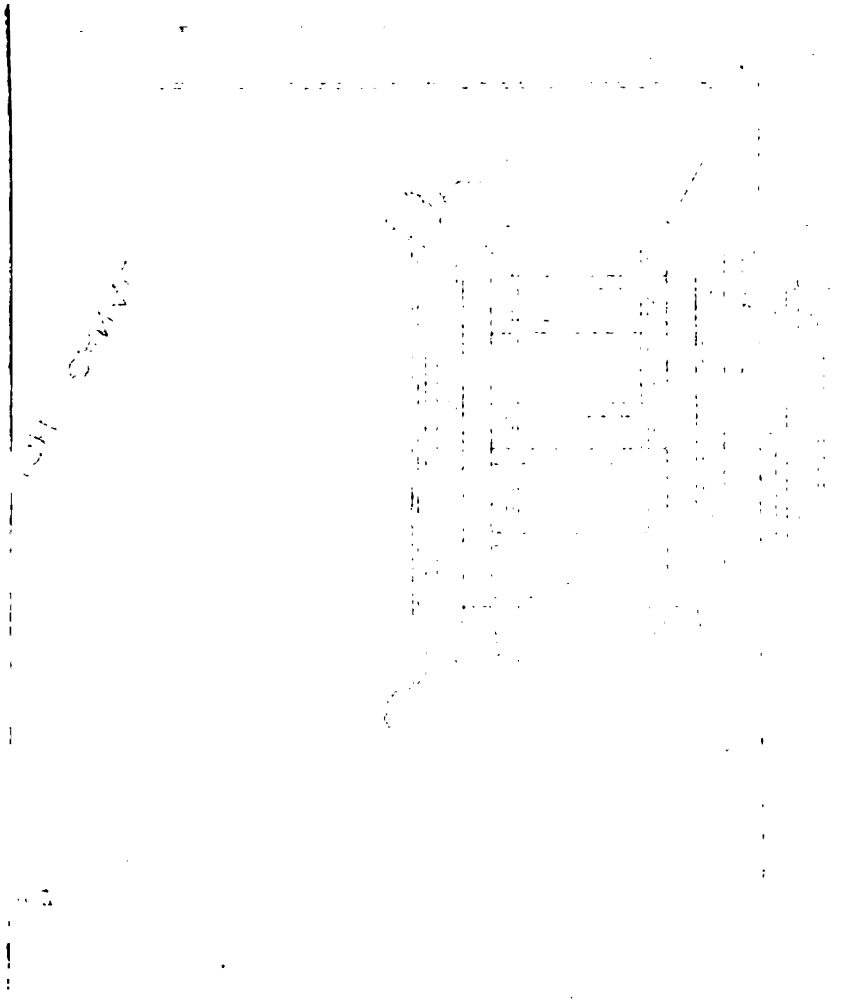
Prior to the improvement of the system of streets bounded on the north by Augusta street, on the south by Chicago avenue, on the east by Willow avenue, and on the west by Austin avenue, all in the annexed town of Austin, the City Council ordered 13,350 feet of 6-inch and 8-inch water pipe laid. The work of laying this pipe was started October 26th and was stopped by injunction of Court on November 7th after 3,001 feet of pipe had been laid. The injunction was obtained by the Chicago Suburban Water & Light Co., whose mains were being paralleled by the laying of the pipes. To date the injunction has not been dissolved, so that no further work has been done.

In connection with the Pitometer survey made during the summer months, all labor necessary to install the taps and boxes for the survey, and the furnishing of the same, together with the cost thereof, was borne by this division. There were forty-nine 1-inch taps inserted in the mains around the pumping stations, the Stock Yards district, and along the lines of the large mains in the Hyde Park district.

A new system was adopted this fall in the work of overhauling fire hydrants prior to filling basins with manure, with the result that every hydrant in the City was thoroughly oiled and repaired, thereby materially lessening damage to system and house connections due to water ram, as is shown by the small number of leaks reported.

Approximately 36,240 feet of 4-inch, 6-inch, 8-inch and 12-inch pipe were laid and valves and hydrants set in connection with remodeling and improving the water system prior to street paving. This is found to be a very important branch of the work of this division, as it prevents the opening of newly paved streets to make changes and repairs.

There were 104,397 feet of pipe laid on revenue and for circulation



piers instead of going below them. The east shaft is 155.5 feet west of the

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and supply at a cost of $180,000.07, including the changing of hydrants and placing of additional valves.

In connection with laying water mains by special assessment this office prepared sixty-one new estimates; plans and specifications, in duplicate, were prepared for contracts on seventy-one streets, all of which were completed. In addition to these streets there were sixteen streets completed this year on which contracts were awarded in 1903; making a total of 87 streets, amounting to 81,926 lineal feet of various sizes of pipe at a cost of $92,916.28. This work was executed under instructions of the City Engineer for the Board of Local Improvements. Where there were not sufficient houses to pay required revenue, and in order to avoid delay incident to securing water pipe by special assessment, property owners deposited with the City during the year the sum of $20,917.78 to cover the cost of laying 20,031 feet of pipe of various sizes.

During the year private meter connections were made and work of a miscellaneous character was done at a total cost of $12,242.78.

In the building of 256 hydrant basins, 343 valve basins, 1 fire cistern and 18 brick piers; in the rebuilding of 271 hydrant basins and 39 valve basins and in the repairing of 1,679 hydrant basins and 971 valve basins there were used 1,335,245 brick, 5,274 barrels of cement, 890 yards of sand, 13,459 feet of 4-inch, 1,001 feet of 6-inch, 8 feet of 8-inch, and 601 feet of 9-inch sewer pipe.

The following is the total number of leaks and complaints reported to this office during the year 1904, all of which received as prompt attention as possible:

Repaired joint leaks in mains	1,840
Repaired hydrants	2,539
Private service pipes shut off	1,133
Private service pipes repaired by owners	1,338
Miscellaneous complaints	495
Total	7,345

The work of filling hydrant basins with manure, heretofore done by this division, was turned over to the Fire Department and let by contract.

EAST DIVISION STREET WATER PIPE TUNNEL.

This tunnel was built under the canal at East Division street to carry a 36-inch water main. Owing to the pile foundations of the new bascule bridge at the site, which extended down to —50 feet C. D., it was deemed advisable to divert the line of the tunnel so as to pass north of the bridge piers instead of going below them. The east shaft is 153.5 feet west of the

west line of Halsted street and about 10 feet south of the center line of Division street, and the west shaft is 582.67 feet west of Halsted street and about 10 feet north of the center line of Division street. The elevation of the invert of the tunnel at the east shaft is —49.75 feet C. D. and at the west shaft —52.06 feet C. D.

The shafts are circular in section, 10 feet in diameter, and lined with 12 inches of concrete. The tunnel is horseshoe shape in section with its greatest horizontal diameter 8 feet 2 inches and its greatest vertical diameter 7 feet, and is lined with 10 inches of concrete.

The area of the section of the tunnel and walls as shown on the plan is 69.7 square feet, which is approximately equal to a circle 9 feet 5 inches in diameter. The average area of the cross section of the tunnel excavation is 76.36 square feet, equivalent to a circle 9 feet 10 inches in diameter. The radius of the excavation is about 2½ inches greater than the neat section shown on the plans.

The excavation was begun May 28th and the tunnel was completed July 31, 1903, by J. J. O'Heron, to whom the contract was let. The contract price for shafts per lineal foot was $46.20, and for tunnel $14.50 per lineal foot. The total cost of the work was $13,324.11.

The following tables show in detail the amount of pipe of different sizes laid and lowered, the number of valves and hydrants placed in connection therewith, a recapitulation, and the total amount of pipe in use by the City of Chicago at the close of 1904:

HYDRANTS PLACED IN 1904, INCLUDING THOSE USED TO REPLACE HYDRANTS OF DIFFERENT SIZE.

DIVISION.	2¼-inch Single.	2½-inch Double.	4-inch Double.	Total.
North	2	13	.....	15
South	2	41	1	44
West	1	131	.....	132
Hyde Park	3	57	.....	60
Lake View	.....	52	.....	52
Lake	5	43	.....	48
Jefferson	.....	146	.....	146
Calumet	.....	31	.....	31
Norwood Park	.....	13	.....	13
Rogers Park	.....	.....	.....	.....
Totals	13	527	1	541

HYDRANTS TAKEN OUT IN 1904, INCLUDING THOSE REPLACED BY HYDRANTS OF DIFFERENT SIZE.

DIVISION.	2½-inch Single.	2½-inch Double.	2½-in. Double with one 4-in. Single.	Total.
North	12	.....	.....	12
South	32	1	.....	33
West	33	1	.....	34
Hyde Park	.....	4	1	5
Lake View	9	2	.....	11
Lake	4	3	11	18
Jefferson	.....	.....	.....	.....
Calumet	.....	.....	1	1
Norwood Park	.....	.....	.....	.....
Rogers Park	.....	.....	.....	.....
Totals	90	11	13	114

TOTAL NUMBER OF FIRE HYDRANTS AT THE CLOSE OF 1904.

DIVISION.	2½-inch Single.	2½-inch Double.	3½-inch Double.	4-inch Double.	2½-inch Double with one 4-inch Single.	Total.
North	870	598	.....	134	.....	1,102
South	710	1,222	.....	195	.....	2,127
West	1,640	4,699	21	286	.....	6,596
Hyde Park	465	1,993	22	12	600	3,092
Lake View	295	1,290	.....	.....	1	1,586
Lake	439	1,080	.....	4	1,555	3,078
Jefferson	297	1,559	.....	4	.....	1,860
Calumet	196	597	.....	.....	54	847
Norwood Park	6	54	.....	.....	.....	60
Rogers Park	.....	1	.....	.....	.....	1
Totals	4,418	13,093	43	585	2,210	20,349

STOP VALVES PUT IN DURING THE YEAR 1904, INCLUDING THOSE USED TO REPLACE VALVES OF DIFFERENT SIZE.

DIVISION.	SIZE OF VALVES.							Total.
	4-inch.	6-inch.	8-inch.	12-inch.	16-inch.	24-inch.	36-inch.	
North	2	6	5	.....	3	.....	1	17
South	3	16	17	6	.....	.....	.....	42
West	.....	117	39	10	.....	6	3	175
Hyde Park	.....	37	13	2	2	.....	2	56
Lake View	1	21	6	1	.....	.....	.....	29
Lake	1	30	16	.....	.....	.....	.....	47
Jefferson	.....	38	9	9	.....	.....	.....	56
Calumet	.....	15	4	2	.....	.....	.....	21
Norwood Park	.....	2	.....	.....	.....	.....	.....	2
Rogers Park	.....	.....	.....	.....	.....	.....	.....	.....
Totals	7	282	109	30	5	6	6	445

STOP VALVES TAKEN OUT OR ABANDONED DURING THE YEAR 1904, INCLUDING THOSE REPLACED BY VALVES OF DIFFERENT SIZE.

DIVISION.	SIZE.				Total.
	4-inch.	6-inch.	8-inch.	24-inch.	
North	5	.....	.....	1	6
South	6	.....	.....	.....	6
West	9	.....	1	.....	10
Hyde Park	.....	.....	.....	.....	.....
Lake View	4	.....	.....	.....	4
Lake	2	1	.....	.....	3
Jefferson	.....	.....	2	.....	2
Calumet	.....	.....	.....	.....	.....
Norwood Park	.....	.....	.....	.....	.....
Rogers Park	.....	.....	.....	.....	.....
Totals	26	1	3	1	31

TOTAL NUMBER AND SIZE OF VALVES IN USE AT THE CLOSE OF 1904.

DIVISION.	SIZE OF VALVES.												Total.
	3-inch.	4-inch.	6-inch.	8-inch.	10-inch.	12-inch.	14-inch.	16-inch.	18-inch.	20-inch.	24-inch.	30-inch.	36-inch.	
North	.....	128	540	336	.....	47	.....	16	.....	.....	20	.....	4	1,091
South	.....	155	846	785	1	105	.....	25	.....	.....	38	2	16	1,923
West	.....	543	2,871	1,459	.....	345	.....	79	.....	.....	40	.....	30	5,367
Hyde Park	.....	73	1,326	370	20	104	4	61	.....	1	23	.....	11	1,993
Lake View	1	187	1,000	222	.....	55	3	17	.....	3	14	1	5	1,508
Lake	.....	108	1,440	463	2	98	14	38	2	.....	25	4	2	2,196
Jefferson	.....	5	888	458	.....	105	.....	12	.....	.....	32	5	8	1,513
Calumet	.....	5	308	121	.....	16	.....	8	.....	.....	1	.....	.....	459
Norwood Park	.....	14	18	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	39
Rogers Park	.....	.....	4	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
Totals	1	1,218	9,241	4,173	23	875	21	256	2	4	193	12	76	16,095

PIPE LAID IN NORTH DIVISION.

STREET.	FROM	TO	Amount in feet.	Diameter in inches.
Beethoven place	Wells	Sedgwick	987	6
Belden avenue	Halsted	Racine	2,597	16
Lincoln avenue	Center	Fullerton avenue	3,739	8
Lincoln Park boulevard	Connection at	Chicago avenue Pumping Station	180	36
	Total		7,503	
	Add branch pipe for hydrants		156	6
			24	4
	Total feet of pipe laid in North Division		7,683	

PIPE LAID IN SOUTH DIVISION.

STREET.	FROM	TO	Amount in feet.	Diameter in inches.
Alley 1st W. of Grand boulevard	300 feet S. of Thirty-eighth	Southward	220	6
Armour avenue	Thirty-fourth	Thirty-fifth	677	6
Armour avenue	Thirty-fifth	Thirty-ninth	2,651	8
Armour avenue	Sixteenth	Twenty-second	2,525	8
*Artesian avenue	Archer avenue	Southward	235	6
Dearborn	Twenty-seventh	Thirtieth	1,737	6
Dearborn	Thirtieth	Thirty-third	1,824	8
Haines court	Thirty-first	Northward	170	6
Indiana avenue	Twelfth	Southward	222	4
Indiana avenue	Thirteenth	Southward	286	6
Leavitt	Thirty-fifth	Archer avenue	453	8
Mary	205 feet N. of Archer avenue	Northward	246	6
State	Adams	Jackson boulevard	496	12
†Thirty-fifth place	Rockwell	Washtenaw avenue	600	6
Thirty-sixth	Crossing	Armour avenue	34	6
Thirty-fourth	Vernon avenue	Rhodes avenue	350	6
Thirty-first place	Auburn avenue	Westward	150	6
Western avenue	Crossing	Thirty-ninth	54	6
	Total		12,930	
	Add branch pipe for hydrants		504	6
			24	4
	Total feet of pipe laid in South Division		13,458	

*Laid by deposit.
†Laid by special assessment.

PIPE LAID IN WEST DIVISION.

STREET.	FROM	TO	Amount in feet.	Diameter in inches.
Armitage avenue	Mendel	Westward	74	6
†Avers avenue	Twenty-sixth	Twenty-eighth	1,305	6
Arthington place	Sibley	Loomis	370	6
Austin avenue	Jefferson	Desplaines	370	6
Albany avenue	180 ft. N. of Thirty-first	70 ft. N. of Thirty-first	110	6
Alma	Chicago avenue	Augusta	1,285	6
Augusta	N. Forty-sixth avenue	Westward	408	8
Baldwin	Crossing	Kinzie	16	6
Chicago Terrace	Harding avenue	N. Fortieth avenue	345	6
Curtis	Lake	Fulton	308	6
Crystal	Crossing	N. Forty-fourth ave.	41	6
†Cortez	N. Forty-ninth avenue	N. Fiftieth avenue	625	6
†Christiania avenue	Huron	Chicago avenue	608	6
Carroll avenue	Central Park avenue	Eastward	180	6
Chicago avenue	Forty-sixth avenue	Eastward	588	12
Carroll avenue	St. Louis avenue	Eastward	348	6
Cornelia avenue	Willow	Central avenue	1,278	6
†Division	Grand avenue	C. M. & St. P. Sub.	723	12
†Division	C. M. & St. P. Sub.	Homan avenue	717	12
Elizabeth	Austin avenue	Grand avenue	385	6
Elburn avenue	Laflin	Ashland avenue	566	6
Erie	N. Fifty-first avenue	Eastward	150	6
Erie	Hoyne avenue	Leavitt	708	6
Erie	Ashland avenue	Hoyne avenue	3,407	8
Forty-first court S.	Colorado avenue	Northward	300	6
Forty-third avenue S.	Colorado avenue	Lexington avenue	233	6
Forty-first avenue S.	Taylor	Northward	154	6
†Forty-fifth court S.	Fifteenth	Sixteenth	624	6
Forty-fourth avenue N.	Crystal	Potomac avenue	327	8
Francisco	Thirty-fifth	Thirty-sixth	616	6
Forty-first court S.	Harrison	Southward	226	6
Fifty-second avenue S.	Washington bvd. (E. Ext'n)	Washington bvd. (W. Ext'n)	259	8
†Forty-fifth avenue S	Randolph	Park avenue	375	8
			35	6
†Francisco avenue	Connection at	Marshall boulevard	25	6
*Fortieth court S.	300 ft. S. of Sixteenth	Southward	335	6
†Forty-fifth court S.	144 ft. S. of Congress	Harrison	150	6
†Forty-fifth avenue S.	Jackson	Gladys avenue	312	6
†Forty-eighth avenue S.	Washington bvd.	Park avenue	970	8
*Forty-first avenue S.	300 ft. S. of Sixteenth	Southward	296	6
*Forty-first court S.	Eighteenth	300 ft. S. of Sixteenth	296	6
†Franklin boulevard N.S.	Kedzie avenue	Troy	290	6
†Forty-fifth avenue S.	Lexington	Colorado avenue	677	6
†Franklin boulevard S.S.	Kedzie avenue	Albany avenue	633	6
Fifty-first avenue S.	Park avenue	Southward	355	6
†Fifty-first avenue N.	Indiana	24 ft. S. of Erie	893	6
†Forty-fifth avenue S.	Washington bvd.	Madison	367	8
†Forty-first court	Thirty-first	Thirty-second	642	6
†Forty-second court	Colorado avenue	Harvard	488	6
†Forty-third avenue S.	Connection at	Randolph	12	6
Fifty-second avenue	208 ft. S. of Park avenue	Washington bvd.	448	8
George	Connection at	Kinzie	11	6

*Laid by Deposit.
†Laid by Special Assessment.

PIPE LAID IN WEST DIVISION—CONTINUED.

STREET.	FROM	TO	Amount in feet.	Diameter in inches
†Harvard	Douglas boulevard	Lawndale avenue	450	8
Huron	84 ft. W. of N. Fiftieth avenue	Westward	75	6
†Hamilton avenue	Thirty-fourth	Southward	538	6
Hart	Connection at	Kinzie	17	6
Hoyne avenue	Connection at	Kinzie	18	8
Hermitage avenue	Connection at	Kinzie	12	6
Irving avenue	Polk	Northward	268	6
Iowa	Central avenue	Pine	420	6
Jessie court	Connection at	Kinzie	11	6
†Kamerling avenue	N. Forty-second ave.	N. Forty-fourth ave.	1,350	6
Kinzie	Ashland avenue	143 ft. E. of Western avenue	5,143	12
Law avenue	Harrison	Polk	855	8
Leavitt	Connection at	Kinzie	85	6
Lincoln	Connection at	Kinzie	4	6
			22	8
†Marshall bvd. (E. S.)	Twenty-fifth	76 ft. N. of River	1,862	6
Morgan	Milwaukee avenue	Pratt	140	6
Marshfield avenue	Ohio	Grand avenue	480	6
Monroe	Albany avenue	Westward	456	6
†Marshall bvd. (E. S.)	Twenty-second	C. B. & Q. R. R.	889	6
†Marshall bvd. (W. S.)	Twenty-second	C. B. & Q. R. R.	925	6
†Marshall bvd. (E. S.)	Nineteenth	C. B. & Q. R. R.	270	6
†Marshall bvd. (W. S.)	Nineteenth	C. B. & Q. R. R.	333	6
†Marshall bvd. (E. S.)	Twenty-second	Southward	155	6
†Marshall bvd. (W. S.)	Twenty second	Twenty-fourth	1,351	6
†Marshall bvd. (S. S.)	Boulevard-way	California avenue	1,095	6
†Marshall bvd. (N. & E. S.)	California avenue	144 ft. S. of Twenty-third place	1,077	6
Milwaukee avenue	Western avenue	Robey	3,550	12
North avenue	Springfield avenue	N. Sixtieth avenue	14,061	36
Ogden avenue	Springfield avenue	Eastward	25	6
Oakley avenue	7 ft. N. of Rhine	Southward	30	6
Ontario	N. Fifty-first avenue	N. Fifty-second ave.	630	8
Oakley avenue	Connection at	Kinzie	7	6
Oswego	Connection at	Kinzie	12	6
Pratt	Sangamon	Morgan	378	6
Park avenue	Leavitt	Western avenue	1,271	6
Potomac	N. Forty-third ave.	N. Forty-fourth ave.	646	6
†Polk	Homan avenue	Central Park avenue	1,262	6
Pine	At	Cornelia avenue	21	6
Paulina	Connection at	Kinzie	31	8
Robey	Carroll avenue	Northward	166	8
†Robey	At	Thirty-eighth	17	8
†Randolph (N. S.)	S. Forty-second ave.	S. Forty-third avenue	647	6
†Randolph (N. S.)	S. Forty-first avenue.	S. Forty-second ave.	628	6
†Randolph (S. S.)	S. Forty-second ave.	S. Forty-sixth avenue	2,560	6
†Randolph (S. S.)	S. Forty-first avenue	S. Forty-second ave.	668	6
†Randolph (S. S.)	S. Fortieth avenue	S. Fortieth court	360	6
Rice	Central avenue	Willow avenue	1,282	6
Springfield avenue	Ogden avenue	Northward	378	6
Superior	Ashland avenue	Wood	1,267	6
Superior	At	N. Forty-sixth ave.	37	6
†Sixteenth	S. Forty-fifth avenue	S. Forty-fifth court	326	8

*Laid by Deposit.
†Laid by Special Assessment.

PIPE LAID IN WEST DIVISION—CONTINUED.

STREET.	FROM	TO	Amount in feet	Diameter in inches.
†Sawyer avenue	Twenty-seventh	Thirtieth	1,375	6
†Spaulding avenue	Thirtieth	A. T. & St. F. R. R.	417	8
Smart	Connection at	Kinzie	14	6
Sixtieth avenue N.	Madison	North avenue	10,629	24
†Twenty-fifth place	Connection at	Marshall boulevard	21	6
Thirteenth	Waller	Blue Island avenue	750	6
Thirteenth	Crossing	Center avenue	60	6
†Twenty-first	Connection at E. S.	Marshall boulevard	22	6
†Twenty-first place	Connection at	Marshall boulevard	22	6
†Twenty-first	Connection at W. S.	Marshall boulevard	22	6
†Twelfth place	Loomis	Central Park avenue	660	6
†Twenty-fourth	Connection at	Marshall boulevard	22	6
†Twenty-third	Connection at	Marshall boulevard	22	6
Troy	Thirty-first	Northward	128	6
†Troy	Jackson boulevard	Van Buren	453	6
†Thirty-eighth	Winchester avenue	Robey	338	6
Trustee	Connection at	Kinzie	19	6
Washington boulevard	S. Fifty-second ave.	S. Fifty-second court	316	6
Washington boulevard	Connection at	S. Fifty-second ave.	21	6
†Winchester avenue	N. line Thirty-eighth	Southward	25	6
Wood	Connection at	Kinzie	22	8
Water Works Shops	12 in. main 20 ft. E. of Slip	Eastward	150	8
		Total	89,266	
		Add branch pipe for hydrants	1,572	6
			12	4
		Total feet of pipe laid in West Division	90,850	

*Laid by Deposit.
†Laid by Special Assessment.

PIPE LAID IN HYDE PARK.

STREET.	FROM	TO	Amount in feet.	Diameter in inches.
Alley 1st W. of Drexel boulevard...	330 ft. N. of Forty-fourth ...	Northward	75	6
Avenue J.....	106th.....	168 ft. N. of 105th...	840	6
Buffalo avenue.....	109th.....	Southward.....	348	6
†Buffalo avenue.....	117th.....	118th.....	654	6
†Colfax avenue.....	Eighty-fourth.....	Eighty-seventh.....	1,945	8
†Dobson avenue.....	Eightieth.....	Eighty-second.....	1,312	6
†Erie avenue.....	130th.....	Howard avenue.....	3,594	6
†Eighty-seventh.....	South Chicago ave...	Palmer avenue.....	741	12
Eighty-sixth	Commercial avenue .	Baltimore avenue ...	600	8
Eighty-seventh.....	E. L. of Palmer ave..	Westward.....	24	12
†Eighty-first.....	Monroe avenue	Kimbark avenue	331	6
Eightieth.....	Dobson avenue.....	Greenwood avenue..	237	6
Fiftieth place.....	Vincennes avenue...	Washington Park ct.	235	6
Forty-ninth	Calumet avenue.....	Indiana avenue	750	8
Fifty-sixth.....	Madison avenue.....	Westward	249	6
*Forestville avenue.....	Forty-seventh.....	Forty-eighth.....	690	6
Forty-third.....	Greenwood avenue..	Cottage Grove ave...	1,955	16
Fifty-sixth.....	Monroe avenue.....	Eastward.....	196	6
Fifty-sixth.....	Woodlawn avenue...	Kimbark avenue....	443	6
Fifty-ninth.....	Connection in.....	South Park avenue..	25	8
Hartwell avenue.....	Crossing.....	Sixty-sixth.....	36	6
Howard avenue.....	Erie avenue.....	Ontario avenue.....	474	6
Houston avenue.....	130th.....	130 ft. N. of 134th...	2,478	6
†Indiana avenue	Sixty-sixth.....	Southward.....	277	6
Jackson Park ave. (E. S.)	Sixty-ninth place....	Seventy-first.....	1,092	6
Manistee avenue.....	Eighty-sixth.....	300 ft. N. of Eighty-seventh..	300	6
†Monroe avenue.....	Eighty-first.....	Eighty-second.....	641	6
103d place.....	Michigan avenue....	Westward.....	312	6
Oglesby avenue.....	Sixty-eighth St. Pumping Sta.	340 ft. S. of Sixty-eighth ...	188	36
Oglesby avenue.....	84 ft. S. of Seventy-third....	Seventy-ninth.....	3,877	36
Palmer avenue.....	Eighty-seventh.....	Southward.....	312	6
Ridgeland avenue.....	Seventy-third.....	Northward.....	319	6
Railroad avenue.....	Sherman avenue....	Seventy-sixth place..	157	6
Seventy-third	Cregier avenue.....	Westward.....	350	8
			12	6
†Sixty-sixth.....	Crossing.....	Indiana avenue	73	6
†Seventy-fourth.....	Kimbark avenue....	Noble court.....	290	6
Seventy-third	Ridgeland avenue...	Eastward.....	167	8
Seventy-second place...	Ridgeland avenue...	Eastward.....	328	6
Sixty-first.....	Monroe avenue	Eastward.....	212	6
Sixty-sixth.....	Kimbark avenue....	Alley E. of Kimbark avenue..	192	6
South Park avenue.....	Connection at.....	Fifty-seventh	26	6
South Park avenue.....	Connection at.....	Fifty-sixth.....	24	8
			4	6
Seventy-second	141 ft. E. of Ridgeland avenue	Cregier avenue.....	349	6
Seventy-sixth place.....	Marquette avenue...	Railroad avenue.....	324	6
South Park avenue.....	Connection at.....	599 ft. N. of Fifty-third	23	8
			2	6
Washington Park court.	S. L. Fiftieth place..	Northward.....	31	6
	Total.....		28,114	
	Add branch pipe for hydrants.....		684	6
			36	4
	Total feet of pipe laid in Hyde Park		28,834	

*Laid by Deposit. †Laid by Special Assessment.

PIPE LAID IN LAKE VIEW.

STREET.	FROM	TO	Amount in feet.	Diameter in inches.
*Airdrie place	Evanston avenue	Sheridan road	592	6
*Alexander place	Evanston avenue	Sheridan road	715	6
Bradley place	Lincoln	Westward	216	6
Claremont avenue	Winnemac avenue	Foster avenue	1,046	6
Florence avenue	Diversey boulevard	Wrightwood avenue	1,290	6
*Glenlake avenue	Clark	Southport avenue	1,269	6
Hollywood avenue	Crossing	Southport avenue	34	6
*Irving avenue	Irving Park bvd	Byron	576	6
*Irving Park boulevard (S. S.)	Oakley avenue	Irving avenue	264	8
*Irving Park boulevard (S. S.)	Irving avenue	Eastward	116	8
Kansen avenue	Irving Park bvd	Byron	674	6
Leland avenue	Western avenue	Eastward	156	6
Lawrence avenue	Lincoln avenue	Western avenue	140	8
Leavitt	Crossing	Waveland avenue	41	6
Lincoln	Norwood	Hood avenue	400	6
Marshfield avenue	428 ft. N. of Wrightwood ave.	355 ft. S. of Diversey boulevard	473	6
Norwood	Lincoln	Robey	750	6
*Oakley avenue	Irving Park bvd	Byron	632	6
Paulina	Irving Park bvd	Byron	665	6
Robbins terrace	E. L. Clarendon ave.	Eastward	6	6
Robey	44 ft. S. of Norwood	Hood avenue	476	8
Southport avenue	Hollywood avenue	Southward	183	8
Waveland avenue	Crossing	Robey	50	6
Waveland avenue	Leavitt	Eastward	185	6
Winchester avenue	65 ft. N. of Norwood	Petersen avenue	495	6
Western avenue	Lincoln avenue	Ainslie	441	8
†Western avenue	Sunnyside avenue	39 ft. N. of Montrose boulevard	610	8
Western avenue	Winnemac avenue	215 ft. N. of Ainslie	715	8
†Wayne avenue	Bryn Mawr avenue	Ridge avenue	820	6
†Western avenue	Lawrence avenue	173 ft. N. of Leland avenue	526	8
Wolfram	175 ft. W. of Ashland avenue	Westward	242	6
†Wrightwood avenue	Crossing	Hamlin avenue	36	8
		Total	14,834	
		Add branch pipe for hydrants	624	6
		Total feet of pipe laid in Lake View	15,458	

*Laid by Deposit.
†Laid by Special Assessment.

PIPE LAID IN TOWN OF LAKE.

STREET.	FROM	TO	Amount in feet.	Diameter in inches.
Alley 1st E. of Western boulevard.	Forty-seventh	Forty-seventh place.	336	6
Alley 1st S. of Garfield boulevard.	Justine	Ashland avenue	336	6
†Aberdeen	Seventieth	Seventy-first	700	6
*Albany	Thirty-ninth	Thirty-ninth place	330	6
*Albany	Thirty-ninth place	Fortieth	330	6
*California avenue	Seventy-first	Northward	241	8
†Emerald avenue	Crossing	Sixty-sixth	18	6
†Eighty-seventh	Crossing	Wallace	35	6
Forty-seventh place	1st alley E. of Western bvd.	Oakley avenue	300	6
Forty-ninth place	Union avenue	Eastward	84	6
*Fortieth	Albany avenue	1st alley E. of Kedzie	498	6
Forty-sixth place	Rock Island R. R.	Wentworth avenue	514	6
Fairfield avenue	Forty-third	Forty-fourth	600	6
Fifty-seventh	Ashland avenue	Elizabeth	2,315	8
Forty-sixth place	Princeton avenue	Portland avenue	137	6
*Fifty-first	Normal avenue	Eastward	137	8
*Forty-fifth	Stewart avenue	Shields avenue	318	6
†Honore	Sixty-ninth	Seventieth	625	6
*Harvard avenue	Seventy-fifth	Southward	253	6
Portland avenue	Forty-sixth place	Forty-sixth	257	6
Robey	129 ft. S. of Garfield bvd.	Southward	84	8
*Sixtieth place	W. I. R. R.	Wallace	120	6
†Sixty-sixth	Halsted	Union	469	6
Seventy-first	Ada	Eastward	212	8
*Seventy-first	Western avenue	California avenue	2,684	8
*Seventy-fifth	Harvard avenue (S. extension)	Harvard avenue (N. extension)	111	8
*Thirty-ninth place	Albany avenue	1st alley E. of Kedzie	498	6
Throop	Fifty-first	Southward	179	6
*Wallace	Sixtieth	Sixtieth place	225	6
†Wood	Fifty-fourth	Garfield boulevard	675	8
Washtenaw avenue	220 ft. S. of Forty-fourth	Southward	50	6
†Wallace	Vincennes road	Eighty-seventh	1,430	8
†Winchester avenue	Sixty-ninth	Seventieth	625	6
		Total	15,721	
		Add branch pipe for hydrants	516	6
			60	4
		Total feet of pipe laid in Town of Lake	16,297	

*Laid by Deposit.
†Laid by Special Assessment.

PIPE LAID IN JEFFERSON.

STREET.	FROM	TO	Amount in feet.	Diameter in inches.
†Albany avenue	Irving Park bvd	Montrose avenue	2,560	6
†Avers avenue	Montrose avenue	Sunnyside avenue	640	6
†Avers avenue	School	Cornelia	1,310	6
Avers avenue	George	Southward	400	6
*Cornelia avenue	145 ft. E. of N. Forty-first ave.	222 ft. W. of N. Forty-first ave.	423	6
Catalpa avenue	196 ft. E. of N. Fifty-first ave.	Eastward	84	8
†California avenue	Irving Park bvd	Montrose boulevard	2,585	12
California avenue	Crossing	Montrose boulevard	72	12
California avenue	Connection at	Irving Park bvd	3	8
†Dunning	Seventy-first court (S. ext'n)	Seventy-first court N. (ext'n)	177	6
†Dakin	N. Fifty-sixth ave	N. Fifty-eighth ave	1,315	6
†Dunning	N. Forty-fifth ave	N. Forty-sixth ave	630	6
Drake avenue	Fullerton avenue	Northward	184	6
Drake avenue	Diversey avenue	Northward	112	6
*Drake avenue	Irving Park bvd	Elston avenue	580	6
†Forty-sixth avenue N	Wilson avenue	Southward	217	6
Fifty-sixth avenue N	Leland avenue	Northward	380	6
*Fairfield avenue	Wellington	Southward	340	6
†Forty-fifth avenue N	Fullerton avenue	Dunning	740	6
Forty-fourth avenue N.	Irving Park bvd	Southward	284	6
†Francisco avenue	Irving Park bvd	Montrose boulevard	2,585	6
*Forty-first avenue N	Milwaukee avenue	Cornelia avenue	864	6
Forty-fourth avenue N.	Irving Park bvd	Northward	612	8
Forty-fifth avenue N	Byron	Southward	479	6
Forty-first court N	Roscoe	Henderson	317	6
Fortieth avenue N	670 ft. N. of Foster avenue	Northward	762	8
Fifty-sixth avenue N	North avenue	161 ft. N. of So. line C., M. & St. P. R. R.	2,149	12
George	2 ft. E. of E. L. Avers	Westward	27	6
†Hamlin avenue	Cortlandt	Southward	328	6
†Henderson avenue	189 ft. E. of N. Forty-second ave.	170 ft. W. of N. Forty-second ave.	425	6
†Humboldt	Irving Part bvd	Montrose boulevard	2,585	6
*Harding avenue	Wilson avenue	Leland avenue	628	6
†Hamlin avenue	1st alley N. of Wrightwood ave.	171 ft. S. of Dunning	1,081	8
Humboldt boulevard	Troy	Westward	84	6
†Irving Park boulevard (N. S.)	Sacramento avenue	Humboldt	269	8
†Irving Park boulevard (N. S.)	Humboldt	Francisco avenue	269	8
†Irving Park boulevard (N. S.)	Francisco avenue	Mozart	268	8
†Irving Park boulevard (N. S.)	Mozart	California avenue	268	8
*Irving Park boulevard (S. S.)	Central Park bvd	Drake avenue	267	8
†Kedzie avenue	Irving Park bvd	Montrose avenue	2,530	12
†Linden avenue	N. Forty-second ct	340 ft. N. of N. Forty-second ave.	190	6
Lyndale avenue	470 ft. W. of Lawndale avenue	Hamlin avenue	130	6
Lawndale avenue	Marianna avenue	Southward	278	6
Leland avenue	Crossing	N. Fifty-sixth ave	46	6
†Mozart	Irving Park bvd	Montrose boulevard	2,585	6
Monticello avenue	Belden avenue	Southward	366	6
Mozart	Waveland avenue	Northward	525	6
*Newport avenue	145 ft. E. of N. Forty-first ave.	Westward	423	6

*Laid by Deposit.
†Laid by Special Assessment.

PIPE LAID IN JEFFERSON—CONTINUED.

STREET.	FROM	TO	Amount in feet.	Diameter in inches.
North avenue	228 ft. E. of N. Forty-second ave.	Eastward	420	12
†Phinney avenue	Foster avenue	Catalpa avenue	1,980	6
†Roscoe	N. Forty-second ave.	Eastward	230	8
*Roscoe	145 ft. E. of N. Forty-first ave.	Westward	423	8
Roberts avenue	Lawrence avenue	Southward	400	6
Roscoe	N. Forty-first court	Westward	133	8
Roberts avenue	N. Fifty-fourth ave.	Westward	100	6
Sixty-fourth avenue N.	Irving Park bvd.	116 ft. N. of Bernice avenue	861	12
†School	189 ft. E. of N. Forty-second ave.	Westward	425	6
Springfield avenue	Wrightwood avenue	Marianna avenue	600	6
†Seventy-first court N.	Grand avenue	Dunning	592	6
†Seventy-first court N.	Dunning	Schubert avenue	1,283	6
Sixty-fourth avenue N.	116 ft. N. of Bernice avenue	Waveland avenue	1,164	12
†Sacramento avenue	Irving Park bvd.	Montrose boulevard	2,621	8
†Springfield avenue	School	Cornelia	1,315	6
Springfield avenue	Irving Park bvd.	Northward	224	6
†Spaulding avenue	Foster avenue	Balmoral avenue	1,310	6
†Sawyer avenue	193 ft. S. of Berwyn avenue	Balmoral avenue	862	6
†Sacramento avenue	73 ft. N. of Schubert avenue	Humboldt boulevard	653	8
Troy	2 ft. N. of Humboldt boulevard	Southward	14	6
*Winnemac avenue	N. Fifty-second ave.	Eastward	354	6
*Whipple	Irving Park bvd	Montrose boulevard	2,562	6
Wellington	Kedzie avenue	Spaulding avenue	622	6
*Wellington	151 ft. W. of Washtenaw ave.	161 ft. E. of California avenue	286	6
*Wilson avenue	N. Fortieth avenue	Harding avenue	314	8
Waveland avenue	Francisco	Mozart	337	6
	Total		54,461	
	Add branch pipe for hydrants		1,752	6
	Total feet of pipe laid in Jefferson		56,213	

*Laid by Deposit.
†Laid by Special Assessment.

PIPE LAID IN CALUMET.

STREET.	FROM	TO	Amount in feet.	Diameter in inches.
†Aberdeen	Eighty-eighth	Eighty-ninth	627	6
Center avenue	104th	106th	1,286	8
Elizabeth	100th place	Southward	798	6
†Honore	Eighty-seventh	Winchester avenue	998	6
†Hermitage avenue	Eighty-ninth	Ninetieth	675	6
†Hermitage avenue	Eighty-seventh	Eighty-eighth	705	6
†Marshfield avenue	174 ft. N. of Eighty-eighth	Eighty-ninth	877	6
Ninety-fifth	Longwood ave. (S. extension)	Longwood ave. (N. extension)	224	8
†Ninety-seventh place	270 ft. E. of Butler	Canal	217	6
104th	Crossing	Center avenue	26	6
104th	Vincennes road	Westward	222	12
†Paulina	Eighty-seventh	Ninety-first	2,654	6
Pleasant avenue	Ninety-first	Northwestward	265	6
Throop	Winston avenue	Northeastward	175	6
Throop	Ninety-ninth	Southwestward	560	6
Vincennes road	104th	Southwestward	176	24
†Wood	Eighty-seventh	Eighty-ninth	1,350	8
*Winchester avenue	Ninety-sixth	Southward	360	6
		Total	12,195	
		Add branch pipe for hydrants	372	6
		Total feet of pipe laid in Calumet	12,567	

*Laid by Deposit.
†Laid by Special Assessment.

PIPE LAID IN NORWOOD PARK.

STREET	FROM	TO	Amount in feet.	Diameter in Inches.
†Ceylon avenue	Circle avenue	Sanford	487	6
†Sanford	Ceylon avenue	Burhans avenue	591	6
		Total	1,078	
		Add Branch Pipe for Hydrants	156	6
		Total feet of pipe laid in Norwood Park	1,234	

†Laid by Special Assessment.

PIPE LOWERED DURING 1904.

STREET	FROM	TO	Amount in feet.	Diameter in Inches.
Ceylon avenue	Myrtle avenue	Circle avenue	557	6
			997	8
Crescent avenue	E. Circle avenue	W. Circle avenue	1,731	6
			30	8
Circle avenue, East	(In Norwood Park)		1,682	6
Circle avenue, West	(In Norwood Park)		1,575	6
Evanston avenue	Hedges court	Graceland avenue	358	6
Grace	Racine avenue	Eastward	250	6
Halsted	100 ft. N. of 82d	466 ft. S. of 82d	566	14
Hobart avenue	E. Circle avenue	Southward	62	4
Mulberry avenue	Crescent avenue	Circle avenue	375	6
Prospect avenue	Ninety-fifth	107th	7,916	8
Stewart avenue	Forty-fifth	Northward	100	6
Sixty-fifth	Ashland avenue	Westward	200	8
Woodlawn avenue	Fifty-first	Fifty-Ninth	2,597	12
		Total	18,996	

NOTE.—In connection with the lowering of above mains the service pipes were lowered wherever necessary from the main to the curb.

RECAPITULATION OF PIPE LAID DURING 1904, INCLUDING HYDRANT BRANCHES.

DIVISION.	DIAMETER OF PIPE IN INCHES.							Total length of Pipe in feet.
	4-inch.	6-inch.	8-inch.	12-inch.	16-inch.	24-inch.	36-inch.	
North	24	1,143	3,739	.....	2,597	.....	180	7,688
South	246	5,263	7,453	496	.....	.....	.....	13,458
West	12	45,774	9,653	10,721	.....	10,629	14,061	90,850
Hyde Park	36	18,129	3,884	765	1,955	.....	4,065	28,834
Lake View	.....	11,951	3,507	.....	.....	.....	.....	15,458
Lake	60	8,848	7,889	.....	.....	.....	.....	16,297
Jefferson	.....	38,175	8,257	9,781	.....	.....	.....	56,213
Calumet	.....	9,809	2,860	222	.....	176	.....	12,567
Norwood Park	.....	1,234	.....	.....	.....	.....	.....	1,234
Rogers Park	.....	.....	.....	.....	.....	.....	.....	.....
Totals	378	139,326	47,242	21,985	4,552	10,805	18,306	242,594

TABLE SHOWING AMOUNT OF PIPE IN THE CITY OF CHICAGO AT THE CLOSE OF 1904.

DIAMETER OF PIPE IN INCHES.	1903	1904			
	Amount in use in feet.	Amount taken up or abandoned in feet.	Amount laid in feet.	Grand total in feet, in use at the close of 1904.	Grand Total in miles.
48	2,873	.....	.....	2,873	$0\frac{873}{5280}$
36	201,366	.....	18,306	219,672	$41\frac{3192}{5280}$
30	38,291	.....	.....	38,291	$7\frac{2291}{5280}$
28	160	.....	.....	160	$0\frac{160}{5280}$
24	346,170	162	10,805	356,813	$67\frac{2093}{5280}$
20	7,931	.....	.....	7,931	$1\frac{2651}{5280}$
18	1,000	.....	.....	1,000	$0\frac{1000}{5280}$
16	331,686	.....	4,552	336,238	$63\frac{4238}{5280}$
14	22,552	.....	.....	22,552	$4\frac{1432}{5280}$
12	595,875	5,143	21,985	612,717	$116\frac{3237}{5280}$
10	26,860	.....	.....	26,860	$5\frac{1460}{5280}$
8	2,152,433	161	47,242	2,199,514	$416\frac{3914}{5280}$
6	5,542,648	954	139,326	5,681,020	$1,075\frac{4020}{5280}$
4	965,029	32,449	378	932,958	$176\frac{4778}{5280}$
3	6,989	370	.....	6,619	$1\frac{1338}{5280}$
Totals in feet	10,241,863	39,239	242,594	10,445,218	.....
Totals in miles	$1,939\frac{1843}{5280}$	$7\frac{2278}{5280}$	$45\frac{4294}{5280}$	$1,978\frac{1378}{5280}$	$1,978\frac{1378}{5280}$

DIVISION OF BRIDGES AND VIADUCTS.

MR. THOMAS G. PIHLFELDT, Structural Iron Designer in Charge.
MR. ALEXANDER VON BABO, Structural Iron Designer.

During the year 1904 complete plans and specifications for the following bridges were prepared:

For the substructure and superstructure of a new one-arm bascule bridge at Archer avenue over the South fork of the South branch of the Chicago river.

For the substructure and superstructure of a temporary two-track movable timber bridge near Archer avenue over the South fork of the South branch of the Chicago river.

For the substructure and superstructure of two steel highway bridges at Eggleston avenue over the lagoons at Auburn Park.

For the substructure and superstructure of a new bascule bridge at North avenue over the north branch of the Chicago river.

For the repairs of the superstructure of the Thirty-fifth street bridge over the South fork of the South branch of Chicago river.

The following subjects were also investigated and plans prepared for the same:

Roof trusses for the Ninety-fifth street sewerage pumping station.

Roof trusses for the Jackson Park sewerage pumping station.

Bridge gates for Taylor street and Van Buren street bridges.

Electrical equipment for the Madison street bridge.

Preliminary plans for a movable timber bridge at Torrence avenue.

Preliminary plan for a proposed boulevard bridge at Michigan avenue over the Chicago river.

Other portions of the work of this office were as follows:

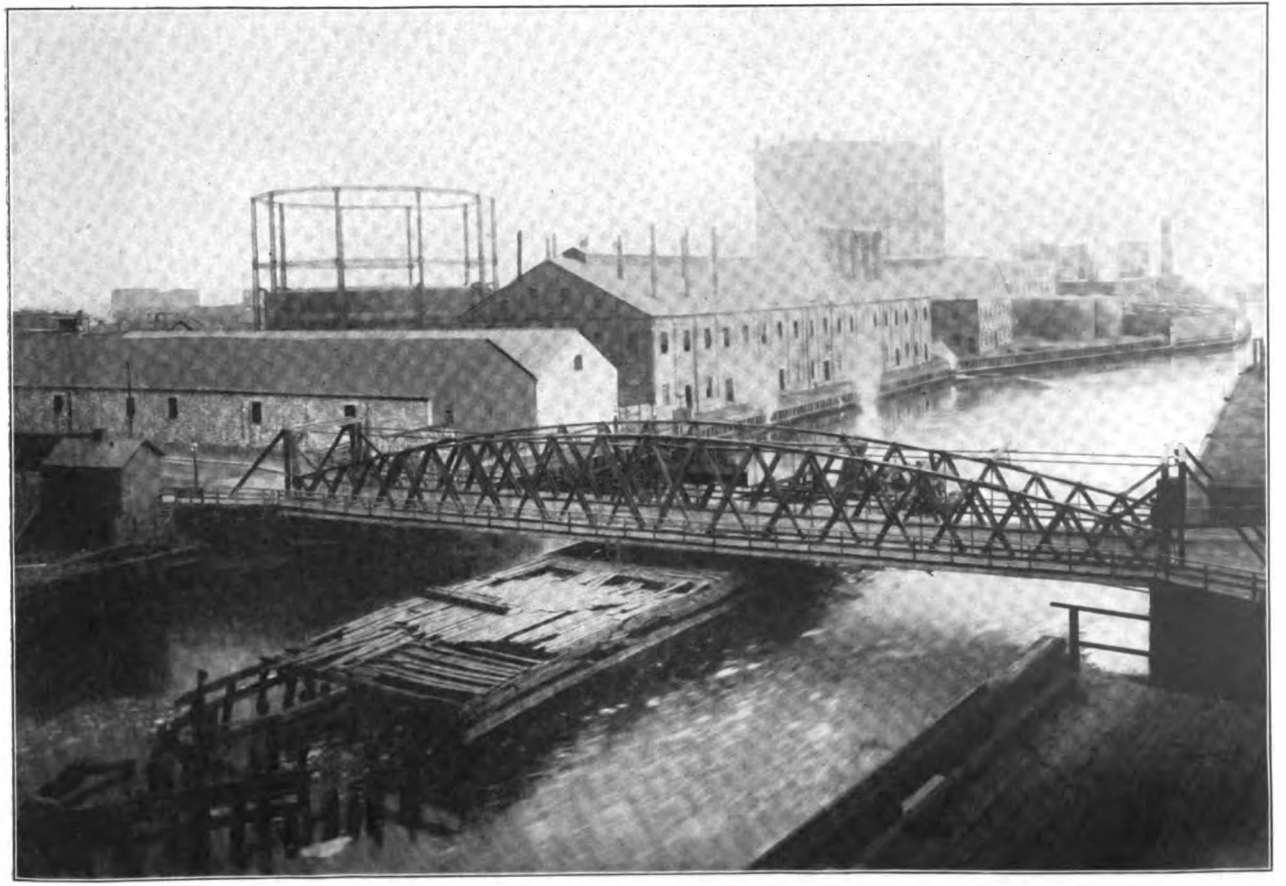
All working drawings submitted by the contractors for bridges and structures under construction were examined, checked and approved.

Shop and field inspections of the machinery for West Division street and North Western avenue bridges, also inspections of miscellaneous smaller constructions were made by members of the force of this office.

Miscellaneous plans, plats, data and estimates for various projects and minor repairs were prepared.

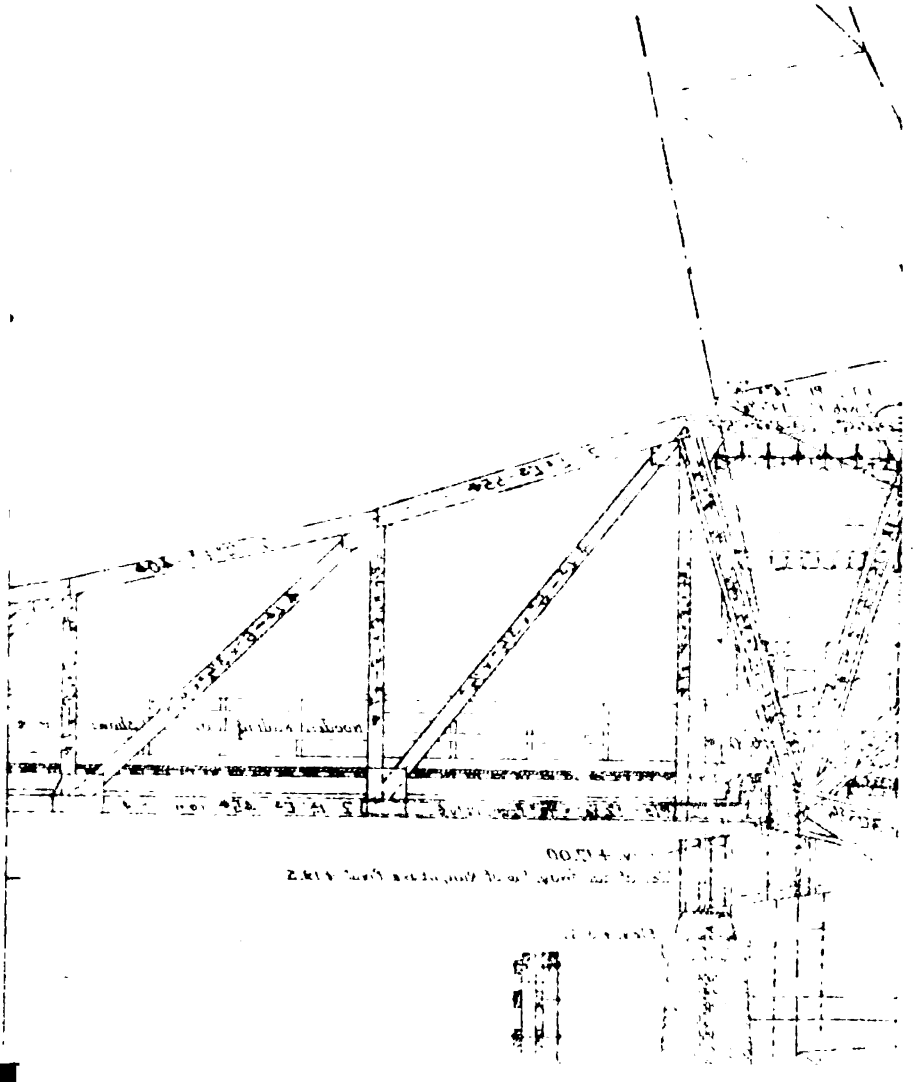
Designs, plans for steel and similar structures of interest to the City were investigated, examined and reported on.

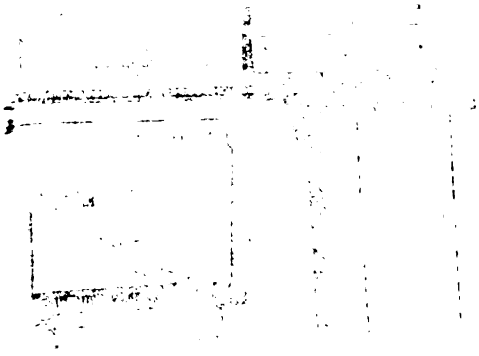
In relation to Archer avenue bridge it may be of interest to state the reasons why an entirely new set of plans for this bridge was worked out



OLD ARCHER ROAD BRIDGE.
BUILT IN 1870.—TO BE REPLACED WITH STEEL BASCULE BRIDGE IN 1905.

again, though complete plans and specifications for same bridge were pre-
[redacted] the year 1903.





again, though complete plans and specifications for same bridge were prepared in the year 1903.

Said plans were made for a bascule bridge with two leaves and a clear opening between pier protections of 136 feet 8 inches, this dimension being at that time in accordance with the requirements of the United States Government. When the United States Government reduced this figure to 107 feet the size of the bridge could be reduced accordingly and thereby also its cost. Investigations showed that a one-arm structure would be feasible, especially if the machinery type which was designed for and for the first time applied to the North Western avenue bridge were adopted.

The latter bridge, being of uncommon dimensions, having river arms 102 feet 9 inches long and presenting, when raised, to the wind a solid surface over 100 feet high and 60 feet wide, required special arrangements to have the leaves under perfect control in all positions, and for all wind conditions likely to occur when the bridge had to be operated. This requirement was thought to be best attained by inserting in the gear trains between main pinions and electric motors worm and worm-wheel reductions of such dimensions and strength that the leaves could be moved by the motors only, the wind pressure acting on the leaves finding in the worm-gearing an almost unsurpassable resistance.

In reference to the proposed Archer avenue bridge, no objection to enlarging the radius of the rear arm, which is also the radius for the pin rack, to 36 feet against 30 feet in the North Western avenue bridge could be found and, as a river arm of 136 feet against 102 feet 9 inches in the North Western avenue bridge would be needed, the machinery for a one-arm structure had to be only a little heavier than the machinery for each arm of the North Western avenue bridge.

All these conditions showed that a one-arm bridge, though of exceptional dimensions, would not be excessive in its requirements for machinery, and that a substantial saving could be effected, not only in relation to the first cost of the bridge, but also in its operation, as only one arm had to be raised or lowered instead of two arms simultaneously.

As a further precaution against a too severe and frequent exposure to heavy wind stresses, the main pier and movable leaf of the bridge are to stand on the west side of the river. The prevailing storms and heavy winds during the time of navigation, coming chiefly from a westerly direction, the action of the severest wind pressure, for this reason, may be expected against the top of the bridge floor, and to retard the raising of the leaf somewhat, but to assist rather the lowering of the bridge leaf to its horizontal position.

Finally it may be stated that the machinery of the North Western

avenue bridge, which was opened to traffic at the beginning of November, works with entire satisfaction, and therefore a similar satisfactory success may be safely expected for the Archer avenue bridge.

NEW BRIDGE CONSTRUCTION.

MR. GEORGE F. SAMUEL, Assistant Engineer.

WEST DIVISION STREET BRIDGE.

This bridge was completed and thrown open to traffic on June 4, 1904. The completion of this bridge removed the last obstruction to traffic on Goose Island, due to the failure of the two old bridges formerly at Division street. The new bridge is of the trunnion bascule type and the total length, including approaches, is 959 feet. The length between trunnion supports is 172.7 feet. The clear width of channel is 133 feet with two roadways 18 feet in width and two sidewalks 8 feet in width, the total width being 60 feet. The bridge rests on a pile foundation, the piles being driven to —50 feet C. D. The total load per pile is 12 tons. The weight of the structural steel in the bridge is 700 tons and of counterweight 500 tons.

The FitzSimons & Connell Co. was the contractor for the substructure and Roemheld & Gallery were the contractors for the superstructure.

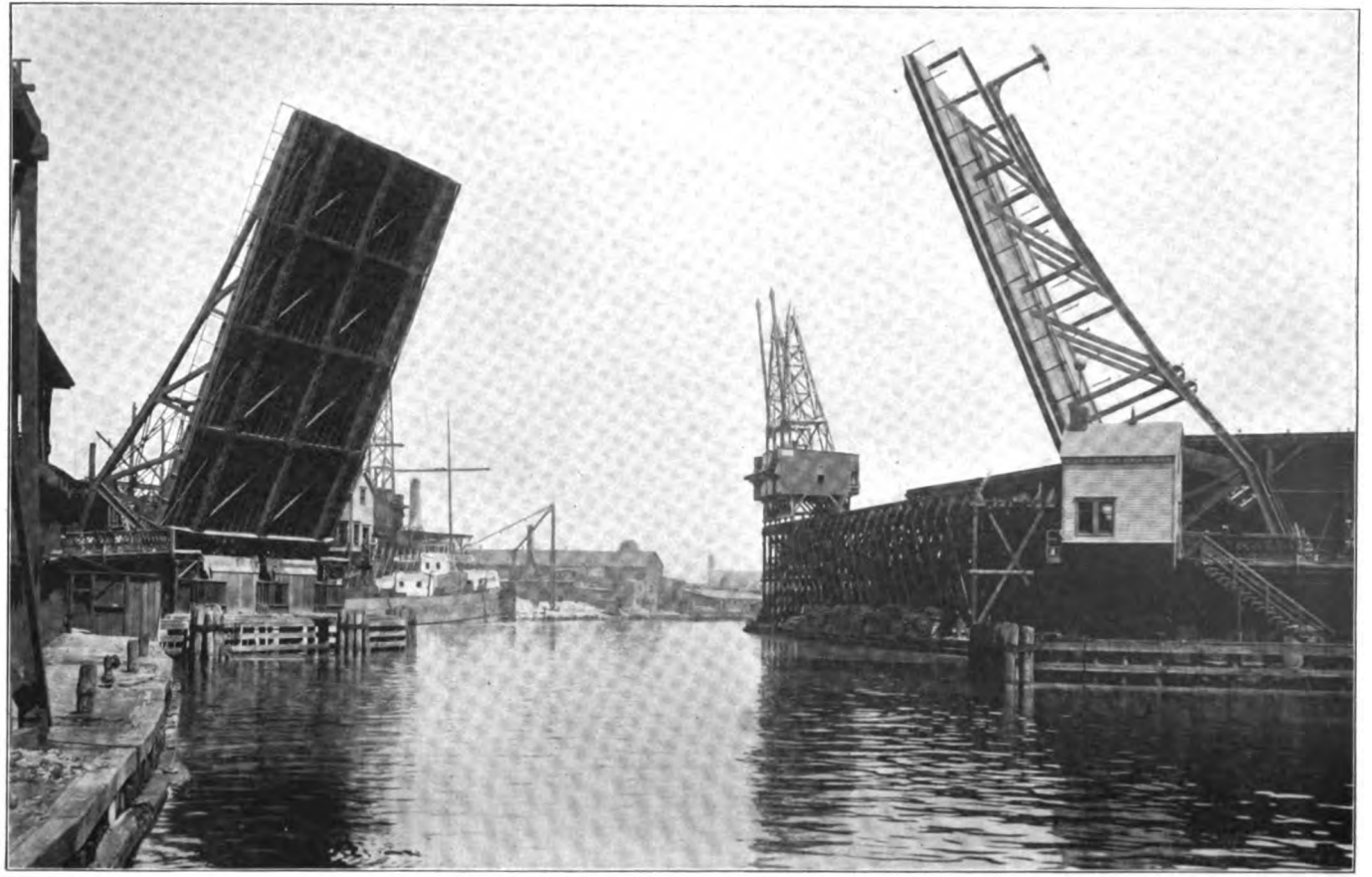
The total cost of the work was as follows:

For substructure	$ 94,407.84
For superstructure	161,912.68
Total	$256,320.52

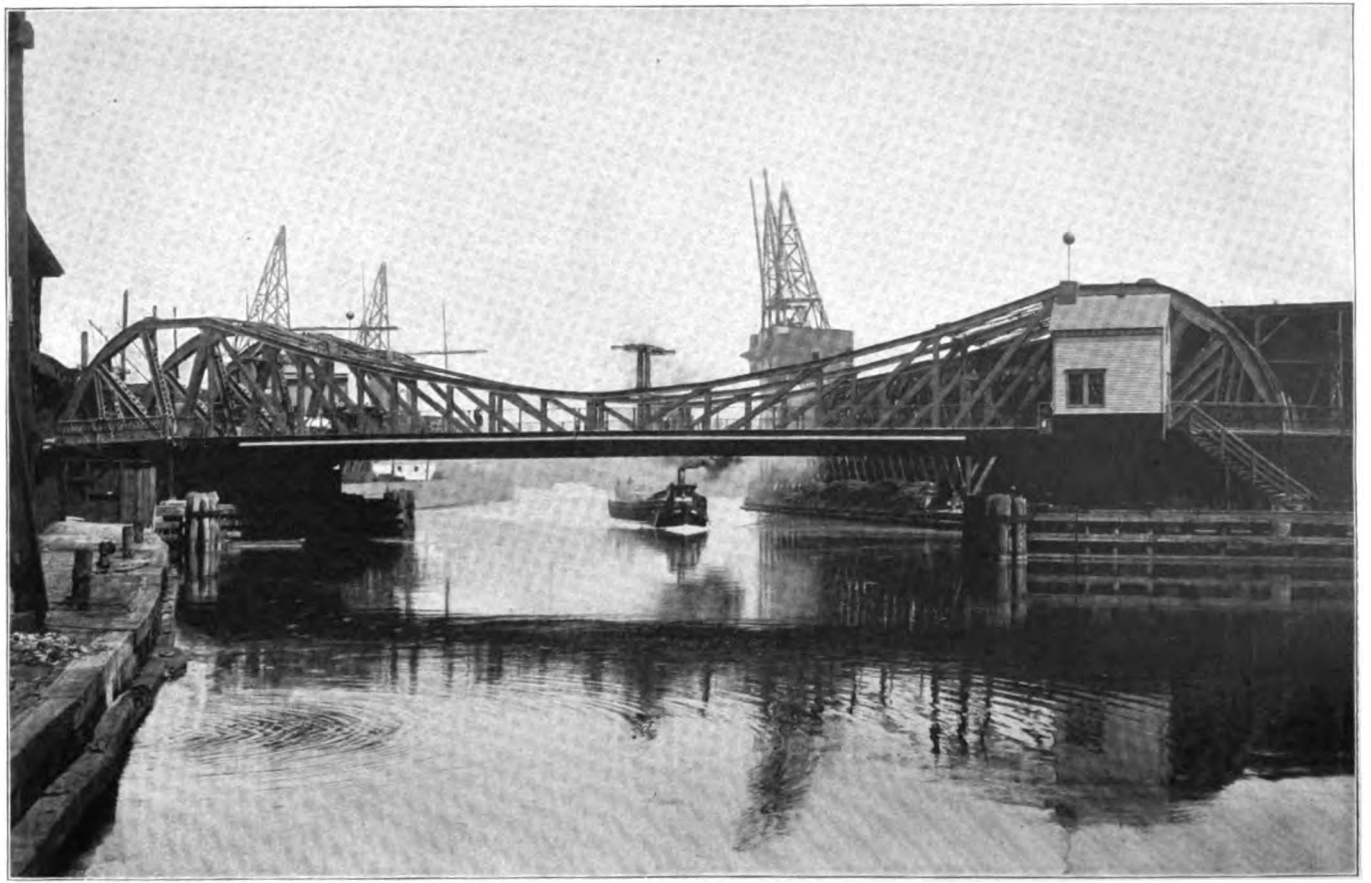
Of this amount the Union Traction Company paid $138,221.95.

NORTH WESTERN AVENUE BRIDGE.

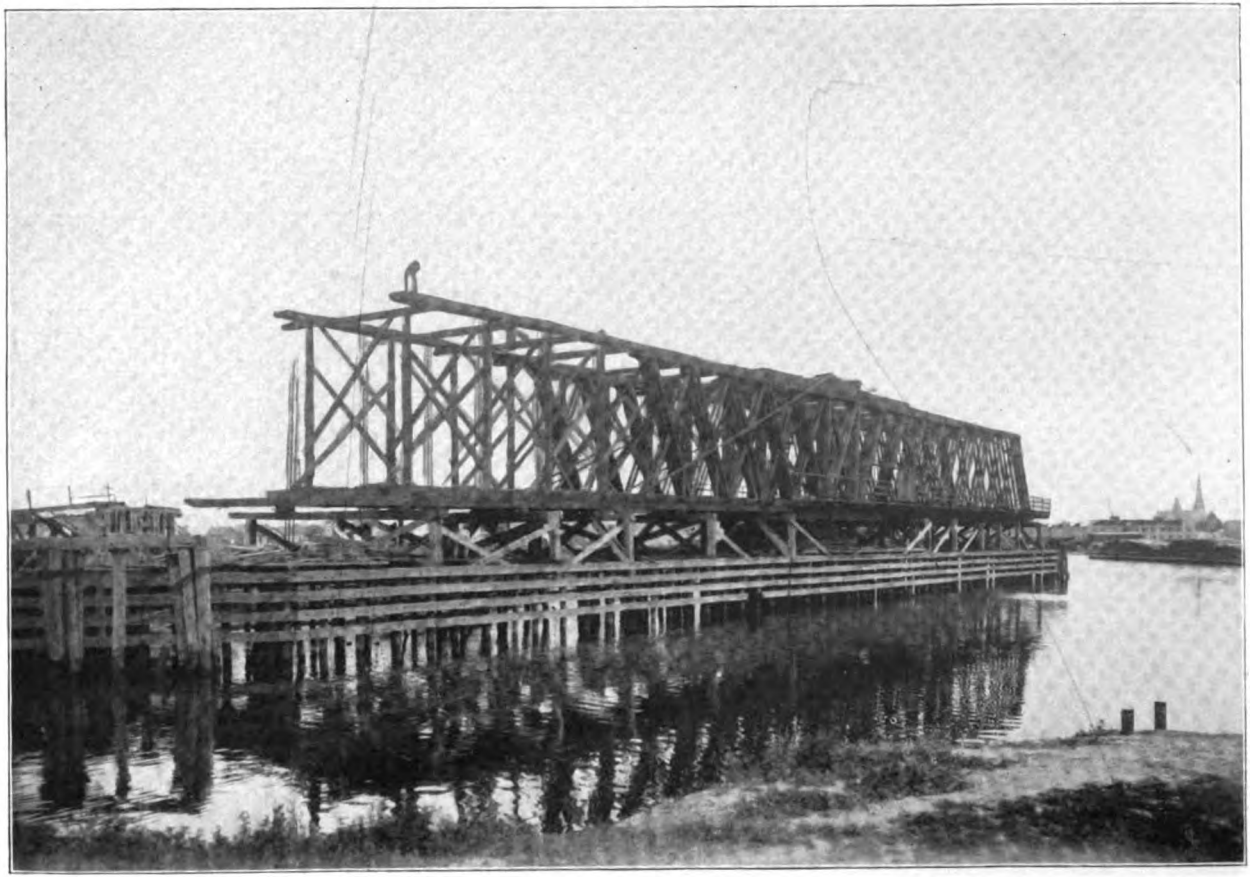
This bridge is of the trunnion bascule type and was built to replace the old Howe truss bridge formerly in use. It was originally intended to put the new bridge on a pile foundation, but it was found on examination that oak piles could not be driven below —22 feet C. D. The clay at this depth was so hard that the contractors considered it necessary to blast it before excavating. The piers rest on this indurated clay foundation. The load per square foot is 4,000 pounds. The piers and tail pits are constructed of Portland cement concrete mixed in the proportion of 1-3-5, reinforced with steel rods. The inside and outside of the piers and tail pits below water level are lined with 4 inches of Portland cement mortar mixed in the proportions of one part of cement to two and one-half of torpedo sand. The length of the bridge, including approaches, is 1,055.6 feet. The length between trunnion supports is



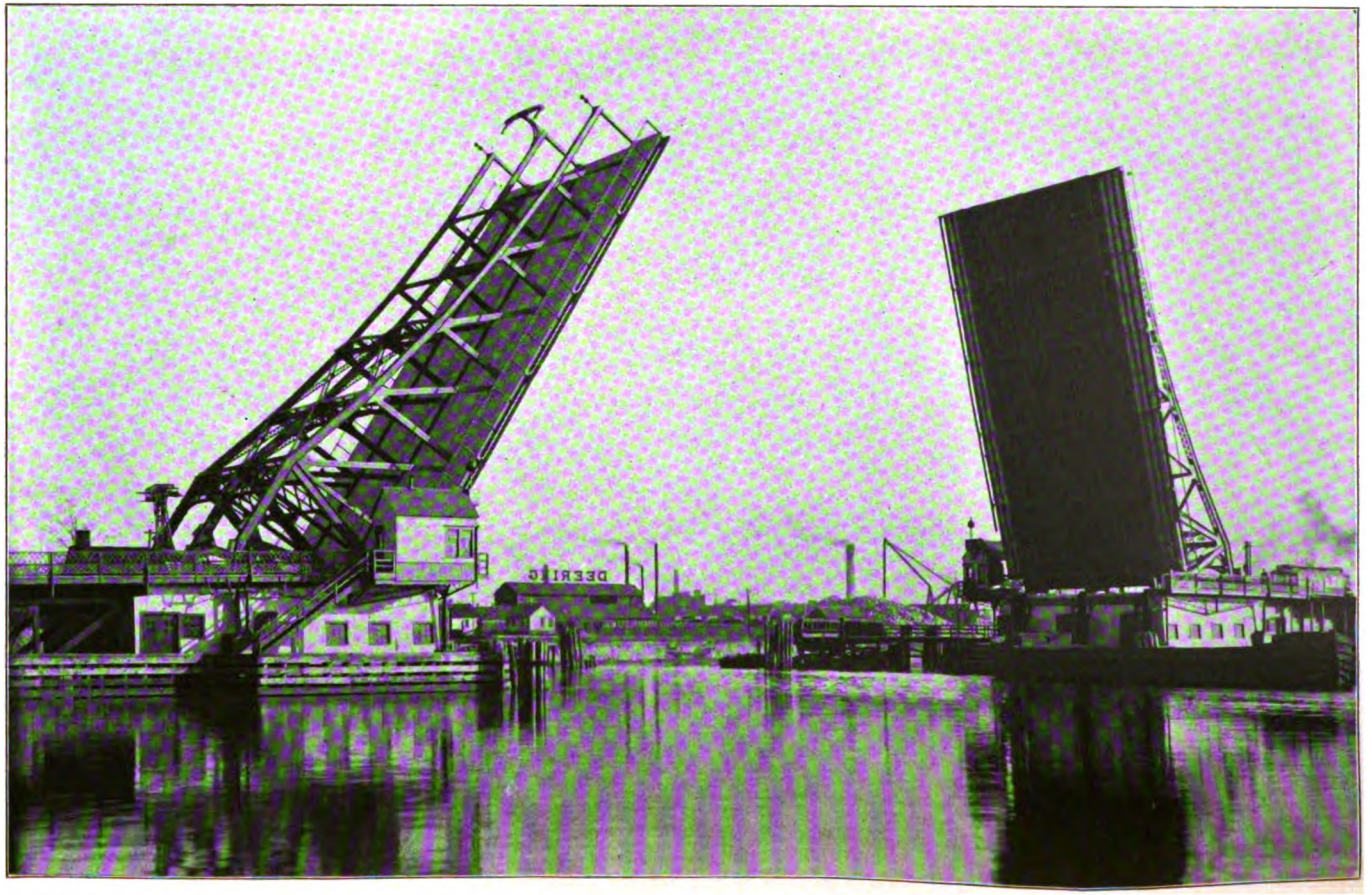
NEW STEEL TRUNNION BASCULE BRIDGE AT WEST DIVISION STREET.—SIDE VIEW, OPEN.—COMPLETED IN 1904.



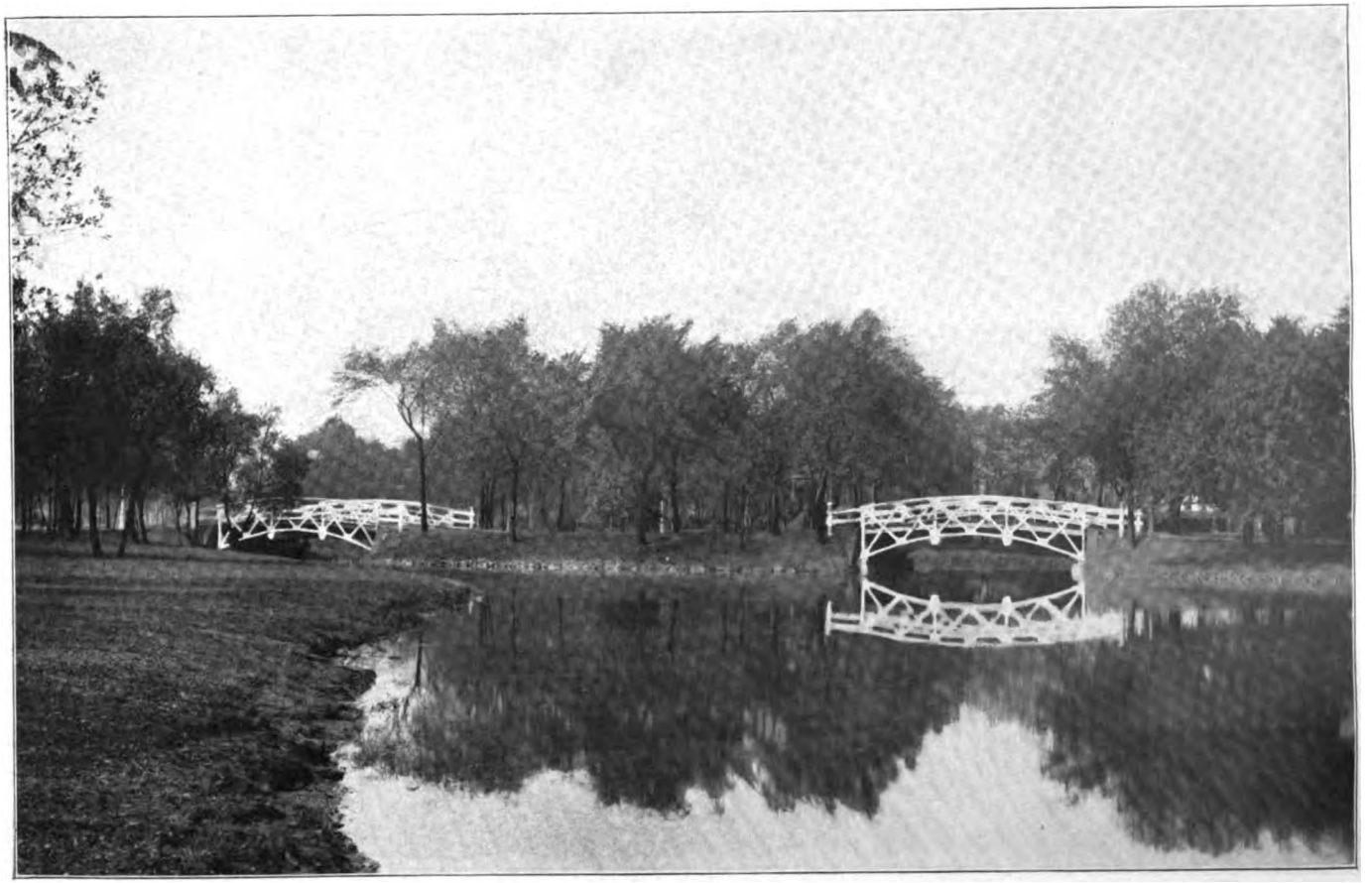
NEW STEEL TRUNNION BASCULE BRIDGE AT WEST DIVISION STREET.—SIDE VIEW, CLOSED.—COMPLETED IN 1904.



OLD HOWE TRUSS BRIDGE AT NORTH WESTERN AVENUE.
BUILT IN 1891. REPLACED WITH STEEL BASCULE BRIDGE IN 1904.



NEW STEEL TRUNNION BASCULE BRIDGE AT NORTH WESTERN AVENUE.—SIDE VIEW, OPEN.—COMPLETED IN 1904.



TWO NEW HIGHWAY BRIDGES BUILT AT AUBURN PARK IN 1904.

205.6 feet, and the width of the channel is 168 feet. It has two roadways 18 feet in width and two sidewalks each 8 feet in width, the width over all being 60 feet.

Each leaf turns on three trunnions, each 17¼ inches in diameter. The total weight of structural steel used is 1,090 tons, and the weight of counterweights 700 tons. Each leaf is driven by two 38-horse-power motors.

The FitzSimons & Connell Company was the contractor for the substructure and C. L. Strobel was the contractor for the superstructure. The cost of the bridge was as follows:

Cost of substructure	$ 91,173.57
Cost of superstructure	212,824.57
Total cost	$303,998.14

The work on the substructure was begun February 23, 1903, and completed December 19, 1903. Work on the superstructure began March 2, 1904, and was completed November 22, 1904, when the bridge was opened to traffic.

EGGLESTON AVENUE BRIDGES.

Two steel bridges 32 feet in length and a single roadway of 25 feet were built on Eggleston avenue crossing the lagoons at Auburn Park. The cost of both spans complete was $3,960. Roemheld & Gallery were the contractors.

REPAIRS AND MAINTENANCE.

MR. THOMAS G. PIHLFELDT, Structural Iron Designer in Charge.

MR. JOHN A. LENNARTSON, Assistant.

The City of Chicago operates and maintains sixty-four bridges, fifty of these being movable bridges and fourteen fixed spans. Of the movable bridges fourteen are bascule bridges of various types, one is a lift bridge, and thirty-five are swing bridges. During the year 1904 three bridges were operated by steam, twenty-three by electricity, and twenty-four by hand power. In addition there are thirty-eight systems of viaducts under the supervision of this division, the repairs to which in most instances are made by the railroad companies occupying tracks underneath the structures.

The following statement shows the amounts expended for repairs and maintenance of the various bridges and viaducts, exclusive of bridge

tenders' salaries, paid out of the appropriation for bridge repairs during the year 1904:

Adams street bridge	$ 3,425.07	Twelfth street bridge	$ 3,930.62
Archer avenue bridge	972.95	Twenty-second street bridge	5,768.71
Ashland avenue (South Fork) bridge	1,490.29	Thirty-fifth street bridge	2,504.36
Ashland avenue (West Fork) bridge	2,964.52	Van Buren street bridge	5,240.60
Belmont avenue bridge	5,186.20	Washington street bridge	1,990.54
Canal street bridge	6,315.56	Webster avenue bridge	5,369.76
Chicago avenue bridge	2,620.37	Weed street bridge	1,391.60
Chittenden street bridge	857.83	Wells street bridge	1,021.44
Clark street bridge	4,983.96	North Western avenue bridge	1,056.27
Clybourn place bridge	2,128.05	South Western avenue bridge	715.70
Dearborn street bridge	3,664.95	Culvert at Canal pumping station	56.13
Deering street bridge	1,320.76	Kedzie avenue (North branch) bridge	1,514.90
Diversey street bridge	1,110.01	Lincoln avenue bridge	103.07
East Division street bridge	5,847.54	Irving Park boulevard bridge	38.51
West Division street bridge	1,856.08	South Western avenue (canal) bridge	377.80
Blackhawk street bridge	799.71	Shop, Lake street	434.68
Erie street bridge	4,174.19	Shop, Eighteenth street	462.77
Fuller street bridge	1,030.19	Scows	491.20
Fullerton avenue bridge	1,966.85	Steamer "Hopkins"	616.92
North Halsted street (canal) bridge	6,200.87	Dock foot of La Salle street	83.40
North Halsted street (river) bridge	4,892.92	Chicago avenue incline	294.59
South Halsted street bridge	8,027.45	Chicago avenue and Halsted street viaduct	96.02
Kedzie avenue (mud lake) bridge	2,127.78	Clark street viaduct	10.25
Indiana street bridge	5,806.57	West Eighteenth street viaduct	675.84
Jackson street bridge	3,935.69	Desplaines street viaduct	8.00
Kinzie street bridge	2,847.91	Ashland avenue and Kinzie street viaduct	7.39
Lake street bridge	5,196.49	Erie street viaduct	11.82
Laurel street bridge	975.50	Halsted street and Chicago avenue viaduct	205.85
Madison street bridge	10,005.73	Halsted street and Kinzie street viaduct	8.00
Main street bridge	5,751.32	Lake street bridge house	2,507.75
Ninety-second street bridge	4,618.02	Approach to Harrison street viaduct	561.43
Ninety-fifth street bridge	4,512.82	Sangamon street viaduct	6.87
North avenue bridge	2,225.12	Northwestern avenue viaduct	23.96
One Hundred and Sixth street bridge	2,286.88	State street viaduct	1,090.18
Polk street bridge	6,995.88	General account	25,378.51
Randolph street bridge	6,233.12		
Riverdale bridge	604.53		
Rush street bridge	10,421.11		
State street bridge	5,653.67		
Taylor street bridge	3,521.42		
Total			$219,611.32

Among the repairs made during the year of 1904 the following are the most essential:

BRIDGES.

ADAMS STREET BRIDGE—The ironwork of the floor system was thoroughly cleaned and given one coat of black carbon paint. The center step, which had become loose on account of disintegration of the underlying stone, was securely fastened and the bridge was centered.

ASHLAND AVENUE BRIDGE (West Fork)—New Center locks were put in and the heel locks were repaired. About 1½ tons of counterweight were added to the north leaf and the air pipes were rearranged.

BELMONT AVENUE BRIDGE—One G. E. 800 motor was mounted and feeders connected with the Chicago Union Traction Company's wires were put in place. The equipment for operating the bridge with electricity for motive power will be completed within a few weeks.

BLACKHAWK STREET BRIDGE—On June 2nd the steamer "Black Rock" collided with the north end of the center pier protection, broke the piles and pushed the bridge, which was swung out in the river at the time, about five feet in a southerly direction, breaking nearly all the piles in the center pier. In order to repair the damage done, it was necessary to remove the bridge, which necessitated the pulling of about 75 per cent of the piles in the center pier protection. This being done, deck scows were placed under the bridge, the chords having been packed and a number of the web members renewed previously, and the bridge was moved over and moored at the dock south of the bridge site. The center pier was completely rebuilt and the bridge was put back in position and reopened to traffic on December 1st.

CANAL STREET BRIDGE—New pit pumps, operated by 15-horse-power motors, were installed and houses were built to protect the pump motors. The operating houses were painted, the tail pits were cleaned repeatedly, and about 50 cubic yards of crushed stone were deposited on the approaches next to the abutments to replace the macadam, which had been carried away. Extensive alterations and repairs were also made to the electrical equipment.

CHICAGO AVENUE BRIDGE—The bridge house was painted and the roadway and sidewalks were patched.

CHITTENDEN BRIDGE—In the latter part of March the pontoon scow was set adrift by the ice and high water, and floated down as far as 106th street. The scow was towed back and placed in position under the bridge on April 4th. The planking on the approaches was renewed and the truss rods were adjusted.

CLARK STREET BRIDGE—The floor beams and stringers in the approaches were painted, as was also the operating house, and the electrical equipment was thoroughly overhauled.

CLYBOURN PLACE BRIDGE—The main shafts of both leaves were lined up and adjusted. The bridge houses were painted and the pavement on the approaches next to the bridge was patched.

DEARBORN STREET BRIDGE—Two timber bents were erected to support the south approach and a clump of nineteen 45-foot piles was driven at the west end of the south abutment. The police officer's house at the north end of the bridge was torn down and a stairway leading down to the dock from the north approach was built.

EAST DIVISION STREET BRIDGE—New additional brakes were put in, the original brakes having been found inadequate for the safe operation of the bridge. New pit pumps were installed and connected up to electric motors previously used at the Canal street bridge. Extensive alterations were made to the switchboards and the wiring, and the bridge houses were painted.

ERIE STREET BRIDGE—The east approach was entirely rebuilt, twenty-five 40-foot piles being driven to replace the old timber supports, which had been undermined by the flow from a defective sewer. Rows of 3x12-inch oak sheeting were driven to prevent the bank from caving in, and a clump of thirteen 45-foot piles was driven to protect the west abutment.

NORTH HALSTED STREET (CANAL BRIDGE)—Owing to the extensive corrosion of the ironwork and the general decay of the structure, there was considerable difficulty in keeping the bridge in service throughout the year. Early in the summer the old counterweight box on the south end of the bridge collapsed and disclosed the fact that several of the floor beams were so badly decayed as to be practically useless. These floor beams were renewed, as well as several web members in the trusses, and the bottom chords were reinforced with steel plates and bolts. About twenty tons of scrap rails were placed in hangers, suspended from the bottom chords to take the place of the old counterweights. The north approach was rebuilt and a clump of nine 45-foot piles was driven west of the north bridge seat.

NORTH HALSTED STREET (River) BRIDGE—On January 1st two of the main 6-inch driving shafts on the south side of the river broke off, making it impossible to operate the south leaf. New shafts were procured and erected in place without delay and neither the river nor the street traffic was impeded to any appreciable extent. One new Christensen No. 4 air

compressor was installed and new maple sidewalks were laid on the bridge and on the approaches.

SOUTH HALSTED STREET BRIDGE—All the ironwork received two coats of paint, and the operating cables were greased and equalized.

INDIANA STREET BRIDGE—Twenty-six 45-foot piles were driven in the center pier protection, and the bridge house was shored up and painted.

JACKSON STREET BRIDGE—The stone on which the center step rests had gradually disintegrated, causing the center pedestal to shift back and forth, and making it difficult to operate the bridge. The decayed stone was removed, the bridge in the meantime being supported on steel wedges, and the material taken out was replaced with cement mortar. In addition, steel straps, securely bolted to the center pier, were butted against the bottom flange of the pedestal to prevent it from moving. The ironwork in the floor system received one coat of paint, and the operating house was covered with corrugated iron and painted.

KINZIE STREET BRIDGE—The approaches were patched repeatedly and the roadway on the bridge was paved with A. F. Shuman's composite pavement.

LAKE STREET BRIDGE—A new bridge house, containing office of harbor master and quarters for the bridge tender, was built, the old operating house on top of the bridge was torn down, and the rebuilding of the center pier protection was commenced.

LAUREL STREET BRIDGE—The planking on the roadway was patched extensively and the sidewalks and railings were repaired.

MADISON STREET BBIDGE—A new center pier protection was built, the pile driving being done under contract by the Chicago & Great Lakes Dredge & Dock Co., and the remainder of the work by the City repair force. The bridge house was painted and the machinery was overhauled.

MAIN STREET BRIDGE—New electric feeders were installed and put in conduits and two 15-horse-power pump motors were put in place.

NINETY-SECOND STREET BRIDGE—Ninety-three 45-foot piles were driven in the center pier protection, and at the abutments, the sidewalks on the bridge and the approaches were partly relaid, and the ironwork was painted.

NINETY-FIFTH STREET BBIDGE—Additional brakes of the same designs as the brakes of the East Division street bridge were put in, the work being done under contract by the Vulcan Iron Works. New pit pumps, operated by motors removed from the Main street bridge, were installed, the machinery was overhauled, and the bridge houses were painted.

NORTH AVENUE BRIDGE—Several of the main braces and counters were renewed, and the approaches were reinforced.

ONE HUNDRED AND SIXTH STREET BRIDGE—Forty-six 40-foot piles were driven in the protection, and the west approach was rebuilt.

POLK STREET BRIDGE—The entire north end of the old dilapidated center pier protection was removed, one hundred and thirty-three 45-foot piles were driven in place, and all caps, wales and braces were renewed. The west abutment was braced and the iron stringers on the west approach were cut off repeatedly, in order to get sufficient clearance to swing the bridge.

RANDOLPH STREET BRIDGE —The planking on the roadway was renewed, the pit pumps were repaired repeatedly, and the electrical machinery was thoroughly overhauled. The bolts holding the main pillow blocks of the east leaf sheared off twice during the year, and were replaced with new ones.

RUSH STREET BRIDGE —Two new G. E. 800 motors were installed with feeders connected to the wires of the Chicago Union Traction Company. The current for the operation of the bridge was previously furnished by the Chicago Edison Co. at a rate of $100 per month, whereas under the present arrangement the current is supplied for $50 per month, thus reducing the cost of operation 50 per cent. Maple sidewalks were laid on the bridge, two timber bents were erected to carry the south approach, and several new cast steel rack sections were substituted for the old ones.

STATE STREET BRIDGE —The pit pumps and heel locks were repaired repeatedly. New street gates with movable aprons were erected on both approaches, and vibrating electric bells, operated from the bridge tender's house when the bridge is in motion, were installed.

TAYLOR STREET BRIDGE—The center locks were partly reconstructed and the heel locks were repaired. The controllers, signal lights and solenoids were overhauled and the bridge houses were painted.

TWELFTH STREET BRIDGE —The bridge house was covered with corrugated iron and painted, and the drum, spider-rods and locks were adjusted. Various repairs were also made to the boilers and engine.

TWENTY-SECOND STREET BRIDGE—A new lower steel track was put in, some of the web members were renewed, and twenty-eight 45-foot piles were driven.

THIRTY-FIFTH STREET BRIDGE—The trusses were reinforced by means of steel rods, and timbers. This work was done under contract by the

Jackson & Corbett Co. The City repair force patched the roadway on the bridge and the approaches and repaired the bridge house.

VAN BUREN STREET BRIDGE—One Christensen No. 4 air compressor, with air tank and necessary pipe lines, was installed. A new submarine telephone cable was laid and a storeroom for painter's supplies was built in the west machinery room.

WASHINGTON STREET BRIDGE —The east approach was replanked and the electrical equipment was overhauled.

WEBSTER AVENUE BRIDGE —Ninety-two 40-foot piles were driven to support the approaches, and all caps, stringers, braces and plankings were renewed. A new bridge house was built and painted.

Eighty-eight collisions occurred during the year in which the various bridges were more or less damaged. The repairs were in most cases made by this division, and the cost was billed against the parties responsible for the damages upon completion of the repairs.

VIADUCTS.

The following repairs to viaducts over the tracks of the Chicago & North-Western Railway Company were made by this division during the year of 1904 and the expense was charged to the railroad company:

CHICAGO AVENUE AND HALSTED STREET VIADUCT —The roadways and sidewalks were patched extensively.

GRAND AVENUE VIADUCT—The sidewalks were patched.

HALSTED STREET AND KINZIE STREET VIADUCT—New sidewalks were laid over the entire right-of-way of the Chicago & North-Western Railway Company.

OGDEN AVENUE VIADUCT—The sidewalks were partly renewed.

WESTERN AVENUE AND KINZIE STREET VIADUCT—A portion of the structure which was damaged in a collision with wrecking car in the early part of July was repaired and put in a serviceable condition.

Other repairs were made on the different viaducts by the various railroad companies at their own expense.

DIVISION OF HARBORS.

COL. RICARD O'S. BURKE, Harbor Engineer.

This division has supervision over the Harbor of the City of Chicago, which consists of the Chicago River, its branches and slips, the Calumet River, its forks and branches and adjacent slips, and Lake Michigan from

the north to the south boundary lines of the City, and three miles out from shore, and for a distance of five miles beyond or east of this latter line Sanitary jurisdiction of the City of Chicago extends.

RICARD O'S. BURKE, Harbor Engineer in Charge; CAPTAIN JOHN MCCARTHY, Harbor Master; THOMAS J. ELDERKIN, Vessel Dispatcher.

DOCKING AND BREAKWATERS IN CHICAGO AND CALUMET RIVERS AND HARBORS—DOCK PERMITS AND FEES.

NEW CONSTRUCTION.

	Permits.	Feet.	Fees.
North Branch Chicago River	1	575	$ 143.75
Calumet River, pile clumps, etc	4	60	.....
Lake Michigan	1	100	25.00
South Branch Chicago River, including (S.).	12	2,873	104.00
Main River	2	20	5.00
Total	20	3,628	$277.75

REBUILDING.

	Permits.	Feet.	Fees.
North Branch Chicago River	8	1,451	$ 291.75
Calumet River	8	1,052	263.00
South Branch Chicago River	24	2,482	520.50
Main River, including 1 pile clump	8	352	88.00
Lake Michigan	1	106	5.00
Total	49	5,443	$1,268.25

REPAIRING.

	Permits.	Feet.	Fees.
Main Chicago River	3	524	$ 65.50
South Branch Chicago River	5	775	96.88
Lake Michigan	3	350	43.75
Total	11	1,649	$206.13

SUMMARY OF DOCK WORK.

	Permits.	Feet.	Fees.
New construction	20	8,628	$ 277.75
Rebuilding	49	5,443	1,268.25
Repairing (no piling)	11	1,649	206.13
Total	80	10,720	$1,752.13

DREDGING DURING 1904.

	Permits.	Feet.	Fees.
Main Chicago river	5	7,000	$ 28.00
North branch Chicago river	3	5,000	20.00
South branch Chicago river	3	4,000	16.00
Calumet river	13	25,000	100.00
Lake Michigan	3	7,000	28.00
Total	27	48,000	$192.00

SUMMARY OF DREDGING.

	Cubic Yards.
By the United States, Calumet river	149,000 460,000
By the United States, Outer Harbor, Chicago	.....
By Park Commissioners for Grant Park	508,963
By Sanitary District, chief cut-off tracts, South branch	53,500
Private dredging	48,000
Total quantity of dredging done in 1904	1,219,463

There were eighteen (18) towing permits issued during the year, yielding $220.00 in fees.

SUMMARY OF FEES.

Docking permits	$1,752.13	
Dredging	192.00	
Towing	220.00	
Total		$2,164.13

SUMMARY OF DREDGING 1904.

Main Chicago river.....	5 permits,	7 days.
North Branch Chicago river.....	10 permits,	285 days, of which 270 days were Sanitary District work.
South Branch Chicago river.....	20 permits,	679 days, of which 675 days were Sanitary District work.
Lake Michigan.....	12 permits,	757 days, of which 750 days were for work of So. Park Com'rs.
Calumet river.....	23 permits,	991 days, of which 960 days were on United States work.
Calumet lake.....	1 permit,	274 days, dredging clay for manufacturing purposes.

The City dredged away 1,500 cubic yards of an obstructing sand-bar from the east draw of Fullerton avenue bridge, near the outlet of the Fullerton avenue conduit, at a cost of 32½ cents per cubic yard, amounting to $487.50.

Under the appropriation for dock renewal the City has rebuilt the dock at the foot of East Monroe street on the east side of the South branch, under contract with the Chicago & Great Lakes Dredge & Dock Company, cost of the work being 67 lineal feet at $18.90 per foot—$1,266.30.

By order of the City Council, passed July 14, 1904, contract was let to the Chicago & Great Lakes Dredge & Dock Company, to rebuild the dock at the foot of Quincy street, on the east side of the South branch of the Chicago river, the contractor to await payment until an appropriation be passed for 1905. The work was entered upon and practically completed when the adjacent property owner proposed to construct a retaining wall of concrete at his own cost at this street end. This property owner's proposal involved the removal of much of the dock construction already in place and substituting therefor a concrete retaining wall resting on a capped pile foundation brought to an elevation of 0.75 feet below City datum, five feet wide at base, and nearly three feet wide at the surface of the street, the height of the retaining wall being twelve feet concrete going about 1½ feet above the street surface at dock. A City permit No. 216 was issued for this construction on Nov. 4, 1904, and much of the dock construction was removed. The substitute work is not yet completed. Work on it will be resumed when the season becomes favorable for concrete construction.

From December 12th to 22d, 1904, dredging was carried on in Slip "A" next west of Ashland avenue and south from Twenty-second street pumping station, an appropriation having been given the Sewer Department for the removal of the sewage deposited in this slip from the 9-foot

sewer discharging into its north end. The cost of this work was 14,064.1 cubic yards at 24½ cents per cubic yard—$3,445.70, and was certified to the Bureau of Sewers for payment on December 29, 1904.

The schooner "Radical" was sunken by the west end of Erie street bridge, and notice No. 218 of November 18, 1904, was served on her owner, the Manitowoc Dry Dock Company, to remove her. While the agent of the owner was removing her on the way to the lake the tow line broke and she sank partly in the draw of Indiana street bridge, where he left her. On December 7, 1904, the owners were informed by telegram of these facts and were required to cause the immediate removal of the sunken schooner "Radical" from her new position in the waters of the harbor near Indiana street, and Notice No. 221 of same date was sent the owners confirming telegram. As no action was taken by the owners, and as the schooner practically closed or blocked the draw of Indiana street bridge, the City contracted with the Chicago & Great Lakes Dredge & Dock Company, to immediately remove her to the lake, which was done at a cost of $430. While the "Radical" lay sunk in the west draw of Indiana street bridge many vessels were detained, which in all probability will result in bills against the City for demurrage. These, with cost of the removal of the sunken schooner "Radical," are to be recovered from the defaulting owner, the Manitowoc Dry Dock Company.

CHICAGO RIVER AND HARBOR.

CHICAGO HARBOR.

The outer or "Chicago Harbor," originally proposed by the United States engineers in 1870, consists of an enclosed portion of Lake Michigan near the mouth of the Chicago river, and a sheltering breakwater in deep water about a mile distant and located across the path of the prevailing winds, thus sheltering the outer harbor and facilitating the approach to Chicago river. The enclosed basin originally covered 455 acres of the lake area, of which 270 acres lie seaward of the dock line established by the Secretary of War September 22, 1890, and 185 acres west of this dock line. The dock line is about 1,300 feet east of the right-of-way of the Illinois Central Railroad and 2,000 feet distant from and parallel to the easterly breakwater of the enclosed basin. Under authority of the Secretary of War of July 24, 1895, a bulkhead has been constructed along the dock line, and the area shoreward of this dock line is now being filled in by the South Park Commissioners, the whole, when completed, to be known as Grant Park. The remaining portion of the enclosed basin, about 3,000 feet long and 1,150 feet wide, has been dredged to a depth of 21 feet below

Chicago City datum. There was no contract for dredging in force in "Chicago Harbor" during the year ending June 30, 1904. The piers and breakwaters are generally in fair condition, except the north pier, which has suffered from fire, collisions and decay, and its present wooden crib structure ballasted by stone, as it is intended by the United States Engineer to replace the superstructure with concrete, during the year ending June 30, 1905, the United States Engineer intending to apply the following funds:

For works of improvement.....	$285,000.00	
For maintenance of improvement.....	10,000.00	$295,000.00

Total money expended by the United States for harbor at Chicago, commencing under the act of Congress of July 11, 1870, to June 30, 1904, $1,909,246.61, the total amount appropriated being $1,910,921.16, which leaves an unexpended balance on June 30, 1904, of $1,674.55.

The outer portion of the old Casino pier at Jackson Park has been removed in part. The inner 1,400 feet are to be rebuilt. The old Illinois Central Railroad bridge near the mouth of the Chicago river, has been entirely removed and the location it occupied dredged to same depth as adjacent part of the harbor.

CHICAGO RIVER.

During the year there was no dredging contract with the United States in force in the Chicago river; that which was done was work of the Sanitary District of Chicago, in furtherance of the completion of the project for securing a width of 200 feet for the South branch of the Chicago river.

The United States Engineer ran a line of soundings from Rush street bridge to the junction in the main river, and thence to Belmont avenue, running two lines through the right and left channels and draws of the bridges with the following results, all referred to Chicago City datum:

FROM RUSH STREET TO THE JUNCTION: 17.5 to 21 feet below, except 16.5 feet in north draw at Rush street, 17 feet in mid-channel across La Salle street tunnel and 16.5 feet in northerly channel near point opposite Lake street bridge. The southerly channel is the deeper, generally from 18.5 to 21 feet below datum.

FROM JUNCTION TO CHICAGO AVENUE: 18.5 to 20 feet, except in the east draws at Kinzie street, where only 10.5 to 11.5 feet were found, and in the east draw at Indiana street only 15.5 to 16.5 feet.

CHICAGO AVENUE TO NORTH AVENUE: 17 to 20 feet, except at Division and Blackhawk street bridges, east channels 16 to 16.5 feet.

NORTH AVENUE TO FULLERTON AVENUE: 16 to 18 feet, except at Chicago, Milwaukee & St. Paul Railway bridge, 14.5 to 15.5 feet; in the east draw Webster avenue bridge 15.5 feet; at Chicago & North-Western Railway bridge, west draw 15 feet; at and near Fullerton avenue bridge, west draw 8.5 to 9.5, and in the east draw 10.5 to 17 feet. The City has since dredged this sandbar away.

FULLERTON AVENUE TO BELMONT AVENUE: From 15.5 to 17 feet, except 14.5 feet in the east draw of Diversey avenue bridge. The temporary bridge at North Western avenue has been removed and its site dredged to a depth of 16 feet.

The North branch or Ogden canal has a channel through the middle of at least 17.5 feet, but generally from 18.5 to 20.5 feet below datum.

The United States has acquired title in the various parcels of land necessary for the formation of the two turning basins in the Chicago river at the following cost:

For the North branch basin at North avenue	$231,946.17
For the South branch basin at forks of South branch	76,920.70
	$308,866.87

Work to commence on them in April, 1905.

Estimated dredging to be done	$114,615.00	
Estimated docking to be done	25,828.00	$140,443.00
Total		$449,309.87

From June 3, 1896, to June 30, 1904, the United States appropriated for the Chicago river	$932,938.12
Expended to June 30, 1904	609,036.80
Balance unexpended July 1, 1904	$323,901.32

CALUMET RIVER AND HARBOR.

CALUMET HARBOR.

During the year there was no dredging contract in force under the United States for the improvement of the Calumet harbor; the last one was finished on November 16, 1903, having dredged 1,440,734 cubic yards.

Work was continued on the southeastern extension of the breakwater for 2,500 feet, work for the season of 1904 having been resumed by the contractors, Gillen & Gillen, on April 15. The cribs are each

100 feet long, 30 feet wide and 24 courses high, are sunk in place on stone foundation and filled with stone. Owing to bad weather the contract time was extended and in December, 1904, it was completed.

For the improvement of this harbor at that part of Lake Michigan, near the mouth of Calumet river, the Congress appropriated from July 11, 1870, to June 30, 1904.....$1,547,231.00

Expended in the improvement of Calumet harbor, making and maintaining..... 1,245,562.32

Balance unexpended June 30, 1904.....$ 301,668.68

CALUMET RIVER.

The river channel has been dredged to 21 feet below Chicago City datum from 106th street to the three railway bridges near Ninety-seventh street, and this work will be continued to the mouth of the river in the spring of 1905. There were 149,000 cubic yards, place, dredged away at the end of 1904, at a price of 22½ cents the cubic yard. Contractor, FitzSimons & Connell Company.

ONE HUNDREDTH AND SIXTH TO 110TH STREET: The contractor under the United States commenced work November 1, 1903, dredging to a depth of 20 feet and 200 feet wide from 106th to 110th street, and thence to Chittenham bridge to a depth of 14 feet, except at the rock section between 112th and 114th streets, where the depth in east side of the river averages only from 9 to 10 feet. No rock work was done during 1904; an appropriation is asked of Congress for the excavation of the rock section. From Chittenham bridge to about 900 feet southwest of it the contractor dredged to a depth of about 10 feet along the new channel or cut-off. The contractor having removed approximately about 460,000 cubic yards, place measurement, at 14½ cents per cubic yard, has completed his work.

The United States Congress appropriated for the Calumet river, from July 5, 1884, to June 30, 1904.....$528,000.00

Expended to June 30, 1904..... 425,749.36

Balance unexpended June 30, 1904.....$102,250.64

MOVEMENT OF VESSELS.

Of the 12,904 vessels that entered and cleared in the harbor of the City eighty-six per cent, or 11,086, took the Chicago river; the remaining fourteen per cent of our total vessels went to the Calumet river, carrying thirty-two per cent or 4,066,063 tons of our total ton-

nage. The average cargo of the vessels that used our southern harbor during 1904 is 2,237 tons, or approximately three times the average cargo of the trade of our City using the Chicago river, which is for the year 1904 only 783 tons.

Of the 11,086 vessels which used the Chicago river sixty-eight per cent passed west of Rush street, the remaining thirty-two per cent entered the river and discharged and took on cargo again east of Rush street bridge. Fifty-two and one-third per cent of the trade of the Chicago river passed west of Wells street bridge, only sixteen per cent of Chicago river trade stopping between Rush street and Wells street bridges. Of this trade that passed west of Wells street, forty-three per cent went down the South branch, while fifty-seven per cent of it went up the North branch.

Of the vessels that took the South branch of the Chicago river seventy-three per cent passed south of Twenty-second street bridge, while of the vessels that took the North branch only thirty-three per cent passed north of Chicago avenue.

There is a movement of vessels from branch to branch of the Chicago river without any of them passing east of Wells street. Last year 692 of these vessels passed to the North branch from the South branch and 928 vessels left the North branch, going through Lake street bridge into the South branch of the Chicago river, none of them going east of Wells street bridge.

LAKE FRONT SURVEY.

The office work was continued on the sheets of the survey of the lake front from the mouth of the Chicago river to the Indiana State line and these sheets were practically completed.

Two small scale maps to a scale one-sixth of that of the larger atlas, have been made, one for each of the harbors of the City, the hydrographic conditions having been taken from the charts of the United States Navy Department and the harbor improvements made under the direction of O. H. Ernst, Colonel Corps of Engineers, U. S. A.

A sketch or skeleton map of the harbor of Chicago, to a scale of 1,126 yards to the inch, is herewith attached. It shows the lake front from the survey of 1900-1902 and the depths of water in Lake Michigan inside the City limits north and south; the contours of equal depths being shown by a dot for every fathom in depth represented by the contour line and these dots alternate with dash or broken line for each contour. The lake is represented as far as the four-mile water crib, which is twelve hundred yards east of the six fathom contour line. The bars and shoals

have the representation of the buoys colored as the actual ones used to show these dangers to navigation.

LAKE MICHIGAN.

In January, 1904, the climatic conditions, taken into consideration with those that obtained during 1903, gave grounds for hope of higher water in Lake Michigan, which was realized during the year, the mean level of the lake for 1904 being +0.66 feet, notwithstanding that over the basin of the Upper Lakes there has been during the year a decrease of 3½ inches of precipitation from the normal of about twenty years. Yet this great decrease in precipitation was neutralized for 1904 by the marked decrease in the mean temperature over the Upper Lake basin, which fell from 43 degrees in 1903 to 41.4 degrees in 1904. From the climatic conditions over the basin of the Upper Lakes it appears that at a mean annual temperature of 45.5 degrees and mean annual barometric pressure of 29.28 inches, an average annual rainfall of 31.96 inches will maintain Lake Michigan at an average annual elevation of 12.45 inches above Chicago datum. These are the values of the normals for the mean local conditions over the basin of the Upper Lakes for thirty-four years.

A study of the climatic conditions of 1904 and the observance of the material departure from the normal temperature shown by the evidences presented at the opening of 1905 lead directly to the statement that the elevation of Lake Michigan for year 1905 will be lower than that for 1904, unless the temperature over the basin of the Upper Lakes shall reach a lower average than that for 1904, as there is evidence of a serious decrease in precipitation over the lake area at the opening of the year.

TABLE SHOWING ELEVATION OF SURFACE OF LAKE MICHIGAN, IN FEET, REFERRED TO CITY DATUM BY MONTHS, YEAR 1904, FROM OBSERVATIONS TAKEN AT TWO-MILE CRIB.

MONTHS.	Max.	Min.	Mean.	Range.	REMARKS.	
January	+0.40	−0.90	−0.24	1.3	Max. Jan. 2	Min. Jan. 7
February	+0.30	−1.20	−0.18	1.5	" Feb. 29	" Feb. 4
March	+0.60	−0.50	+0.06	1.1	" Mar. 11	" Mar. 4
April	+1.80	+1.10	+0.56	1.9	" Apr. 25	" Apr. 2
May	+1.60	+0.40	+0.85	2.0	" May 24	" May 13
June	+1.60	+0.90	+1.25	2.5	" June 16	" June 5
July	+1.70	+1.00	+1.32	2.7	" July 6	" July 4
August	+1.60	+0.80	+1.19	2.4	" Aug. 7	" Aug. 26
September	+2.00	+0.70	+1.11	2.7	" Sept. 20	" Sept. 15
October	+1.40	+0.30	+0.96	1.7	" Oct. 12	" Oct. 28
November	+1.40	−0.10	+0.71	1.5	" Nov. 10	" Nov. 12
December	+1.20	−0.90	+0.30	2.1	" Dec. 2	" Dec. 27
Year 1904	+2.00	−1.20	+0.66	3.2		

TABLE SHOWING PRECIPITATION AND MEAN TEMPERATURE AND MEAN BAROMETRIC PRESSURE (ACTUAL) IN INCHES AND IN DEGREES FAHR., OVER THE BASIN IN UPPER LAKES, AND MEAN WATER IN LAKE MICHIGAN IN INCHES, BY YEARS, FROM 1871 TO 1904, BOTH INCLUSIVE, WITH THE ANNUAL INCREASE OR DECREASE.

Year	BASIN OF UPPER LAKES.								LAKE MICHIGAN.		
	Precipitation	Difference with Preceding Year		Mean Temp.	Difference with Preceding Year		Pressure.	Difference with Preceding Year		Levels of Mean Water	Difference with Preceding Year	
	Inches	Inc.	Dec.	Deg's.	Inc.	Dec.	Inches	Inc.	Dec.	Inches	Inc.	Dec.
1871	30.75	.....	.....	47.2	.....	.....	29.26	.....	.....	21.24	.....	.....
1872	29.59	.....	1.16	44.2	.....	3.0	29.26	0.00	0.00	9.62	.....	11.62
1873	32.49	2.90	.....	44.3	0.1	.....	29.25	.....	.01	16.80	7.18	.....
1874	29.56	.....	2.93	46.3	2.0	.....	29.31	.06	.....	20.04	3.24	.....
1875	33.06	3.50	.....	42.0	.....	4.3	29.26	.....	0.5	17.40	.....	2.64
1876	28.93	.....	4.13	45.1	3.1	.....	29.25	.....	0.1	30.72	13.32	.....
1877	36.23	7.30	.....	47.5	2.4	.....	29.28	.03	.....	27.72	.....	3.00
1878	38.35	2.12	.....	49.2	1.7	.....	29.22	.....	.06	24.00	.....	3.72
1879	35.51	.....	2.84	46.5	.....	2.7	29.30	.08	.....	12.72	.....	11.28
1880	38.36	2.85	.....	47.0	0.5	.....	29.28	.....	.02	13.92	1.20	.....
1881	42.42	4.06	.....	47.1	0.1	.....	29.29	.01	.....	15.12	1.20	.....
1882	37.28	.....	5.14	48.2	1.1	.....	29.29	.00	.00	24.00	8.88	.....
1883	32.66	.....	4.62	44.4	.....	3.8	29.28	.....	.01	25.20	1.20	.....
1884	34.31	1.65	.....	46.2	1.8	.....	29.28	.00	.00	26.88	1.68	.....
1885	32.99	.....	1.32	43.8	.....	2.4	29.26	.....	.02	28.56	1.68	.....
1886	30.56	.....	2.43	45.8	2.0	.....	29.28	.02	.....	31.68	3.12	.....
1887	29.63	.....	0.93	45.5	.....	0.3	29.29	.01	.....	23.52	.....	8.16
1888	27.57	.....	2.06	43.8	.....	1.7	29.31	.02	.....	15.60	.....	7.92
1889	28.65	1.08	.....	45.9	2.1	.....	29.29	.....	.02	9.24	.....	6.36
1890	34.58	5.93	.....	46.0	0.1	.....	29.30	.01	.....	7.56	.....	1.68
1891	29.62	.....	4.96	46.4	0.4	.....	29.30	.00	.00	0.60	.....	6.96
1892	34.15	4.53	.....	44.7	.....	1.7	29.31	.01	.....	—2.04	.....	2.64
1893	31.46	.....	2.69	43.8	.....	0.9	29.26	.....	.05	—2.35	.....	0.31
1894	29.51	.....	1.95	46.9	3.1	.....	29.28	.02	.....	6.00	8.35	.....
1895	26.03	.....	3.48	44.9	.....	2.0	29.29	.01	.....	—5.88	0.00	11.88
1896	31.59	5.56	.....	46.1	1.2	.....	29.30	.01	.....	—6.96	0.00	1.08
1897	30.36	.....	1.23	45.9	.....	0.2	29.31	.01	.....	+3.96	10.92	.....
1898	31.32	0.96	.....	46.2	0.3	.....	29.27	.....	.04	+5.64	1.68	.....
1899	29.26	.....	2.06	44.7	.....	1.5	29.31	.04	.....	+6.36	.72	.....
1900	31.25	1.99	.....	46.7	2.0	.....	29.31	.....	.....	+1.44	.....	4.92
1901	26.88	.....	4.37	45.0	.....	1.7	29.27	.....	.04	+4.68	3.24	.....
1902	31.21	4.33	.....	44.8	.....	0.2	29.25	.....	.02	+0.48	.....	4.20
1903	31.91	0.70	.....	43.0	.....	1.8	29.27	.02	.....	+1.80	1.32	.....
1904	28.45	.....	3.46	41.4	.....	1.6	29.24	.....	.03	+7.92	6.12	.....

MAXIMUM, MINIMUM AND MEAN ELEVATION (IN FEET) OF WATER IN LAKE MICHIGAN FOR EACH YEAR FROM 1854 TO 1904, INCLUSIVE.

Referred to City Datum (Low Water of 1847.)

Year.	LAKE MICHIGAN.			Year.	LAKE MICHIGAN.		
	Maximum.	Minimum.	Mean.		Maximum.	Minimum.	Mean.
1854.....	.....	.....	1.83	1879.....	2.51	—0.49	1.06
1855.....	3.45	0.15	1.56	1880.....	2.81	—0.99	1.16
1856.....	3.05	0.42	1.60	1881.....	3.01	—2.19	1.26
1857.....	4.35	0.60	2.42	1882.....	3.01	—0.99	2.00
1858.....	4.69	1.33	2.00	1883.....	3.81	—0.99	2.10
1859.....	4.45	1.31	2.98	1884.....	3.31	—0.01	2.24
1860.....	3.53	1.30	2.54	1885.....	3.71	—0.01	2.48
1861.....	4.40	1.20	2.56	1886.....	4.41	0.01	2.64
1862.....	3.30	0.70	2.50	1887.....	3.11	0.01	1.96
1863.....	3.30	—0.80	2.10	1888.....	3.01	0.01	1.30
1864.....	2.80	—0.40	1.57	1889.....	2.51	—0.79	0.77
1865.....	3.66	—1.08	1.30	1890.....	2.21	—0.99	0.63
1866.....	2.50	0.00	1.07	1891.....	1.61	—2.39	0.05
1867.....	2.60	—0.41	1.49	1892.....	1.30	—3.60	—0.17
1868.....	2.58	—1.00	1.01	1893.....	1.70	—0.30	0.69
1869.....	2.13	0.41	1.13	1894.....	1.80	—1.80	0.50
1870.....	3.25	—0.30	2.09	1895.....	0.00	—1.57	—0.49
1871.....	2.80	—0.40	1.77	1896.....	0.00	—1.70	—0.58
1872.....	1.80	—0.74	0.81	1897.....	1.60	—1.30	0.38
1873.....	2.70	—0.76	1.40	1898.....	1.09	—1.25	0.47
1874.....	2.80	—0.20	1.67	1899.....	2.10	—1.50	0.58
1875.....	3.01	—0.34	1.45	1900.....	1.20	—1.60	0.12
1876.....	4.31	0.34	2.56	1901.....	1.70	—0.90	0.89
1877.....	3.56	1.04	2.31	1902.....	1.30	—1.20	0.04
1878.....	3.14	0.51	2.00	1903.....	1.10	—1.40	0.15
				1904.....	2.00	—1.20	0.66

NORTH BRANCH, CHICAGO RIVER, CHANNEL FROM LAWRENCE AVENUE TO LAKE MICHIGAN.

The Sanitary District by ordinance of July 20, 1904, established right-of-way for a channel from Lawrence avenue and the North branch of Chicago river, northeasterly to Lake Michigan, described generally as follows (for more detailed description see pages 10,048 to 10,053, Proceedings of the Board of Trustees):

Beginning at a point in the south line of Section 12, Town 40 N., Range 13, east of the 3d P. M., 282.82 feet west of the south ¼ corner of said Section 12, thence northwesterly, passing out of said Section 12 at a point 1,351.13 feet east of the northwest corner of said section; thence northerly through Section 1, same town and range, leaving the section at a point 787.1 feet east of its northwest corner; thence northwesterly through Section 36, Town 41, N., Range 13 east of the 3d P. M., to its west ¼ corner, thence north along the east lines of Sections 35, 26, 23 and 14, same town and range, as far as a point in said east line of Section 14, 511.5 feet north of its ¼ corner; thence northeasterly through Section 13, same town and range, to the south line of Simpson street near Hartrey avenue; thence across Simpson street; thence east along north line of Simpson street to Dodge avenue, in Section 12, Town 41, N. Range 13, east of 3d P. M.; thence from Dodge avenue northeasterly, crossing Section 12, same town and range, to a point about 570 feet south of the south line of Lincoln street; thence northeasterly through Section 7, Town 41, N. Range 14, east of the 3d P. M., to Central avenue near its crossing by the Chicago, Milwaukee & St. Paul Railway, thence northerly, crossing Hill, Bryan, Linden and Greenleaf avenues in the Ouilmette Reservation, after which it curves northeasterly, crossing Sheridan Road nearly at right angles, connects with Lake Michigan.

THE IMPROVEMENT OF THE NORTH BRANCH FROM BELMONT TO LAWRENCE AVENUES.

On March 18, 1904, the Sanitary District let the work for excavating this channel for its northern 3,100 feet to Callaghan Brothers & Katz, being the part next south from Lawrence avenue, the 8,400 feet next north from Belmont avenue was let to the Chicago & Great Lakes Dredge & Dock Company, to whom subsequently the work of the northern 3,100 feet passed by agreement with the former contractors.

SPECIFICATIONS.

D. The work to be done consists of the excavation of a channel as shown upon the general map (see sheet No. 1) between the south line of Belmont avenue and the south line of Lawrence avenue; the filling of the bed of the present river and the low ground adjacent thereto, to the general elevation of adjacent land, as shown on above map; the disposal of the excess of excavation which is not required for filling; the excavating and disposal upon certain areas of the black soil between Berteau and Lawrence avenues; the building of certain bridges and the necessary approaches thereto; and the extension of existing sewers.

DIVISION OF WORK.

The work is divided into two sections, known respectively as Section 1 and Section 2.

SECTION 1 extends from the south line of Belmont avenue to the north line of Montrose boulevard, a distance of 8,400 feet, more or less, and includes the removal of existing bridges and the building of certain bridges as hereinafter specified. The amount of material to be excavated is approximately 451,000 cubic yards.

SECTION 2 extends from the north end of Section 1 to the south line of Lawrence avenue, a distance of 3,100 feet, more or less. The amount of excavation is approximately 252,000 cubic yards.

GRADE AND DIMENSIONS.

As shown upon sheet 2, the contractor shall excavate a channel ninety (90) feet wide and shall make the sides as nearly vertical as is practicable without the use of sustaining sheeting or other supports to the sides of the cut, thus allowing the sides of the channel to take a natural slope after the excavation is made. The channel must be excavated to grade, but no material excavated from below the grade plane will be paid for; nor in figuring the cubiture of the excavation will there be allowed a larger volume of excavation than that included between the natural surface of the ground and a plane twelve (12) feet below Chicago City datum for a width of ninety (90) feet. With the above limitation the material excavated will be paid for.

FLOODS.

In times of excessive rainfalls and freshets resulting therefrom, the land adjacent to the site of this work is overflowed. During the work of construction the contractor must so carry on the work of excavation and filling that there will be a channel at all times as adequate as present river to take care of flood waters. In case of any overflow and damage therefrom, resulting from negligence on the part of the contractor to provide a suitable channel, as above described, the contractor shall save the Sanitary District harmless from any and all resulting damage suits.

All public roads crossing or lying adjacent to the work shall be kept open and unobstructed during the progress of the work. No interference with any public road will be allowed until a temporary or permanent road has been provided, under the direction of the Chief Engineer, which will permit safe and free travel. No interference will be allowed with any street railway until such

time as other and proper provisions for the operation of such railway have been made.

The work specified is to be done and prosecuted with all possible diligence. The work must be completed in all its parts, including collateral work involved, on or before the expiration of eighteen months from date of contract.

(*a*). Price per cubic yard measured in place of black soil removed and spoiled upon the areas shown upon sheet No. 1, twenty-four and one-half cents (24½c).

(*b*). Price per cubic yard measured in place for the removal and disposal by the contractor of all material, other than the black soil, and that which is required for filling, twenty-eight and one-half cents (28½c).

(*c*). Price per cubic yard measured in place for excavation and placing as specified, of the material in the old river bed and on the low ground adjacent thereto; and in roadway approaches to bridge, twenty-eight and one-half cents (28½c).

The above prices must include the entire cost to the Sanitary District for the complete doing of the work of excavation.

(*d*). Price per thousand for extra brick for sewers as specified, fifteen dollars ($15.00).

All excavation shall be measured in place, and prices for excavation shall be understood to include all cost involved in finally disposing of the material excavated at the localities specified.

During the year the contractors on these two sections of the river improvement north of Belmont avenue performed the following work:

	Sec. 1.	Sec. 2.
Black dirt excavation.	3,500 cubic yards.	12,080.2 cubic yards.
Filling	49,200 cubic yards.	38,203.3 cubic yards.
Main sewer construction	300 feet.	

The Sanitary District has constructed central channels at the following streets, bridges of the bascule type having been built there in each case: State, Randolph, Taylor, Canal, Main and Loomis streets and Ashland avenue, and is now engaged in similar construction for Harrison and Eighteenth streets; has let contract for Twenty-second street, and has plans prepared for like work at Dearborn and Polk streets.

The expenditures by the Sanitary District for river improvement to December 1, 1904, are as follows:

Right-of-way	$ 1,599,364.75
Dredging and docking	1,868,681.09
Construction of bridges	2,141,955.97
Total	$ 5,610,001.81

THE WIDENING OF THE SOUTH BRANCH

was continued during the past year by the Sanitary District, excavating the tracts acquired from Gallup, Keith, Maxwell, Alton, Severns, and tract 57 which required the following work:

Total dredging these tracts.....53,500 cubic yards
Removal of old dock ..... 2,231.5 feet.
Removal of old piles, number.....251.
New pile dock ..... 1,878.3 lineal feet.
Total cost of this work.....$63,163.55.

CALUMET RIVER TO FLOW FROM LAKE MICHIGAN.

NEW CHANNEL SELECTED.

On May 4, 1904, the Sanitary District passed an ordinance for the establishment of the right-of-way for a channel for the Calumet district over certain lands in Cook County and on July 20, 1904, an ordinance was passed providing for the construction of a channel from the central line of the main channel of the Sanitary District of Chicago in Section 14, Town 37 N., Range 13 east of the 3d P. M., to the east line of the west half of the northeast ¼ Section 23, Town 37 N., Range 13 East of the 3d P. M.; but on December 7, 1904, both these ordinances were repealed and a new ordinance was passed which provides in its second section that a channel be constructed by the Sanitary District of Chicago, the center line of which shall begin at the center line of the main channel in Section 14, Town 37 N., Range 11, east of the 3d P. M. in Cook County, Illinois, at a point 807.55 feet (measured along the center line of said main channel) distant from the westerly line of said Section 14; running thence south 84 degrees east to the westerly reserve line of the Illinois and Michigan Canal; thence along the center line of the below described route. Said channel shall be constructed to a width of 90 feet at the bottom, with vertical sides — where the same is constructed to a width of 70 feet on the bottom, with side slopes of 3 feet vertical to 5 feet horizontal, where the same is constructed to a depth and on a grade sufficient to insure a flow of 22 feet of water.

The following is the route of the Calumet channel above ordered constructed as stated in a general way; the details are on pages 10,290 to 10,296 of District Proceedings:

The channel leaves the Calumet river, which is designed as its lake intake, and the channel center line is approximately the north line of the southwest ¼ of Section 32, Town 37 N., Range 14 East of the 3d P. M.; thence it passes southwestwardly through the south ½ of Section 31, same

town and range; westwardly about the center of the south half of Sections 36 and 35, same town, Range 13 East of the 3d P. M.; thence curves northwestwardly through Section 34, leaving it about 320 feet north of the east and west center line of the section; thence northwestwardly through the north half of Section 33, south ½ of Section 28, the east ½ and northwest ¼ of Section 29, the north ½ of Section 30, the south ½ of Section 19, same town and range and south ½ of Section 24, same town, Range 12 East of 3d P. M., leaving the latter section at the center of its west line; thence centrally and westwardly approximately in a straight line through Section 23, Town 37 N., Range 12, east of 3d P. M., Sections 22, 21, 20 and 17, 18, all of same town and range, and through Section 13, Town 37 N., Range 11, east of the 3d P. M., a little north of the center of its west line, thence to a point in the main channel of the Sanitary District of Chicago in Section 14, Town 37 N., Range 11, east of the 3d P. M., as previously described.

WEST FORK OF THE SOUTH BRANCH.

EXCAVATION OF THE ROCK SECTION.

On May 29, 1893, the City Council by order directed the Commissioner of Public Works "to proceed at once with the work of removing the rock from the West fork of the South branch." On September 1, 1893, a contract was made with FitzSimons & Connell Company. The improvement then contemplated was making a channel 60 feet wide and about 1,900 feet long through the rock ledge west of Western avenue, cutting to a depth of 17 feet below datum, so as to allow any vessels that could pass the tunnels to have a free waterway in the rock cut. Work under the contract was done in the years 1894, 1895 and 1896. Total cost of work done was $85,220.22.

At the end of 1895 it was estimated that 24,000 cubic yards of rock yet remained to be blasted and dredged, which would need about $94,000; but in 1896 it was expected that the United States would devote some of the money appropriated for the improvement of the Chicago river to the removal of this rock ledge, and the City did not prosecute that work farther.

On October 13, 1904, a contract was executed by the Sanitary District with Franklin Hardin and E. A. Hardin to excavate this part of the West fork of the South branch, of which the following are a few of the most important requirements:

COFFER-DAMS.

Coffer-dams must be built across the stream at or near the points marked A and B on the map. These may be of crib construction, as shown on plans

Exhibit No. 2. The contractor, however, may build these dams in any manner and of any material that he may select, but they must be water-tight and of ample strength to protect the work after the water is pumped out of the stretch of channel enclosed between the coffer-dams. They must be built to a height of four feet above Chicago datum. The contractor must maintain these dams during the whole period in which they are necessary for the protection of the work free of all cost or expense to the Sanitary District of Chicago. The price bid must be a lump sum for each dam and that sum must cover the entire amount to be paid by the district for erection, including materials used in construction and labor and use of tools, machinery and appliances, and the entire removal of the structures after the channel excavation shall have been completed.

PUMPING.

Immediately after the coffer-dams shall have been completed the contractor shall proceed to pump out and unwater the enclosed area so that the excavation hereinafter called for by these specifications can be performed by dry methods, and he shall keep the area to be excavated free from water until the entire excavation is completed. The cost of this pumping must be included in the prices bid for excavation.

EXCAVATION.

As soon as the contractor shall have unwatered the area between the coffer-dams, he shall proceed to excavate the channel within the lines established by the Engineer and to the depths which he shall direct. The channel so excavated shall be not less than eighty (80) feet in width and to a depth not above twelve (12) feet below Chicago datum.

DISPOSITION OF MATERIAL.

The excavated material shall be deposited on the south side of the channel on the space marked "spoil area;" the glacial drift shall be deposited farthest from the channel and the rock between it and the southerly edge of the channel, leaving a berm of ten (10) feet between the foot of the slope and the edge of the channel. The excavated material shall be leveled off on the spoil area to a height approximately that of the natural surface of the adjacent ground on the south.

SEWERS.

Provision must be made for caring for the several sewers discharging into the stretch of channel which must be unwatered, in the following manner: Strongly built box drains are to be built and connected up with the existing sewers and the effluent from these is to be carried in these boxes and discharged into the river either east or west of the unwatered area determined by the shortest distance to an outlet. The lumber used in these boxes shall be sound pine or hemlock not less than 1½ inches thick. The boxes shall be carried upon a uniform grade to be established by the engineer and shall be supported upon posts or studding securely placed at intervals not greater than 6 feet for the large boxes and 8 feet for the small boxes. These boxes must be made water-tight and so maintained during the progress of the work.

Box drains leading east on south side of channel:

(*a*). Box 2½ feet square, 100 feet long, taking sewage of brick sewer to station 0+85.

(*b*). Box 1½ feet square, 400 feet long, to take sewage from out-falls at station 3+70 and 3+86.

On north side of channel:

(*a*). Box 5 feet square, 130 feet long, taking sewage from 4½-foot brick sewer, station 1+14.

(*b*). Box drain 1 foot square, 200 feet long, to take sewage from 8-inch tile drain at station 1+82.

Box drains discharging west, north side of channel:

(*a*). Wooden box 1 foot square, 500 feet long, taking sewage from 12-inch tile drains located at station 18+31 and 21+82.

INTAKES.

EAST, SOUTH SIDE.—Four-inch iron pipe, 550 feet long, connecting to intake at station 5+34.

WEST, NORTH SIDE.—Box 1 foot square from station 17+65 to station 20+83 (318) feet and 1 foot x 2 feet from station 20+83 west through coffer-dam, to supply intakes at said station 17+76 and 20+83. These intakes are to be strongly built of 1½-inch pine or hemlock plank, to be water-tight and to be supported on posts or studding in the same manner as the sewer boxes hereinbefore described.

The International Harvester Company on December 7, 1904, agreed with the Sanitary District to give the use of portion of its lands to the temporary use of the contractor for the excavation of this part of the West fork, but imposed on such use by the Sanitary District contractor the following conditions, which were agreed to December 7, 1904, by the Trustees:

That the Sanitary District will, when it shall have unwatered that portion of the West fork of the South branch upon which our property abuts reconstruct our docks in a substantial manner which shall be acceptable to our engineer, it being understood that the style of dock is to be timber crib construction filled with broken stone. We, on our part, agree that we will pay toward the construction of this dock $12 per lineal foot, and you agreeing that all cost in excess of this resulting aggregate figure and the said sum of $12 per lineal foot shall be borne by you. Or in the event of our desiring to delay the erection of said dock or docks, the total length of which shall not exceed six hundred and three (603) feet, you shall pay us a sum which shall equal the cost of building such dock in excess of $12 per lineal foot, said excess cost to be determined on the basis of a good and sufficient timber dock, stone filled and completed in a thoroughly workmanlike manner to the satisfaction of our engineer, as above mentioned. It is also agreed that you shall at once construct and maintain a good and sufficient fence in the position indicated in red lines on said plat, for the exclusion of trespassers, which fence shall, with all other construction and appliances, be removed by you within the time granted you as above set forth.

And further on condition that you or your contractors shall pay for the removal of the steel now stored on the area so to be used and for supporting the end of a shed now located thereon, all as per plat herewith.

CONCRETE DOCK CONSTRUCTION.

The Sanitary District has commenced what it is hoped will be continued by property owners, that is, the construction of permanent docks. During the year the first main dock in concrete was constructed on the west side of the South branch of the Chicago river from Madison street to Randolph street.

COMMERCE BY LAKE.

The study of the tables of our commerce by lake for the year 1901 is not one calculated to bring pleasure to one anxious for the progress of our City. Our lake commerce has fallen off 2,279,936 tons; practically one-seventh of our lake tonnage of 1903 has left our City and gone to other ports. Our lake trade has gone back eight years; we have lost the progress that we have made since 1896, when our lake tonnage was 12,965,812 tons, which is practically our tonnage in 1904, being only 219,734 tons greater than that year. The number of vessels in our lake carrying trade has decreased 1,899 for 1904 as against year 1903, that is, we have lost a fleet of vessels from the trade of our City in 1904 equal to the entire number of vessels that entered and cleared from our southern deep water port on the Calumet during the past year. The average cargo for our City has decreased from 1,015 tons in 1903 to 988 tons for 1904, so that we realize that the vessels that remained in our trade in 1904 were of lighter draft than those that used our harbors in the preceding year.

If we seek the cause of this decrease in the number as well as the average carrying capacity of the vessels that used our harbors during the year, we must realize that the obstructions to vessel movement presented by the three tunnels under the river (although the mean depth of water over them has increased six inches in 1904) form an important if not the chief part of the cause of this decline in our shipping interests, which also manifests itself in the decrease in the tonnage built by the City during the year.

TONNAGE, CITY OF CHICAGO, YEAR 1904.

ENTRANCES.

ENTERED AT	FROM AMERICAN PORTS.		FROM FOREIGN PORTS.		TOTALS.	
	No. Vessels	Tonnage.	No. Vessels	Tonnage.	No. Vessels	Tonnage.
Chicago river	5,515	4,314,520	78	114,086	5,593	4,428,606
Calumet river	821	1,881,044	14	15,442	835	1,896,486
Total Entrances, Chicago	6,336	6,195,564	92	129,528	6,428	6,325,092

CLEARANCES.

CLEARED FROM	TO AMERICAN PORTS.		TO FOREIGN PORTS.		TOTALS.	
	No. Vessels	Tonnage.	No. Vessels	Tonnage.	No. Vessels	Tonnage.
Chicago river	5,365	4,093,095	128	158,314	5,493	4,251,409
Calumet river	936	2,116,069	47	53,508	983	2,169,577
Clearances, City of Chicago	6,301	6,209,164	175	211,822	6,476	6,420,986
Totals Trade, City of Chicago.	12,637	12,404,728	267	341,350	12,904	12,746,078

CITY OF CHICAGO—SUMMARY OF COMMERCE BY LAKE. 1904.

	Vessels.	Tons
Entrances	6,428	6,325,092
Clearances	6,476	6,420,986
Total	12,904	12,746,078
Average cargo for the City		988

VESSELS BUILT IN THE DISTRICT OF CHICAGO, YEAR 1904.

WOOD.				STEEL.			
Class.	Name.	Tons.	Cost.	Class.	Name.	Tons.	Cost.
Gasoline.	Alice Mac.	8	$10,000.00	Steamer.	Missouri...	1,484	$165,000.00
Gasoline.	Norma	11	6,000.00	Steamer.	Tensas.....	42	14,000.00
Yawl....	Nahma....	15	4,000.00				
Yawl....	Roamer ...	9	1,000.00				
Schooner	Foam.....	10	2,500.00				
Steam...	May Queen	16	5,000.00				
Totals.	(Wood)	69	$19,500.00	Totals.	(Steel)	1,526	$179,000.00

GRAND TOTAL.

	Vessels.	Tonnage.	Cost.
Steel.....	2	1,526	$179,000.00
Wood.....	6	69	19,500.00
Total.....	8	1,595	$198,500.00

Comparing the above results with those for last year shows that for year 1904 we built in this district 13,237 tons less than in 1903, employing in new vessel construction $1,578,000.00 less than we used for that purpose in 1903.

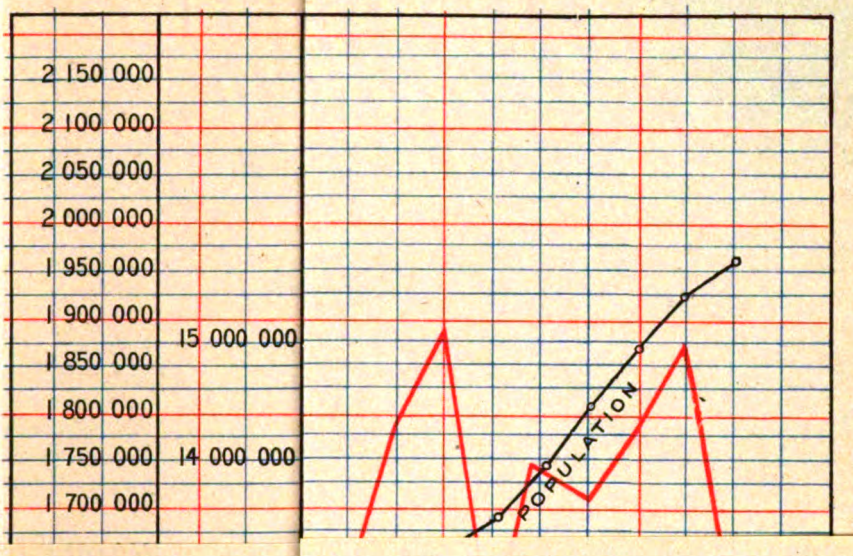
MOVEMENT OF VESSELS IN CHICAGO RIVER.

BRIDGES.	Days in Service.	NUMBER.			AVERAGE.					PERCENTAGE OF TIME.	
		Hours Open.	Vessels Passed.	Swings of Bridges.	Number of Vessels per Day.	Number of Swings per Day.	Time Open in Minutes, per Swing.	Time Open in Minutes, per Hour.	Time Open in Minutes, per Day.	Closed.	Open.
Rush street.....	247	272.01	7,558	6,493	30.59	26.28	2.51	2.75	66.07	95.42	4.58
Wells street.....	254	263.25	5,803	5,221	22.84	20.55	3.02	2.59	62.18	95.69	4.31
Lake street.....	254	194.50	3,865	3,420	15.21	13.46	3.41	1.91	45.94	96.81	3.19
Jackson street	199	157.68	3,040	2,798	15.27	14.06	3.38	1.98	47.53	96.70	3.30
Twelfth street	247	166.78	3,530	3,168	14.29	12.82	3.16	1.69	40.51	97.19	2.85
Twenty-second street....	254	221.18	2,807	2,520	11.05	9.92	5.27	2.18	52.24	96.38	3.62
Kinzie street.....	247	240.16	5,179	4,045	20.97	16.38	3.56	2.43	58.34	95.95	4.05
Chicago avenue.....	225	181.93	1,688	1,633	7.50	7.26	4.85	1.47	35.18	97.56	2.44

NOTE.—This table gives time only for actual service per telephone operator at the designated bridges, night and day. Day and night reports are given for the above named bridges until December 18th. Wells, Lake and Twenty-second streets to December 25th.

YEAR 1904—DETAILS OF VESSEL MOVEMENTS PASSING BRIDGES, BY MONTHS.

MONTHS.	RUSH STREET.			WELLS STREET.			LAKE STREET.			JACKSON STREET.			TWELFTH STREET.			TWENTY-SECOND STREET.			KINZIE STREET.			CHICAGO AVENUE.		
	No. Vessels.	No. Swings.	Minutes Open.	No. Vessels.	No. Swings.	Minutes Open.	No. Vessels.	No. Swings.	Minutes Open.	No. Vessels.	No. Swings.	Minutes Open.	No. Vessels.	No. Swings.	Minutes Open.	No. Vessels.	No. Swings.	Minutes Open.	No. Vessels.	No. Swings.	Minutes Open.	No. Vessels.	No. Swings.	Minutes Open.
April	115	111	240	74	72	209	58	58	183	47	45	135	47	46	135	57	54	223	237	187	653	60	58	284
May	557	500	1,086	435	393	1,090	294	270	813	85	80	261	273	251	760	258	248	1,037	500	402	1,361	175	171	774
June	1,073	921	2,313	756	684	2,065	467	407	1,253	93	88	296	442	390	1,222	369	332	1,442	787	608	2,205	296	290	1,333
July	1,472	1,199	3,069	961	825	2,601	558	487	1,685	566	513	1,738	547	499	1,484	440	379	1,734	747	582	2,048	266	255	1,302
August	1,446	1,224	3,143	959	859	2,687	543	477	1,656	527	473	1,661	521	452	1,414	384	348	1,583	765	594	2,058	279	273	1,319
September	1,065	915	2,375	783	710	2,231	543	459	1,640	518	477	1,668	514	464	1,456	373	325	1,341	712	547	1,974	227	222	1,096
October	887	770	1,971	793	726	2,190	579	510	1,773	557	512	1,662	546	479	1,505	417	370	1,776	624	504	1,741	237	225	1,123
November	705	631	1,575	733	663	1,945	572	514	1,839	486	456	1,544	483	437	1,498	373	338	1,568	582	413	1,552	55	55	257
December	238	222	554	309	289	777	251	238	830	161	154	496	157	150	533	136	126	567	275	213	818	93	84	428
Totals	7,558	6,493	16,326	5,803	5,221	15,795	3,865	3,420	11,672	3,040	2,798	9,461	3,530	3,168	10,007	2,807	2,520	11,271	5,179	4,045	14,410	1,688	1,633	7,916



DAMAGE DONE BY VESSELS.

MONTHS.	Accidents.	Damage.
January	.....	.....
February	.....	.....
March	5	$ 28.15
April	2	55.30
May	6	50.26
June	18	979.00
July	15	1,120.00
August	18	762.97
September	24	630.96
October	15	853.46
November	10	76.14
December	10	22.04
Total	118	$4,578.98

In addition to the foregoing a serious accident occurred at Blackhawk Street Bridge on June 2d, 1904, when the steamer Black Rock of Michigan City ran against the center pier of the bridge displacing the bridge, moving it several feet out of center, and entailing a heavy expense probably over three thousand dollars to get the bridge in working condition again. The repairing of this damage will be completed in January, 1905.

THE LAKE COMMERCE OF CHICAGO—FOREIGN AND DOMESTIC—1904. RECEIPTS—CITY OF CHICAGO.

ARTICLES.	CHICAGO RIVER		CALUMET RIVER		TOTALS.
	Foreign.	Domestic.	Foreign.	Domestic.	
Coal.....tons	.....	762,671	.....	262,182	1,024,853
Iron ore ..... "	....	15,182	.....	2,558,440	2,574,622
Salt.....bbls.	.....	1,397,252	.....	129,607	1,526,859
Lumber .....M	6,920	371,107	.....	24,812	402,839
Shingles..... "	.....	10,770	.....	10,026	20,796
Lath..... ..... "	2,181	9,580	.....	2,000	13,761
Posts .....pieces	1,529	1,006,954	.....	42,600	1,051,083
Ties..... "	147,347	1,512,403	.....	127,484	1,787,234
Poles..... ..... "	.....	35,045	.....	78,120	113,165
Wood.....cords	.....	8,006	....	1,990	9,996
Plaster .....bbls.	.....	41,598	.....	42,500	84,098
Cement ..... "	.....	278,413	.....	.....	278,413
Asphalt..... "	.....	24,657	.....	.....	24,657
Sulphur ..... "	.....	5,644	.....	.....	5,644
Copper .....bars	.....	76,466	.....	.....	76,466
Hides.....bales	.....	1,214	.....	.....	1,214
Hardware .....pkgs.	5	399,078	.....	.....	399,083
Shoes..... "	.....	368,079	.....	.....	368,079
Sugar ..... "	.....	1,478,305	.....	.....	1,478,305
Groceries.....tons	1,216	72,047	.....	360	73,623
Green Fruit.....bags	.....	3,882,058	.....	.....	3,882,058
Potatoes..... ..... "	.....	180,330	.....	.....	180,330
Coffee .....sacks	16	127,348	.....	.....	127,364
Grain .....bush.	.....	978,600	75,000	959,000	2,012,600
Unclassified.....tons	4,403	457,326	.....	1,860	463,589

THE LAKE COMMERCE OF CHICAGO—FOREIGN AND DOMESTIC—1904. SHIPMENTS—CITY OF CHICAGO.

ARTICLES.	CHICAGO RIVER		CALUMET RIVER		TOTALS.
	Foreign.	Domestic.	Foreign.	Domestic.	
Wheat.....bush.	.....	3,671,112	.....	2,044,875	5,715,987
Corn..... ..... "	1,546,669	23,092,204	1,735,165	15,490,790	41,864,828
Oats..... "	.....	5,052,595	.....	2,552,871	7,607,466
Rye .... "	.....	125,000	.....	112,000	237,000
Barley..... "	.....	284,990	89,000	710,000	1,083,990
Flaxseed .... "	.....	161,500	.....	.....	161,500
Flour ....bbls.	19,664	1,315,710	.....	200,065	1,535,439
Cereals..... "	725	69,798	.....	.....	70,523
Mill stuffs .....sacks	.....	1,726,374	.....	178,876	1,905,250
Gluten meal ..... "	.....	119,266	.....	.....	119,266
Malt..... "	.....	114,973	.....	.....	114,973
Oil-cake ..... "	2,117	146,482	1,324	46,052	195,975
Grass-seed ..... "	600	34,719	.....	1,270	36,589
Glucose ..... "	.....	67,104	.....	.....	67,104
Sugar ..... "	.....	30,010	.....	.....	30,010
Oil ..... "	.....	2,845	.....	101,823	104,668
Pork ..... "	2,112	4,860	170	.....	7,142
Tallow ..... "	.....	23,553	.....	300	23,853
Hides.....bales	.....	4,898	.....	.....	4,898
Wool and Hair.....sacks	.....	31,962	.....	3,125	35,087
Broom-corn .....bales	.....	1,249	.....	.....	1,249
Spelter.....plates	.....	120,981	.....	.....	120,981
Groceries .....tons	.....	5,850	.....	1,260	7,110
Iron ..... "	194	2,146	660	17,989	20,989
Unclassified..... "	5,305	310,030	55	61,354	370,144

OPERATION OF BRIDGES, YEAR 1904.

PATRICK WHITE, Superintendent.

The following table, prepared in the Harbor Division from the reports of Bridge Tender, gives a detailed account of the bridges of the City, showing the average time consumed per swing, also giving an average number of swings that each bridge makes both monthly and annually, and by what power each bridge is operated:

BRIDGES.		Average Time of each Swing in Minutes.	Average Number of Swings Each Month.	Total Number of Swings Annually.
Adams street	Electricity	3.9	289	3,466
Archer avenue	Hand	6.9	112	1,349
Ashland avenue (Thirty-ninth street)	"	10.	8	16
Ashland Avenue (river)	Electricity	4.35	118	1,417
Belmont avenue	(9 months) Hand	10⅛	20	178
*Blackhawk street	"	4.16	81	489
Chicago avenue	"	4.85	136	1,633
Chittenden street	"	20	34	405
Clark street	Electricity	2	492	5,905
Canal street	"	2.99	287	3,446
Clybourn place	"	3	91	1,097
†Deering street	Hand	.....	.....	.....
Diversey boulevard	"	4½	10	115
Division street (canal)	Electricity	4	87	1,049
Division street (river)	(6 months) "	4.83	129	779
Dearborn street	"	2	455	5,459
†Eighteenth street	"	.....	.....	.....
Erie street	Hand	5½	150	1,811
Fuller street	"	7	199	2,394
Fullerton avenue	Electricity	3.37	84	1,002
†Harrison street	.....	.....	.....	.....
Halsted street (canal)	Hand	4.3	171	2,051
Halsted street (South)	Steam	3.53	264	3,169
Halsted street (North, river)	Electricity	2.26	122	1,468
Indiana street	Hand	3.51	362	4,344
Jackson boulevard	Electricity	2	288	3,465
Kinzie street	Hand	3.56	371	4,457
Lake street	Electricity	3.42	305	3,668
Laurel street	Hand	4.95	2	22
Madison street	Steam	3.26	296	3,555
Main street	Electricity	3.5	165	1,988
North avenue	Hand	3.16	225	2,699
Ninety-second street	"	4.65	412	4,949
Ninety-fifth street	Electricity	5.10	130	1,563
106th street	Hand	5.5	272	3,271
Polk street	"	5.16	271	3,248
Randolph street	Electricity	3.15	301	3,611
Riverdale	.....	.....	.....	.....
Rush street	Electricity	2	598	7,181
State street	"	3	487	5,840
‡Taylor street	"	3	291	3,494
Twelfth street	Steam	3.20	278	3,324
Twenty-second street	Hand	5.55	222	2,665
Thirty-fifth street	"	7	37	446
Van Buren street	Electricity	2	296	3,540
Washington street	"	2.19	310	3,729
Webster avenue	Hand	3.67	120	1,441
Weed street	"	.....	.....	.....
Wells street	Electricity	3.05	457	5,491
Western avenue (North)	"	7	37	446
Western avenue (South)	Hand	5	56	677

*Bridge undergoing repairs.
†New bridge under construction.
‡Bridge was open 681 minutes making repairs.

COMMERCE BY LAKE AND CANAL—CITY OF CHICAGO.

FROM 1860 TO 1904, BY YEARS, WITH POPULATION 1831 TO 1904. COMPILED FROM OFFICIAL RECORDS OF THE DEPARTMENT.

Years	VESSELS BY LAKE.			BY ILL. & MICH. CANAL.			POPULATION.	REMARKS.	
	Total No.	Total Tonnage.	Average, Cargo, Ton.	Boats No.	Tonnage.	Tolls, Dollars.			
1860	.....	.....	.....	201	367,437	138,554	109,460		
1861	.....	.....	.....	194	547,295	218,040	120,000		
1862	14,687	3,847,246	262	211	673,590	264,647	137,030		
1863	17,135	4,333,832	252	240	619,599	210,386	150,000	Population, Prior Years.	
1864	17,762	4,339,770	244	228	510,286	156,607	161,288		
1865	20,179	4,199,135	208	228	616,140	300,810	178,492		
1866	22,199	4,620,092	208	230	746,815	202,958	200,418		
1867	24,370	5,101,203	209	209	746,954	252,231	225,000	1831	60
1868	26,399	6,005,403	265	218	737,827	215,720	252,054	1832	600
1869	27,602	6,273,346	227	219	817,788	238,759	280,000	1833	350
1870	25,172	6,033,207	239	179	585,970	149,635	298,700	1834	1,800
1871	24,632	6,178,336	251	186	628,975	159,050	334,270	1835	3,265
1872	25,353	6,077,542	239	173	783,641	165,874	367,396	1836	4,000
1873	23,734	6,564,542	239	172	849,533	166,641	380,000	1837	4,179
1874	21,547	6,329,711	294	152	712,020	144,831	395,400	1838	4,000
1875	21,095	6,279,055	298	142	676,025	107,081	407,000	1839	4,200
1876	19,245	6,167,786	320	146	691,946	113,293	420,000	1840	4,470
1877	20,517	6,585,415	321	145	605,912	96,913	439,776	1841	5,500
1878	20,984	7,239,673	345	140	598,792	84,330	450,000	1842	6,590
1879	23,873	7,757,395	325	136	669,559	89,064	475,000	1843	7,580
1880	25,520	9,154,351	345	133	751,360	92,296	503,298	1844	8,000
1881	26,005	8,762,247	337	133	826,133	85,130	540,000	1845	12,088
1882	26,977	9,754,949	362	132	1,011,287	85,947	560,693	1846	14,169
1883	23,982	7,790 337	325	132	925,575	77,975	580,000	1847	16,859
1884	22,826	7,508,696	330	134	956,721	77,102	630,000	1848	20,023
1885	21,542	7,306,222	339	135	827,355	66,800	664,634	1849	23,047
1886	22,372	7,877,080	352	130	808,019	62,516	704,000	1850	28,296
1887	23,972	8,749,852	365	132	742,074	58,024	760,000	1851	34,000
1888	22,095	8,890,658	402	127	751,055	56,028	830,000	1852	38,734
1889	21,788	10,267,881	471	114	917,047	60,605	1,100,000	1853	60,662
1890	20,133	10,116,051	502	104	742,392	65,112	1,208,669	1854	65,872
1891	19,680	10,862,898	522	97	641,156	49,557	1,323,339	1855	80,023
1892	21,123	11,780,393	565	95	783,288	54,937	1,438,010	1856	86,000
1893	17,044	10,788,029	692	82	529,816	38,702	1,502,868	1857	93,000
1894	16,202	10,284,178	635	85	617,811	44,928	1,567,727	1858	84,000
1895	18,232	12,631,180	693	83	591,407	39,106	1,584,070	1859	94,000
1896	16,999	12,965,812	763	67	446,762	34,543	1,600,418		
1897	17,865	14,277,235	799	64	600,000	41,000	1,637,000		
1898	18,512	15,116,426	817	64	395,017	38,570	1,670,000		
1899	16,174	12,599,239	779	64	469,352	41,022	1,698,575		
1900	16,976	13,990,894	824	60	121,759	20,866	1,758,000		
1901	16,274	13,634,904	838	41	81,456	11,151	1,820,000		
1902	15,754	14,239,398	904	.....	.....	.....	1,885,000		
1903	14,803	15,026,014	1,015	.....	.....	.....	1,950,000		
1904	12,904	12,746,078	988	.....	.....	.....	1,962,251		

MONTHLY MEAN BAROMETRIC PRESSURE—(IN INCHES) ANNUAL MEANS FROM 1873 TO 1904—FOR CHICAGO.

YEAR.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.	YEAR.
1873	29.13	29.14	29.14	29.05	29.02	29.10	29.13	29.17	29.17	29.15	29.11	29.21	29.13	1873
1874	.21	.22	.18	.19	.11	.09	.13	.13	.16	.21	.19	.22	.17	1874
1875	.31	.19	.10	.10	.06	.10	.12	.10	.17	.10	.17	.03	.13	1875
1876	.16	.15	.10	.09	.10	.02	.12	.16	.12	.06	.10	.18	.11	1876
1877	.22	.27	.14	.07	.15	.04	.09	.09	.14	.11	.14	.19	.14	1877
1878	.14	.05	.04	28.91	.06	.06	.11	.04	.18	.12	.15	.16	.08	1878
1879	.22	.19	.18	29.13	.16	.13	.10	.11	.21	.25	.18	.19	.17	1879
1880	.13	.16	.19	.06	.11	.10	.12	.16	.18	.18	.28	.21	.16	1880
1881	.23	.21	.00	.13	.15	.07	.15	.15	.09	.20	.18	.21	.15	1881
1882	.23	.13	.16	.15	.11	.02	.15	.12	.21	.14	.25	.20	.16	1882
1883	.23	.35	.15	.07	.06	.06	.12	.20	.20	.22	.19	.19	.17	1883
1884	.25	.13	.13	.07	.07	.16	.06	.17	.15	.24	.19	.20	.15	1884
1885	.22	.10	.18	.13	.05	.15	.10	.11	.16	.11	.09	.15	.13	1885
1886	.15	.17	.08	.17	.09	.12	.11	.11	.17	.30	.13	.27	.16	1886
1887	.16	.23	.18	.07	.11	.11	.10	.14	.20	.17	.17	.16	.15	1887
1888	.31	.14	.20	.25	.04	.05	.16	.16	.19	.09	.24	.17	.17	1888
1889	.03	.21	.11	.13	.07	.10	.10	.20	.14	.25	.18	.15	.14	1889
1890	.23	.16	.18	.21	.14	.11	.14	.19	.23	.06	.17	.20	.16	1890
1891	.16	.11	.14	.12	.23	.07	.16	.12	.25	.22	.17	.14	.16	1891
1892	.20	.20	.17	.15	.02	.06	.20	.15	.21	.18	.17	.20	.16	1892
1893	.08	.19	.11	.01	.03	.10	.10	.15	.12	.13	.14	.18	.11	1893
1894	.17	.20	.11	.12	.07	.13	.16	.17	.17	.06	.17	.19	.14	1894
1895	.10	.22	.14	.12	.13	.17	.14	.08	.14	.18	.21	30.00	.25	1895
1896	29.23	29.04	29.16	29.14	29.07	29.11	29.15	29.16	29.15	29.17	29.21	29.27	29.16	1896
1897	29.20	29.16	29.13	29.17	29.14	29.10	29.08	29.13	29.29	29.20	29.18	29.17	29.16	1897
1898	29.12	29.18	29.20	29.18	29.08	29.13	29.17	29.12	29.15	29.13	29.15	29.16	29.15	1898
1899	29.19	29.15	20.06	29.13	29.14	29.16	29.12	29.11	29.19	29.24	29.17	29.15	29.15	1899
1900	29.16	29.10	29.16	29.16	29.09	29.09	29.10	29.15	29.19	29.21	29.18	29.16	29.15	1900
1901	29.12	29.15	28.98	29.21	29.01	29.04	29.03	29.10	29.14	29.23	29.23	29.13	29.14	1901
1902	29.24	29.11	29.08	29.08	29.13	29.05	29.12	29.13	29.11	29.15	29.13	29.18	29.12	1902
1903	29.06	29.18	29.25	29.03	29.16	29.10	29.12	29.11	29.20	29.21	29.20	29.15	29.15	1903
1904	29.18	29.27	29.11	29.15	29.08	29.12	29.14	29.18	29.19	29.19	29.18	29.12	29.16	1904

PRECIPITATION AT CHICAGO, ILL., IN INCHES, BY MONTHS, SEASONS AND YEARS, FROM 1843 TO 1904, INCLUSIVE.

Year.	MONTHLY TOTALS.												TOTALS, SEASONS AND YEARS.					Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Spring.	Summer.	Autumn.	Winter.	Annual.	
1843	2.0	1.9	3.0	4.5	4.0	4.6	1.4	2.4	3.0	1.2	5.1	2.4	11.5	8.4	9.3	. . .	35.50	1843
1844	2.8	1.3	1.76	2.76	6.0	5.5	5.0	4.2	0.8	1.6	0.7	0.7	10.52	14.7	3.1	6.5	33.12	1844
1845	2.0	0.5	2.2	6.5	2.0	3.8	3.5	1.2	4.4	1.4	3.3	1.5	10.7	8.5	9.1	3.2	32.30	1845
1846	4.9	1.8	2.6	7.8	2.4	4.3	2.9	1.0	5.0	0.8	1.5	5.0	12.8	8.2	7.3	8.2	40.00	1846
1847	2.3	3.5	1.5	2.1	3.3	1.5	2.8	2.0	3.2	4.6	4.8	1.2	6.9	6.3	12.6	10.8	32.80	1847
1848	1.6	2.4	4.5	3.3	3.8	4.4	3.4	5.1	2.2	3.2	2.1	8.4	11.6	12.9	7.5	5.2	44.40	1848
1849	5.5	1.0	4.7	1.8	3.8	3.6	2.3	3.5	2.6	2.8	1.4	1.2	10.3	9.4	6.8	14.9	34.20	1849
1850	2.1	0.7	2.0	3.8	1.9	3.1	2.1	6.4	1.4	2.0	3.2	1.7	7.7	11.6	7.6	4.0	30.40	1850
1851	1.5	3.8	0.8	4.2	6.7	5.3	3.8	3.1	3.2	2.3	2.3	1.6	11.7	12.2	7.8	7.0	38.60	1851
1852	2.0	1.2	5.5	4.8	2.4	2.5	3.4	0.6	2.3	6.8	4.0	3.3	12.7	6.5	13.1	4.8	38.80	1852
1853	1.4	2.2	1.8	2.8	4.4	4.9	6.1	2.2	4.2	2.0	2.1	2.3	9 0	13.2	9.3	6.9	36 40	1853
1854	1.3	1.9	2.1	2.1	3.1	2.6	3.0	0.9	1.6	3.6	1.0	1.4	7.3	6.5	6.2	5 5	24.60	1854
1855	8.0	0.6	2.6	1.4	2.5	3.7	5.8	3.2	2.3	2.0	2.2	2.0	6 5	12.7	6.5	10.0	36 30	1855
1856	0.9	1.8	0.6	2.6	4.8	2.5	2.1	1.3	2.5	2.1	3.98	3.86	8.0	6.9	8.55	4.7	29.04	1856
1857	1.09	5 43	2.5	2.19	6.33	4.14	3.0	5.0	2.2	4.0	2.7	1.2	11.02	12.14	8.9	10.38	39.83	1857
1858	1.3	1.4	3.0	3.1	7.8	6.3	5.9	3.2	4.0	4.6	4.5	2.0	13.9	15.4	13.1	3.9	47.10	1858
1859	1.4	1.8	5.2	3.4	3.6	1.7	0.9	0.4	2.2	4.1	2.8	1.8	12.2	3.0	9.1	5.2	29.30	1859
1860	1.6	1.6	1.0	2.8	4.6	3.5	5.3	2.6	2.8	4.1	2.3	4.2	8.4	11.4	9.2	5.0	36.40	1860
1861	1.4	3.0	3.4	4.7	3.7	2.1	4.3	2.4	3.4	7.5	1.5	1.9	11.8	8.8	12.4	8.6	39.30	1861
1862	4.0	0.7	2.0	5.2	4.3	2.9	6.7	3.6	5.6	2.92	1.2	1.3	11.5	13.2	9.72	6.6	40.42	1862
1863	2.8	2.6	2.1	2.1	5.1	1.3	2.3	4.2	1.6	4.0	1.9	3.6	9.3	7.8	7.5	6.7	33.60	1863
1864	1.6	0.4	2.1	3.2	1.9	2.1	6.4	1.1	2.1	1.9	3.1	2.5	7.3	9.6	7.1	5.6	28.40	1864
1865	0.4	3.1	3.1	3.8	1.5	5.1	6.1	7.2	4.8	4.0	0.5	0.6	8.4	18.5	9.3	6.0	40.20	1865
1866	2.8	1.6	2.2	2.	2.0	4.4	4.7	4.2	4.6	2.8	0.8	3.4	7.0	13.3	8.2	5.0	36.30	1866
1867	1.93	2.22	1.58	1.70	4.42	1.86	1.52	2.33	0.57	1.28	1.89	1.11	7.70	5.71	3.74	7.55	22.41	1867
1868	1.28	0.92	5.24	3.00	3.74	3.11	2.87	3.55	7.08	1.69	2.60	1.40	11.98	9.45	11.37	3.31	36.48	1868
1869	1.97	2.23	1.33	4.90	5.69	5.03	3.26	1.32	0.89	1.10	2.42	2.03	11.22	10.61	4.41	5.60	31 57	1869
1870	1.95	0.86	1.81	1.15	0.80	1.70	3.71	2.07	2.82	2.43	1.16	2.46	3.76	7.48	6.41	4.84	22.92	1870
1871	4.13	1.45	2.66	3.79	3.90	5.56	2.52	2.01	0.74	1.88	3.62	3.44	10.35	10.10	12.24	8.04	35.61	1871
1872	0.68	0.84	3.79	3.08	3 24	3.45	3.09	2.59	6.43	0.65	1.06	0.22	10.06	9.13	2 14	5.14	29.07	1872
1873	2.56	0.47	0.89	6.22	7.20	1.44	4.04	1.58	3.53	2.43	1.61	4.44	14.31	7.06	7.57	3.25	36.41	1873
1874	3.47	1.51	2.15	2.67	2.08	3.25	0.58	3.15	3.76	2.55	2.83	0.63	6.90	6.98	9.14	9.42	28.63	1874
1875	0.96	1.99	1.43	2.32	3.64	5.17	7.18	3.28	4.39	4.32	0.75	2.62	7.39	15.60	9.46	3.58	38.06	1875
1876	3.22	3.90	4.04	2.07	1.85	5.96	3.11	3.66	3.74	1.20	3.25	0.48	7.96	12.73	8.29	9.74	36.48	1876
1877	1.91	0.06	5 37	2.42	1.81	6.04	2.98	3.06	2.02	6.15	6.08	2.75	9.60	12.08	14.25	2.45	41.01	1877
1878	1.31	2.12	4.39	5.57	5.22	3.02	6.09	3.66	1.99	5.17	0.83	2.58	15.18	12.77	7.99	6.18	41.96	1878
1879	0.54	1.47	2.37	1.93	3.89	3.18	5.58	0.45	1.18	2.72	4.93	2.47	8.19	9.21	8.83	4.59	30.71	1879
1880	3.53	2.91	2.25	5.20	4.97	3.50	3.07	4.47	2.25	3.19	0.87	1.11	12.42	10.04	6.31	8.91	37.32	1880
1881	0.87	5.98	2.99	1.84	1.85	5.93	4.31	0.54	4.84	6.89	5.97	2.67	6.68	10.78	17.21	8.06	44.18	1881
1882	1.55	2.24	3.43	6 72	5.52	5.71	3.43	4.96	0.91	3.40	1.48	1.99	15.67	14.00	5.97	6.46	41.34	1882
1883	1.74	4.74	0.42	3.72	7.32	5.61	5.53	1.21	1.36	1.36	5.26	1.59	11.46	12.35	13.98	8.47	45.86	1883
1884	1.39	3.27	5.16	3.05	1.53	2.11	3.71	2.50	2.29	3.59	1.80	4.21	9.74	8.32	7.68	6.25	34.61	1884
1885	3.18	2.01	0.57	4.00	3.17	5.20	2.44	11.28	2.97	3.87	2.33	3.35	7.74	18.92	9.17	9.40	44.37	1885
1886	3.56	1.51	1.79	1.29	1.00	0.94	1.53	3.38	6.93	1.42	1.66	1.76	4.08	5.85	10 01	8.42	26.77	1886
1887	3.13	5.10	0.89	0.46	1.38	1.63	1.05	3.35	4.03	2.03	2.41	3.67	2.63	6.03	4.47	9.99	29.13	1887
1888	1.56	1.51	2.99	2.13	6.22	1.66	3.93	2.10	0.98	2.95	2.89	1.94	11.34	7.69	6.72	6.74	30.86	1888
1889	1.60	1.31	1.43	2.35	5.38	2.93	9.56	0.39	2.75	1.82	3.49	1.90	9.18	12.88	8.06	4.09	34.95	1889
1890	2.98	2.42	2.10	3.23	5.13	3.25	2.57	2.58	1.39	4.20	1.59	1.25	10.46	8.40	7.18	7.30	32.69	1890
1891	1.99	1.96	2.13	3.14	2.09	2.42	2.47	4.52	0.32	0.36	2.83	1.32	7.36	9.41	4.51	5.19	26.54	1891
1892	1.99	1.57	2.21	2.17	6.77	10.58	2.23	1.85	1.34	1.54	2.68	1.63	11.15	14.66	5.56	4.88	36.56	1892
1893	2.08	2.44	1.69	4.16	1.93	3.59	3.08	0.18	1.98	1.75	2.45	2.14	7.78	6.85	6.18	6.15	27.47	1893
1894	1.55	2.15	2.66	2.65	3 35	1 96	0.60	0.60	8.28	0.84	1.18	1.66	8.66	3.16	10.30	5.84	27.46	1894
1895	2.15	1.60	1.32	0.86	1.99	1.79	2.42	6.49	0.89	0.51	5.60	6.76	4.17	10.70	7.00	5.41	32 38	1895
1896	1.12	3.48	1.26	2 79	4.16	2.83	3.61	3.52	6.70	1.36	2.16	0.16	8.21	9.96	10 22	11 36	39.14	1896
1897	4.53	2.22	3.56	2.23	0.84	3.60	1.47	1.70	0.84	0.18	3.06	1.62	6.63	6.77	4.08	6.91	25.85	1897
1898	3.54	2.59	4.60	0.76	2.23	5.30	1.94	3.03	3.16	3.26	2.25	1.11	7.59	10.27	8.67	7.24	33.77	1898
1899	0.58	1.60	2.11	0.14	4.35	2.71	6.6	0.91	2.39	2.09	2.73	1.81	6.60	10.28	7.21	3.99	28 08	1899
1900	1.21	3.52	1.58	1.02	3.59	2.06	4.64	4.24	1.56	1.35	3.30	0.58	6.19	10.94	6.21	6.54	28.65	1900
1901	1.15	2.05	3.38	0.33	2.18	2.42	4.25	2.00	2.92	1.29	0.85	1.70	5.89	8.69	5.06	4.90	24.52	1901
1902	0.66	1.53	4.16	2.26	5.08	6.45	5.78	1.44	4.83	1.45	2.03	1.90	11.50	13.67	8.31	3.89	37.57	1902
1903	1.09	3.03	1.67	3.77	0.93	1.62	4.78	3.49	4.00	1.09	0.34	2.28	6.37	9.89	5.43	5.02	31.91	1903
1904	2.25	1.71	4.57	3.01	1.54	0.55	2.76	4.00	2.65	1.58	0.31	1.21	9.12	7.31	4.54	6.24	26.14	1904

TEMPERATURE BY MONTHS, SEASONS AND YEARS, FROM 1830 TO 1904, BOTH INCLUSIVE—AT CHICAGO, ILL.

Year.	MONTHLY MEANS.												MEANS, SEASONS AND YEARS.					Year.
	January.	February	March.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	Spring.	Summer.	Autumn.	Winter.	Annual.	
1830	28	30	37	53	59	64	75	72	58	57	45	26	49.7	70.3	53.3	....	50	1830
1831	18	20	37	43	57	69	72	70	51	49	32	15	45.7	70.3	47.3	21.3	45	1831
1832	24	15	37	49	55	68	70.6	71.4	62.9	54	39.9	33.2	47	70	52.3	18	48	1832
1833	29.7	27.6	33.3	50.5	60.1	68.6	72.4	70.3	64	45.5	39.8	34.1	48	68.8	49.8	30.2	49.2	1833
1834	13.3	34.9	36.6	47.4	54.6	62.9	74.3	71.2	60.1	46.3	40.3	29.6	46.2	69.5	48.9	27 4	47.6	1834
1835	28.1	14	32	42.5	54.6	63.1	67.1	65.2	54.3	47.9	34.2	24.8	43	65.1	45.5	23 9	44	1835
1836	22.4	21.7	26.1	42.4	53.5	58 6	66.5	61.9	56.7	46.8	34.3	24.2	40.7	62.3	45.9	23	42.9	1836
1837	23	25	28	38	48	61	66	65	59	50	40	26	38	64	49.7	24.1	44	1837
1838	25	11	42	40	50	66	74	69	58	48	25	19	44	69.7	48.7	20.7	44	1838
1839	29	28	35	53	54	61	73	66	54	59	31	27	47.3	66.7	48	25.3	48	1839
1840	21	28	37	46	58	66	68	66	56	49	35	26	47	66.7	46.7	25.3	46	1840
1841	22	23	35	41	55	67	69	67	57	48	37	27	43.7	67.7	47.3	23.7	46	1841
1842	25	28	43	52	52	59	67	65	61	52	30	22	49.7	63.7	47.7	26.7	46	1842
1843	26	13	16	45	53	65	71	67	65	44	33	32	38	67.7	47.3	20.4	44	1843
1844	22	30.8	38.4	55.3	58.7	64	78.6	68	68.6	48	34	31	50.8	68.5	50.2	28.8	49	1844
1845	35	33	39	51	58	68	75	70	63	51	37	23	49.3	71	50.3	33	50	1845
1846	39	31	42	49	62	64	78	75	62	53	43	34	51	72.3	54	31	53	1846
1847	20	30	32	47	53	65	76	67	64	51	41	30	44	69.3	52	28	48	1847
1848	32	31	36	46	58	68	69	69	58	55	36	27	46.7	68.7	49.7	31	49	1848
1849	22	21	38	42	50	66	70	66	62	50	45	22	43 3	67.3	52.3	23.3	46	1849
1850	30	32	34	41	51	66	74	71	61	51	43	26	42	70.4	51.7	28	48	1850
1851	28	35	40	45	53	64	71	69	67	51	36	23	46	68	51.3	29.7	49	1851
1852	22	32	34	39	55	66	72	69	59	54	35	28	42.7	69	51	25.7	47	1852
1853	29.7	29.1	37	45	52	67	68	68	62	50	39	30	44.7	67.7	50.4	28.9	48	1853
1854	19	29	38	44	54	66	74	72	67	55	38	28	45.3	70.7	53.3	26	49	1854
1855	26	18	31	48	56	62	70	67	62	46	37	22	45	66.6	48.3	24	45	1855
1856	13	17	27	44	51	68	71	65	59	49	35	18.4	40.7	68	47.7	17.3	43	1856
1857	10.7	30.6	27.9	34.6	50.4	68.1	71.5	67.7	62.8	48.9	29.9	31.4	37.6	67.8	47.2	19.9	44.2	1857
1858	33	19	36	48	52	68	73	70	63	50	35	28	43.7	70.4	49.3	27.8	48	1858
1859	27	29	38	41	55	62	74	71	59	49	32.9	15.7	44.7	69	47	20.8	46	1859
1860	18 1	26.8	35.1	42.6	57.7	63	68.2	68.8	57.6	49.5	31.3	20.5	45.1	66.7	45.8	20.2	44.9	1860
1861	21 9	29.4	31 7	43	49.1	63.2	66.2	68.5	61	48.4	34.1	28.4	41.3	66	47.8	23.9	45.4	1861
1862	18.2	20.9	32.1	43	51.8	57	68	70 9	63.8	51.2	34.4	30 3	42.3	65.3	49.9	22.5	45.1	1862
1863	33.5	20.6	31.9	41.9	52.7	59.4	65.6	65.6	56.9	39.9	33.4	26.3	42.2	63.5	43.4	28.1	44.3	1863
1864	16.2	23.6	27.4	38.6	55.7	60.6	67.9	68	58 4	43	32.5	17.8	40.6	65.5	44.6	22	42.5	1864
1865	17.2	26	32.2	42.5	51.3	66.1	62.9	65.2	66.3	46.6	35.4	20.2	42	64.7	49.4	20.3	44.3	1865
1866	17.7	17.9	26.4	43.8	51.4	69.4	72.2	68.9	60.8	53.8	40.9	25.8	40.5	71.8	51.8	18.6	46.2	1866
1867	19.9	30.8	29.5	46.5	50.7	72.4	73.1	74.5	67.4	56.1	43.5	28.8	42.2	73.8	55.7	25.5	49.4	1867
1868	17.9	24.7	42.4	44.4	54.2	66	80.6	71.8	61.3	50.8	38	22.6	47	72.8	50	23.8	47.9	1868
1869	31.2	29.3	29.5	45.2	53.1	64.3	71.2	72.1	64.9	43.2	33.9	28.6	42.6	69.2	47.3	27.7	47.2	1869
1870	25.9	27.5	32.5	48.4	62.4	69.3	76.8	72.7	68.7	55.1	42.3	27.1	47.8	72.9	55.4	27.3	50.7	1870
1871	30.9	30.2	41.2	51.2	56.7	66.8	73	72.7	61	54.6	35	20	49.7	70.8	50.2	29.7	49.4	1871
1872	23	25.5	28.1	47.2	56.1	69.2	72.2	71.8	63.9	50.1	31.5	19	43.8	71.1	48.5	22.8	46.5	1872
1873	20.4	24.1	34.3	43	53.8	70.8	70.8	72.1	62.1	48.9	34.3	32	43.7	71.1	48.4	21.2	47.2	1873
1874	28.9	31.4	36.5	38.6	59.8	70.5	74.8	71.8	66.4	53	40.3	33.5	44.8	72.4	53.2	30.4	50.4	1874
1875	17.9	14.7	31.8	42.5	55.5	63.1	68.8	68.4	61	47.5	37	36.8	43.3	66.8	48.5	22	45.4	1875
1876	33	31.8	33.9	46.5	59	67.5	73.5	73.5	61.1	48.8	39.3	20	46.5	71.5	49.7	33.9	49	1876
1877	21.9	36.4	29.4	45.4	56.9	66 1	73.1	71.5	66.5	54.7	39.7	42.8	43.9	70.1	53.6	26.1	50.3	1877
1878	31.2	35.7	44.3	52.2	55.5	65.4	74.8	73.6	65.9	52	43.1	23.7	50.7	71.3	53.7	36.6	51.4	1878
1879	21.4	27.4	39.1	46.8	57.6	64.7	73	72.6	61.2	59.9	41.9	30.3	47.8	70.1	54.3	24.2	49.9	1879
1880	40.1	34.6	37.9	48.5	64.2	69.9	72.4	72.4	62.5	50.8	31.4	23	50.2	71.6	48.2	35	50.6	1880
1881	19.5	24.7	32.2	41.5	61	63	72.9	75	69.5	55.9	39.9	37.1	44.9	70.3	55.1	22.4	49.4	1881
1882	28.3	33.2	38.3	45.9	51.7	63.6	68.6	71.2	65	56.5	41.7	26	45.3	67.8	54.1	34.5	49.6	1882
1883	16.9	23	31.4	45.6	52.1	64.1	71	68.3	60.7	51.8	41.5	30.1	43	67.8	51.3	21.8	46.3	1883
1884	19.2	27.7	34.2	44.3	56.7	65	69.2	68.8	68.9	56.4	39.6	28.4	45.1	67.7	55	25.7	48.2	1884
1885	18.3	16.8	30	45.3	52.8	65.4	72.8	68.1	63.9	51	41.9	31.1	42.7	69.1	52.3	21.2	46.4	1885
1886	21.4	28.1	36.1	49.1	57	66	71.	72.4	66.1	56.6	38.2	25	49.7	69.9	53.6	26.9	49	1886
1887	17.3	27.1	31.9	47.4	59.4	67.3	76	69.7	62.5	47.3	38	28.1	46.2	70	49.3	23.1	47.7	1887
1888	15.1	23	30.5	45.4	52 6	67.4	72.6	69.4	59.8	49.1	41.6	32.2	42.8	69.8	50.2	22.1	46.6	1888
1889	29	19.9	38.4	46.8	56.8	62.3	70.5	70.6	62.8	49.4	38.6	40.6	47.7	67.8	50.3	27	48.8	1889
1890	30.8	32.4	29.5	45.6	58.4	70.2	72.1	67.6	60.4	51.4	41.9	30.6	42.8	70	51.2	34.6	48.8	1890
1891	30.2	28.6	30.6	47	53.4	65.7	67	69	69	52.6	33.8	35.4	43.7	67.2	51.8	29.8	48.5	1891
1892	19.5	30.2	31	44	52.4	61.4	71.6	70.9	63.9	53.6	34.7	23.4	42.5	67.9	50.7	28.4	46.6	1892
1893	12	21.5	33.2	44.3	52.4	67.8	73.8	69.8	64.1	52.6	36	25.4	43.3	70.5	50.9	18.9	46.1	1893
1894	27.5	23	41.2	46.8	56.1	71.4	73.4	70.8	66.2	52.1	34.4	32.4	48	72.5	50.9	25.3	49.6	1894
1895	17.5	17	31.7	46.1	59.1	70	70.2	72.5	68.6	46.2	36.5	30	45.6	70.9	50.4	22.3	47.1	1895
1896	27	26.6	31.3	53.4	65.4	67	72.3	72.8	60.5	49.5	38.4	32.1	50	70.7	49.4	27.8	49.8	1896
1897	21.8	28.6	34.7	46	55	65.2	74.2	69	69.5	58.4	38.7	25	45.2	69.5	55.5	27.5	48.8	1897
1898	28.6	27.6	40.4	44.4	56.2	68.8	73.4	71.4	67.6	50.6	37	24.3	47	71.2	51.7	27.1	49.2	1898
1899	23	17.9	29.8	50	59	69.9	72.2	73.5	62.7	58	44.8	27.2	46.3	71.5	55.2	21.7	49	1899
1900	28.7	20.1	29	46.8	58.1	69.0	71.6	76.3	65.6	61.4	38.4	30	44.6	70.6	67.8	25.3	49.2	1900
1901	26	17.1	34	45	54.1	69	77.4	71.6	64.2	55.2	37.6	24	44.3	72.7	71.1	24.3	47.9	1901
1902	25.2	20.8	38.6	46.4	59.1	64.2	72.6	68.3	60.8	55.2	47.0	26.5	48.0	68.4	54.3	23.3	48.7	1902
1903	24.0	25.0	40.4	47.2	59.0	61.2	72 2	68.4	64.4	53.6	36.4	20.1	48.8	67.3	51.5	25.2	43.0	1903
1904	17.8	17.2	35.2	40.7	57.3	64.2	71.0	68.3	64.5	53.4	42.8	26.7	44.4	67.8	53.6	18.4	46.6	1904

TABLE OF DAILY PRECIPITATION, CHICAGO, YEAR 1904.

DATE.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	.00	T	.00	.10	.00	.00	T	.00	T	.00	.00	T
2	.22	.07	.01	T	.00	.00	.00	.00	T	.17	.00	.16
3	.08	.02	.15	T	.00	T	.00	.00	.00	.00	.00	T
4	.00	.00	.00	.00	.00	.16	T	.08	.00	.01	.00	.00
5	.00	.01	.00	.00	T	.00	.00	.00	.00	.97	.00	.00
6	.05	T	.41	.11	T	.01	.24	.00	.00	.06	T	.00
7	.00	.02	.01	T	.02	T	.10	.00	T	.00	.00	.00
8	.00	T	.00	.35	.36	T	.07	.00	.00	T	.02	.00
9	.00	.08	.00	.22	.23	.00	.01	.00	.00	.11	.04	T
10	T	T	.20	.02	.03	.00	.00	.31	.00	.11	.24	T
11	T	.01	.06	.12	.01	.00	.58	.00	.03	.04	.00	.20
12	.30	T	T	.06	T	.00	.04	.00	.00	.01	.00	.19
13	.02	.00	.00	T	.02	.00	.00	.39	.19	.00	T	.02
14	.00	T	.84	.00	T	.01	.04	.00	T	.00	.00	.01
15	.00	.00	.03	T	.00	.01	.00	.00	.00	.00	.00	T
16	.00	T	.00	T	.00	T	.00	T	.00	.00	.00	.00
17	T	T	.51	.00	.00	.00	.00	.00	.00	.00	.00	.02
18	T	.48	.01	.00	T	.00	.00	.00	1.25	.00	.00	.00
19	T	T	.09	.00	.08	.00	.00	1.27	T	T	.00	T
20	1.05	.00	.00	.00	T	.12	.00	.06	.25	T	.01	T
21	.20	.43	.15	.00	.00	T	.00	1.22	.00	.06	.00	.00
22	T	.04	.65	.13	.00	.00	.24	.61	.00	T	.00	.00
23	.02	.05	.00	T	.11	.00	.00	.00	.00	.00	.00	T
24	T	T	.04	1.24	T	.00	.00	.00	.34	.00	.00	.06
25	.01	.08	.81	.66	.00	.08	.00	.06	T	.00	T	.02
26	.23	.06	T	.00	.17	00	T	.00	.53	.00	T	.28
27	.01	.00	T	.00	.00	.00	.53	.00	.00	.04	.00	.24
28	T	.01	.00	.00	.00	T	.00	.00	.06	.00	.00	.01
29	.04	.35	.00	.00	.06	.06	.00	T	.00	.00	.00	.00
30	.02	.....	.19	.00	.45	.10	T	.00	.00	.00	.00	.00
31	T	.....	.41	.....	.00	.....	.91	.00	.....	.00	.....	.00

T indicates *Trace* of precipitation.

TABLE OF MEAN DAILY TEMPERATURE, CHICAGO, YEAR 1904.

DATE.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	24	2	30	44	47	52	57	70	74	62	58	27
2	12	10	42	36	48	54	62	64	70	56	58	28
3	4	8	32	30	48	73	72	68	65	52	55	28
4	9	6	26	39	58	73	75	72	67	62	52	24
5	16	29	38	46	63	72	72	72	64	56	44	26
6	26	48	38	49	69	61	64	72	68	47	42	28
7	26	28	39	42	66	62	60	66	67	51	46	32
8	32	8	36	44	57	58	69	60	62	63	44	32
9	25	12	32	36	54	58	72	70	69	71	40	28
10	24	11	43	36	46	57	68	66	76	68	40	27
11	25	12	30	42	57	58	72	62	66	56	38	26
12	30	12	25	34	7	60	64	74	56	52	36	25
13	18	28	26	33	57	68	71	76	60	52	36	24
14	13	23	26	37	48	61	75	68	52	50	40	20
15	22	4	26	40	41	63	76	76	57	54	44	20
16	20	0	30	28	45	56	80	68	64	58	46	22
17	16	8	31	37	46	59	84	70	72	67	50	24
18	19	14	34	42	46	70	84	66	66	66	52	25
19	27	12	38	31	56	64	76	67	66	64	57	20
20	36	14	30	28	62	72	77	68	60	49	52	26
21	34	26	45	35	66	67	70	78	51	46	42	21
22	30	16	48	44	72	56	67	63	54	42	47	38
23	12	28	39	65	62	72	62	67	64	42	50	42
24	8	16	50	51	60	78	66	72	70	50	41	28
25	2	10	44	38	78	76	72	70	62	42	36	27
26	7	18	24	38	60	66	72	61	62	44	28	33
27	3	28	21	42	61	64	71	66	59	40	22	27
28	9	36	32	46	65	64	66	70	72	46	34	8
29	9	31	46	53	66	72	72	67	74	50	33	16
30	18	.....	42	53	50	64	78	63	64	47	23	35
31	16	.....	49	.....	50	....	78	68	.....	50	.....	44

TABLE OF MAXIMUM DAILY TEMPERATURE, CHICAGO, YEAR 1904.

DATE.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	27	10	35	49	51	55	61	78	82	72	67	31
2	21	15	51	41	55	65	68	66	77	60	67	31
3	10	15	50	34	54	87	83	74	71	59	60	29
4	16	16	34	48	66	82	80	82	76	73	58	26
5	24	43	44	53	69	77	76	81	68	64	47	32
6	30	53	40	57	79	65	70	78	74	49	45	36
7	36	49	46	53	77	67	62	74	72	60	55	36
8	36	14	40	49	71	62	78	64	65	72	47	35
9	30	14	36	40	62	63	79	82	80	77	44	31
10	26	14	52	39	52	61	71	70	87	78	42	30
11	27	17	34	50	69	62	80	66	73	59	45	28
12	34	18	27	37	80	67	68	85	60	53	45	29
13	27	37	29	36	67	76	80	85	65	53	40	29
14	20	35	27	45	52	68	85	72	58	53	45	24
15	31	11	30	51	44	73	86	86	67	58	54	23
16	29	5	33	32	51	60	90	75	76	69	53	29
17	23	13	32	46	50	65	94	76	85	78	58	32
18	24	15	40	50	50	77	92	67	73	75	65	34
19	39	15	44	34	66	70	80	72	72	74	66	26
20	39	24	33	32	68	83	84	77	70	54	60	32
21	37	31	59	39	74	76	74	90	55	50	49	28
22	34	31	60	52	83	60	72	67	60	45	55	
23	25	38	44	79	70	86	66	76	76	50	58	54
24	—2	21	65	63	72	88	69	83	72	55	43	32
25	11	16	57	40	87	82	82	78	67	48	42	29
26	12	23	31	40	74	71	79	66	66	50	32	37
27	12	41	26	46	71	67	80	73	63	46	26	43
28	14	39	41	52	75	67	69	81	83	57	44	11
29	13	35	57	62	74	81	80	73	79	58	44	30
30	26	.....	45	60	58	71	88	66	69	50	27	42
31	25	.....	57	.....	56	.....	87	71	.....	62	.....	49

TABLE OF MINIMUM DAILY TEMPERATURE, CHICAGO, YEAR 1904.

DATE.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1.	20	—6	25	40	43	48	53	62	67	52	49	23
2.....	4	6	32	32	42	50	56	62	64	52	49	25
3..... ..	—1	1	13	27	42	58	60	61	59	45	50	26
4.....	2	—4	19	30	50	64	70	63	58	50	45	21
5.....	7	15	31	38	57	64	67	62	59	49	42	20
6.....	22	42	35	41	59	57	57	65	63	45	38	20
7.....	16	7	32	31	56	55	58	59	62	42	37	27
8.....	28	2	31	38	43	54	60	55	60	54	40	30
9.....	20	10	28	33	45	52	66	59	58	65	36	24
10.....	22	8	34	33	40	53	64	61	64	59	38	24
11.....	23	7	27	33	45	53	65	58	60	53	32	24
12.....	25	7	23	32	60	53	60	62	52	50	27	21
13.....	10	18	23	30	47	59	62	66	54	50	31	19
14.....	6	11	24	29	44	54	65	64	47	47	34	16
15.....	12	—2	21	29	38	53	66	65	47	50	33	16
16.....	11	—4	26	23	39	53	71	62	52	48	40	15
17....	8	2	30	28	42	53	75	64	59	56	42	17
18...	14	12	28	33	42	62	75	64	60	57	40	16
19.....	15	8	33	28	47	58	71	62	60	54	48	15
20.....	32	5	26	25	55	60	70	60	52	44	43	19
21.....	31	20	31	31	57	58	67	66	47	43	35	14
22.....	25	0	36	37	61	52	62	69	47	39	39	26
23.....	—2	19	34	51	55	59	59	58	51	55	43	31
24.....	—13	10	36	39	49	67	64	60	67	44	39	25
25.....	—15	5	31	36	70	70	61	61	58	37	30	25
26.....	2	14	18	37	45	62	65	56	58	37	23	29
27.....	—6	14	16	38	51	60	62	58	55	34	19	11
28.....	4	33	22	41	55	61	62	60	62	34	25	4
29.....	5	27	35	44	58	62	65	61	69	42	22	2
30.....	9	.....	38	46	42	58	67	60	58	44	19	28
31..... ...	6	.....	41	.....	45	.....	68	64	.....	39	.....	38

The City is under many obligations to Colonel O. H. Ernst, Corps of Engineers, U. S. A., officers of the Sanitary District of Chicago, the United States Collector of the port of Chicago, and the observers of the United States Weather Bureau at Alpena, Detroit, Escanaba, Grand

Rapids, Marquette, Saulte St. Marie, Michigan; Duluth, Minn.; Green Bay, Milwaukee, Wis.; and our local officers of the United States Weather Bureau for courtesies extended and information furnished.

DIVISION OF ARCHITECTURE.

MR. C. F. HERMANN, City Architect.

The following buildings, etc., were designed and their construction supervised by this division during the year 1904:

BUREAU OF ENGINEERING.

Plans were completed and contract let for an addition to Sixty-eighth street pumping station to cost $20,000. This addition provides room for a new engine. The exterior will be of red pressed brick and blue Bedford stone trimmings. The interior is to be finished in patent plaster and have encaustic tile floor.

A Harbor Master's office was built at Lake street and the river, of pressed brick in and out side, concrete floors and steel ceilings at a cost of $2,413.

Plans were made for an addition to the repair shop at Ashland avenue near Twenty-second street.

FIRE DEPARTMENT.

A two-story and basement fire engine house at Chicago avenue and St. Clair street was completed March 30th at a cost of $19,975. It has all exterior wall faces of blue Bedford stone. The interior walls are faced with enameled bricks and trimmed in antique oak.

SIXTY-NINTH STREET ENGINE HOUSE—Plans were completed and contract let for a brick engine house to be erected at Sixty-ninth and Justine streets, 25x80 feet in size and two stories and cellar in height. The two fronts will have light colored pressed brick and stone trimmings, copper cornice, and the interior will be finished in oak. The walls of engine-room are to be lined with glazed brick and to have an enameled steel ceiling. The cost of the building will be $10,959.

Plans were made and contracts will be let as soon as possible for the following buildings:

1. Two story and basement double building at Michigan avenue and Fourteenth street, at a cost of $30,000.

2. Two story and basement brick building at 6017-6019 State street, to cost $12,000.

3. Double house at Diversey and Fairfield avenue, to cost $24,000.

4. One single building at 817-819 Rosemont avenue to cost $12,000.

5. An addition to Hook and Ladder Company No. 12 at 1245 West Thirteenth street, to cost $10,000.

6. New quarters for Engine Company No. 52 at 4714 Elizabeth street, to cost $12,000.

The above buildings will be first-class and modern in every respect, pressed brick, stone trimmings and copper cornices for fronts, enameled bricks and steel ceilings for engine-room, sanitary stall floors, shower and tub baths, tile floors, oak trimmings, etc.

Sketches, plans and estimates were furnished for houses at South Chicago, Austin and various other engine-houses of the City.

HEALTH DEPARTMENT.

Plans were made and bids advertised for two new public bath-houses, one to be located at 193-195 Gault place, to contain sixteen showers, and the other at 2830-2840 South Halsted street, to contain twenty showers, each to cost about $15,000. The buildings have pressed brick fronts with stone trimmings and copper cornices. The interior is comfortably arranged, first floor having waiting-rooms, private office, etc.; the second story is arranged for usage of the Superintendent and has five rooms. All the plastering is done with patent cement plaster, and trimming is of oak.

INTERCEPTING SEWER.

Plans were completed, specifications and details made for the intercepting sewage pumping station at Thirty-ninth street and the lake.

HOUSE OF CORRECTION.

Plans were made and work supervised for the following:

A concrete retaining wall was built at two sides of the stone quarry. A prison wall with towers and gates was built at Sacramento avenue and Twenty-sixth street. A cell block of eighty cells was built of concrete; the cell block is four stories high and connects the north and south cell-houses. A building for a stone crusher is now in course of erection. All this work was done by the Bridewell authorities. Plans were made for a new women's cell-house to cost when completed about $60,000.

CITY HALL—BUILDING DEPARTMENT.

A gallery, new vault and toilet-rooms, at Room 122, were built at a cost of $1,287. Various plans and sketches were made for partitions, vaults and alterations in different rooms of the City Hall.

I am deeply grateful to you for the support and assistance I at all times have received from you, which has made my arduous work a pleasure and the heavy responsibilities seem comparatively light.

The loyal support and services of the various division heads and other employees of this bureau is also appreciated, and credit is due them to a great extent for the results of our efforts during the year.

Very respectfully,

JOHN ERICSON,
City Engineer.

Auxiliary Reports

THE WATER WORKS SYSTEM OF CHICAGO.

A paper read before the Western Society of Engineers, May 15, 1901, by J. H. Spengler, M. W. S. E., Assistant City Engineer.

Corrected to January 1, 1905.

As a result of the writer's close connection and extended experience with the operation and maintenance of the water works system of this City during the past five years, it occurred to him that a review of the development and growth of this system would, perhaps, give the members of this society a better knowledge of this important branch of the municipal service. The general public seems to have but a hazy idea as to the extent of the system—the number of pumping stations, the number and character of engines, boilers and other appurtenances that go to make up the various plants, the complicated pipe system, the location and extent of the tunnels and cribs by which the water of Lake Michigan is supplied to the various stations.

Streets may possibly not be properly kept in repair or cleaned, sewerage facilities may perhaps be inadequate, but so long as an ample and pure supply of water is furnished, the general public is compensated to a great extent for any deficiencies that may exist in other requisites of a municipality.

In its remarkable growth, both as to population and area, in the development of its manufactures, commerce, etc., Chicago stands out pre-eminent among American cities.

This unparalleled growth has at all times made it a difficult problem for the engineer to plan extensions and improvements on a scale commensurate with the needs of the people. The absorption of adjacent towns, and especially the annexation in 1889 of the towns of Hyde Park, Lake, Lake View and others, each with its independent water works, by which 126 square miles were added to the City, further complicated the system of Chicago as a whole.

It will be the purpose of this paper further on to dwell more particularly on the extensive additions and improvements that have been made to the water works system during the past five years under the immediate supervision of the present City Engineer, by which all parts of the City as far south as 107th street are now obtaining, for the first time, an ample and satisfactory supply of water.

The water tunnels with the various intakes have been written up rather extensively during the past year in several technical journals. No attempt will, therefore, be made at this time to give any details with reference to their construction.

Chicago, as an incorporated city, is sixty-eight years old. By an act passed January 15, 1831, the County of Cook was organized. The Town of Chicago came into existence in 1833, at which time the population was 350. Chicago as a city was incorporated March 3, 1837, and the first City officers were elected May 2 following.

The earliest effort of which there is any record to provide a public water supply for the citizens of Chicago was November 10, 1834, when the Board of

Trustees paid $95.50 for the digging of a well in Kinzie's addition. This well was located at what is now the intersection of Cass and Michigan streets. The settlers, however, soon realized that the lake was the most suitable source of water, and for some years private enterprise reaped a financial harvest in operating water carts for the supply of lake water to the citizens.

In January, 1836, the State Legislature passed a law incorporating the Chicago Hydraulic Company, and on March 10th following an organization was effected. The charter was to continue in force for a period of seventy years. The company had four years from the passage of the act in which to commence the construction of works. The panic of 1837, however, interfered with the affairs of the concern so that operations were not commenced until 1840. In this year the company built a reservoir at the corner of Lake street and Michigan avenue, 25 feet square and 8 feet deep, elevated about 80 feet above the surface of the ground, and erected a 25-horse-power engine, connecting it by an iron pipe with the lake, the pipe running into the lake about 150 feet.

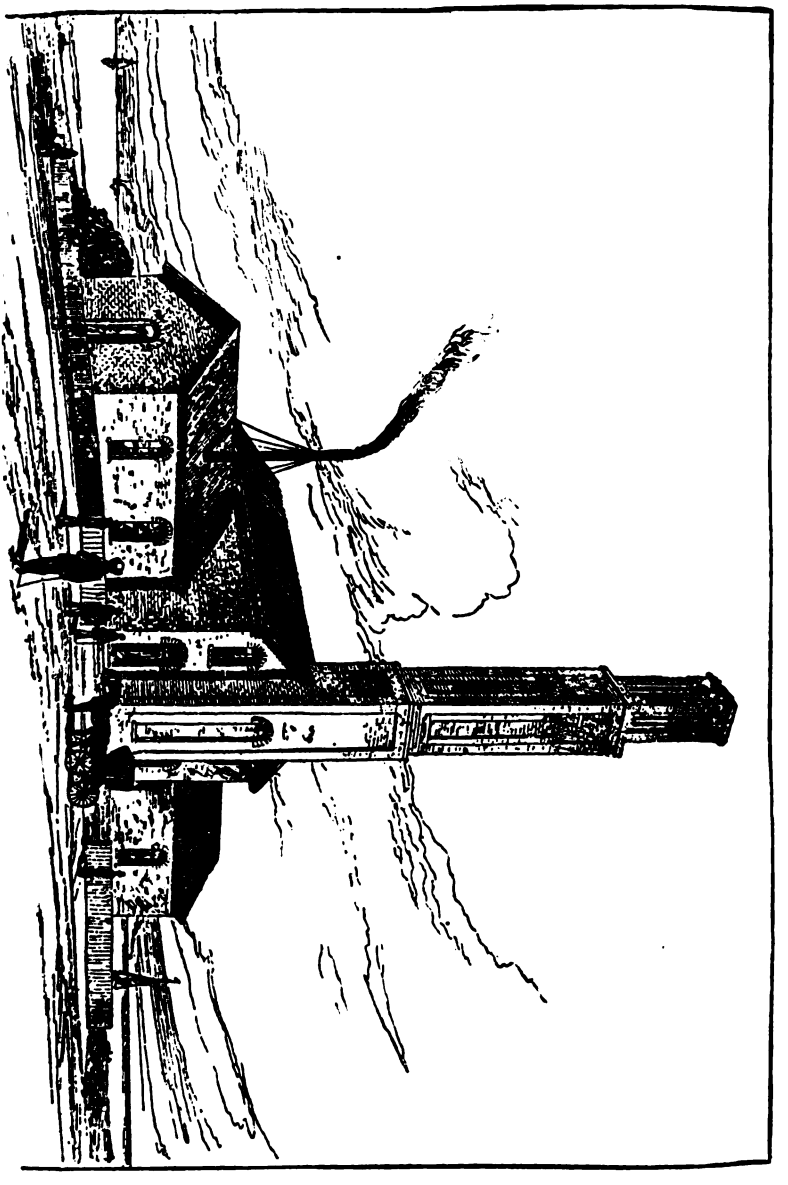
The water was distributed through about two miles of wooden mains, these being logs bored at the works, 5 inches for the main lines and 3 inches for the subordinate ones. This supply reached but a small portion of the south and west divisions of the City. There was no supply from this source to the north division. At least four-fifths of the City, which then included about 10½ square miles, was supplied with water for domestic and other purposes from the river or by water cart system. The works of the Chicago Hydraulic Company were operated with varying success until 1852, during which year, as a result of a legislative act passed February 15, 1851, the rights and franchises of the company were taken over by the City and new works commenced.

In June, 1851, the Board of Water Commissioners employed William J. McAlpine to make the necessary surveys for the works. Plans were later submitted and adopted. These were based on the estimate that at the end of fifteen years the population would be 100,000. As a matter of fact, at the end of that period, 1866, the population was more than double that amount. The estimated cost of the work was $335,500. The annual expense of running them was estimated at $18,000. Following the plans and recommendations of the engineers, provision was made for a pumping station on the lake shore near Chicago avenue. A timber crib 20 by 40 feet was to be sunk 600 feet from the then shore line, and from this crib a wooden inlet pipe of 30 inches interior diameter was to be laid in a trench on the bottom of the lake to convey the water to the pump well placed in the engine-house.

Work was commenced in the summer of 1852. The pump well was finished, a portion of the 30-inch inlet pipe was laid toward the lake, and the foundation of the building and tower put in, closing the work for the season. The following year the buildings and tower were finished, and several attempts were made to put in place the 30-inch wooden main. The boisterous condition of the lake rendered it difficult to secure the crib in place. The work was therefore finally abandoned and the water allowed to enter the pipe close to the shore.

During the same year the standpipe was put up and the engines erected. The main engine was started on December 16, 1853, and the supply of water for the City commenced February, 1854. The original pump well is rectangular, 20 x 30 feet, and 25 feet deep. The walls are of stone, 6 to 7 feet thick. Upon these walls the engines were located. The buildings were of brick, consisting

of the engine-room, 40 x 50 feet, and two wings for the boiler-rooms, each 31½ x 40½ feet in the clear. The water tower was built of brick, 14 feet square

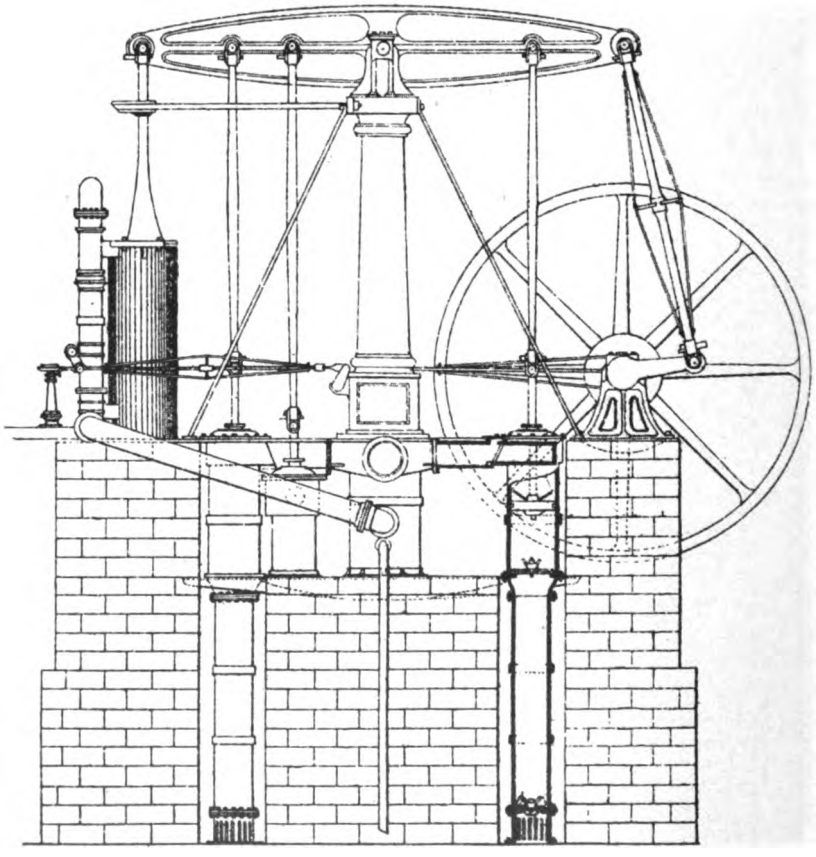


ORIGINAL WATER WORKS.

at base, 11 feet at top and 140 feet high. The interior was divided by a wall, one part designed for a stack, the other for a cast iron standpipe 24 inches in diameter. The pumping machinery consisted of a vertical condensing beam

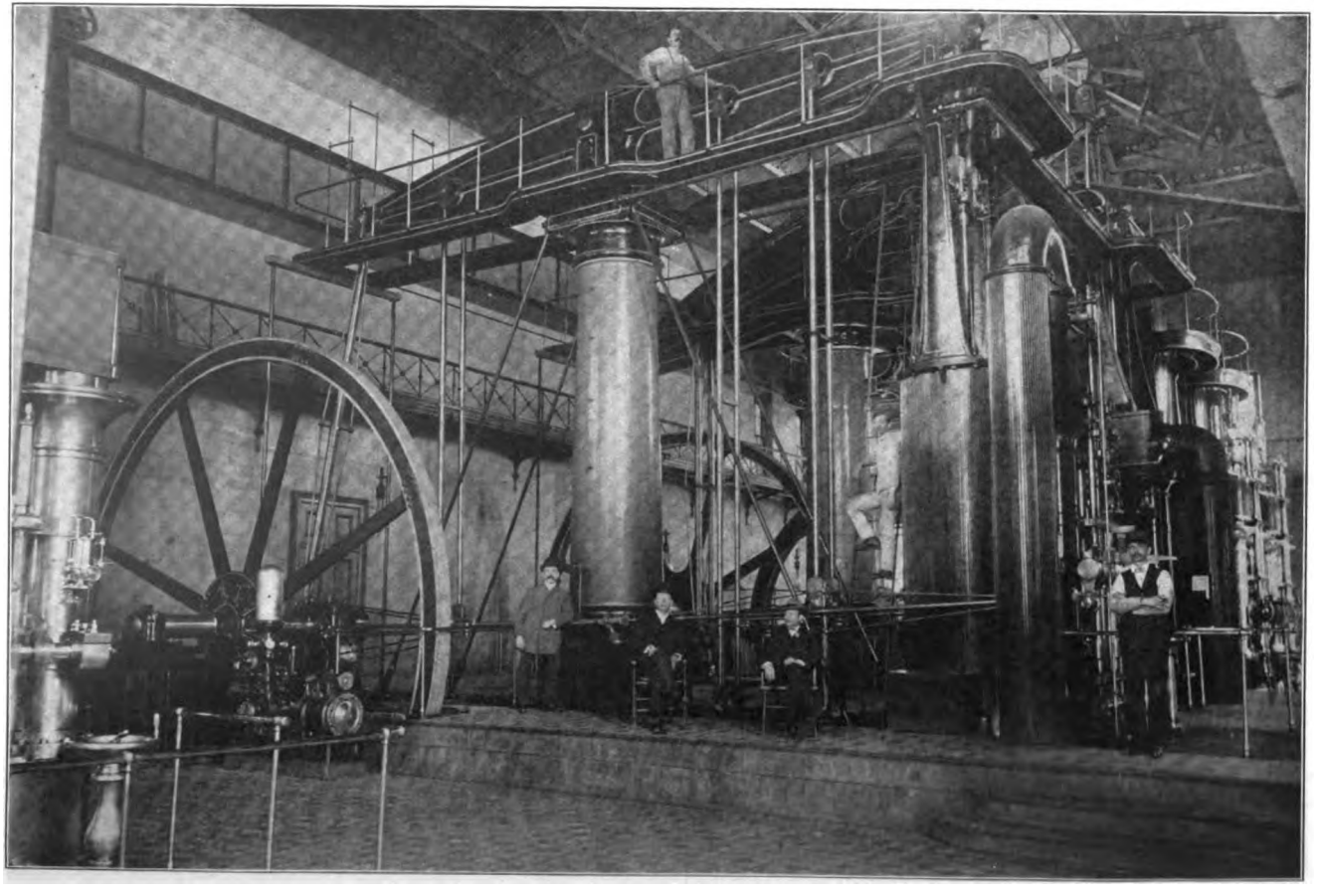
engine, having a steam cylinder of 44 inches diameter and a stroke of 9 feet, with two single acting pumps of 34 inches diameter and 5½ feet stroke. The length of the walking beam is 30 feet. The diameter of the fly wheel is 24 feet, and the weight 12 tons. It has a capacity of 8,000,000 gallons per 24 hours. The cost of the engine and boilers was $24,500.

This condensing engine is working successfully and giving good service to this day. Working with a single steam cylinder under about 30 pounds



Single Engine Erected in 1853—Chicago Avenue Pumping Station.

steam pressure, it naturally is not economical compared with modern triple expansion engines working under a high initial steam pressure. The average daily working duty of this engine, known as the '53 engine, is less than 40,000,000 foot pounds per 100 pounds of coal, the consumption of coal being about 5 pounds per horse-power per hour. The water pumped was distributed through three reservoirs, located respectively at La Salle and Adams streets, Chicago avenue and Sedgwick street, and Morgan and Monroe streets. The first two



"SALLY."

THE FIRST PUMPING ENGINE OWNED AND OPERATED BY THE CITY OF CHICAGO. THIS ENGINE WAS BUILT IN 1854 AND HAS BEEN IN CONTINUOUS USE FOR FIFTY YEARS AT THE CHICAGO AVENUE PUMPING STATION. REPLACED BY MODERN ENGINES IN 1904.

were built in 1853 and the latter in 1854, each holding about two or three days' supply. The first iron distribution pipe, 4 inches in diameter, was laid in Clark street in 1852.

As before stated, the supply of water commenced in February, 1854. During the first four months water was supplied but nine hours per day and none on Sunday, except in cases of fire. After that the supply was continued regularly throughout the twenty-four hours.

During the year 1855 a portion of the original 30-inch inlet pipe leading from the lake to the pump well was found defective, and a new one 3 x 4 feet square, made of oak plank, was put in at a greater depth.

During the early part of 1856 the quantity of water used in the City was nearly equal to the maximum capacity of the pumping machinery. A contract was made with the Morgan Iron Works of New York, for the installation of an engine similar to the '53 engine, but of larger capacity. This engine, put into operation in July, 1857, has a single steam cylinder 60 inches in diameter with a stroke of 10 feet. There are two single acting pumps, each 40 inches diameter and 6¼ feet stroke. The length of the walking beam is 30 feet; the diameter of the fly-wheel 24 feet, having a weight of 16 tons. The total cost of the engine and two boilers was $59,000. The capacity per twenty-four hours is 13,000,000 gallons, and it also is in successful operation at this time.

In the report of the Board of Water Commissioners for the year ending March 31, 1858, we find that in order to keep the three reservoirs filled it was necessary to pump during about twelve and one-half hours each day. During 1858 two new reservoirs of half a million gallons capacity each were erected in the north and west divisions, one on Sangamon street near Monroe street, the other on Chicago avenue near Franklin street, and the distribution pipes were gradually extended all over the City, till at the close of the year 1862 there were nearly 105 miles in service. It appears that the use of these reservoirs had a favorable effect upon the operations of the pumping works, as well as upon the uniformity of the supply.

From this period up to 1863 the operations of the works were of an uniform and satisfactory character. During 1863 the daily average consumption of water reached nearly 7,000,000 gallons, and at certain periods a greater quantity.

In view of the rapid increase in population there was an urgent demand for an increased and adequate water supply.

I quote from Blanchard's History of Chicago, as to the agitation at this time relative to the necessity of an improvement in the water supply, both as to quantity and quality:

"Many suggestions were made and many plans submitted. Pipes along the lake shore, pipes out into the lake, filtering places along its margin, deep cuts from river to lake, fanning mills and Archimedean screws, pumps at Bridgeport, and numerous other schemes. All of these plans sought to cleanse the Chicago river from its accumulation of filth, and to provide an ample supply of pure drinking water. * * * Still other propositions were submitted as follows: To divert the water of the Calumet and Desplaines rivers into the Chicago river by means of a feeder and the use of pumps. * * * A second plan suggested was to build a series of intercepting sewers similar in their nature to those which had been built in the City of London for the purification of the river Thames. A ship canal as well as a covered aqueduct were proposed."

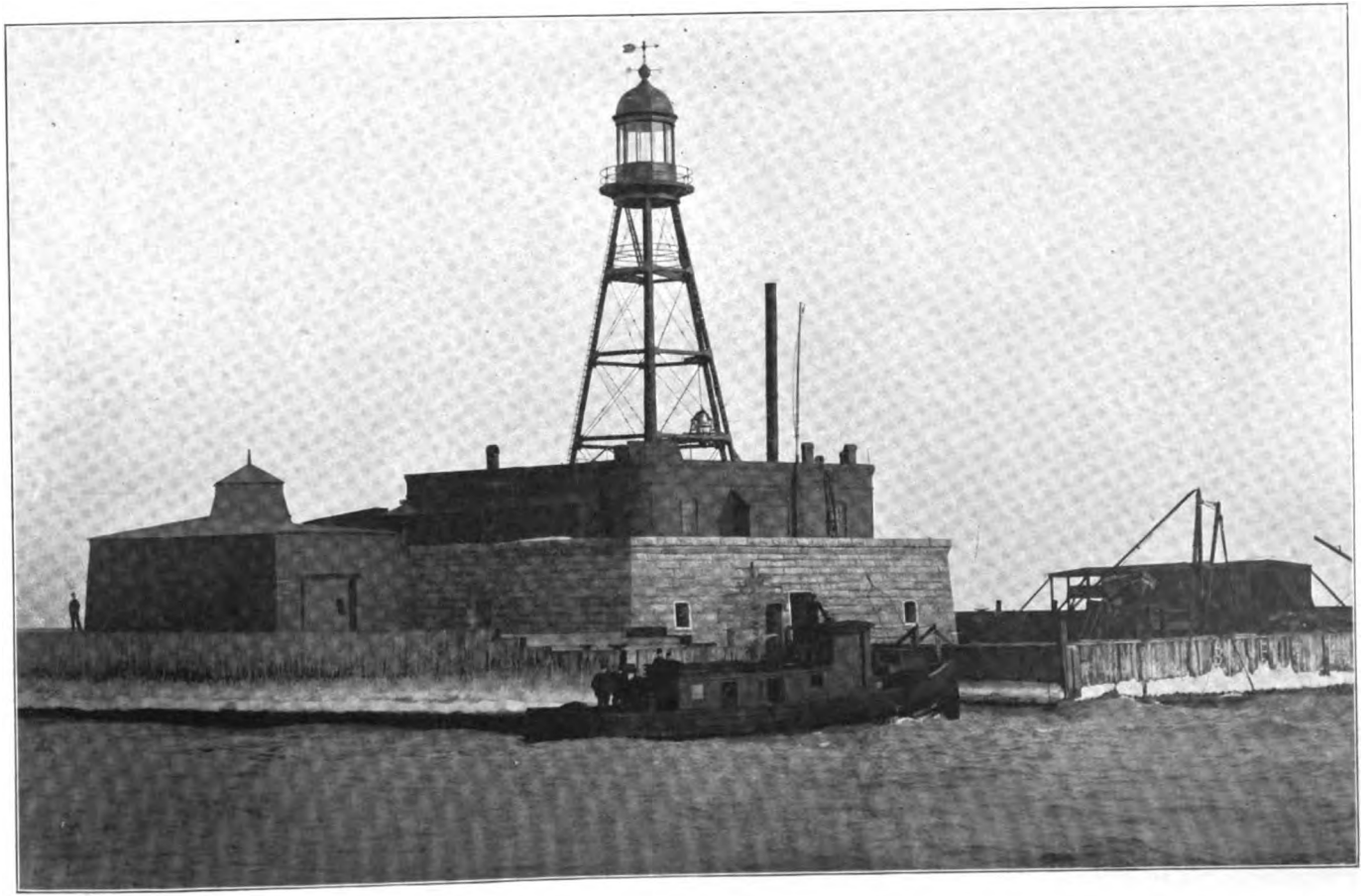
It was finally resolved that water should be taken from the lake, and on February 13, 1863, an amendment to the City charter was approved, by which power was given to the City "to construct such aqueducts along the shore of Lake Michigan, or in the high ways or elsewhere in the said Cook County, and to construct such pumping works, breakwaters, subsidiary basins, filter beds and reservoirs, and to lay such water mains, and to make all other constructions in said county as shall be necessary in obtaining from Lake Michigan a sufficient supply of pure water for said City;" "to extend aqueducts or inlet pipes into Lake Michigan, so far as may be deemed necessary to insure a supply of pure water, and to erect a pier or piers in the navigable waters of said lake, for the making, preserving and working of said pipes or aqueducts." This action of the Legislature was sanctioned by Congress, January 16, 1864, and a tunnel under the lake was decided upon as the proper means for obtaining the requisite quantity and quality of water.

Construction of this first tunnel, extending from a shore shaft near Chicago avenue, northeast to a crib two miles out in the lake, was commenced March 17, 1864. The tunnel is 5 feet in diameter, and was first put in use March 25, 1867. It was calculated that with a head of 18 feet the tunnel would supply one million people with 57 gallons each per day. The total cost was $457,845. At this time (1867) the average daily supply was 11,562,273 gallons, with a maximum of 18,000,000 to 20,000,000 gallons, and the population was about 240,000, the revenues being $337,468. There were 175 miles of distributing pipe.

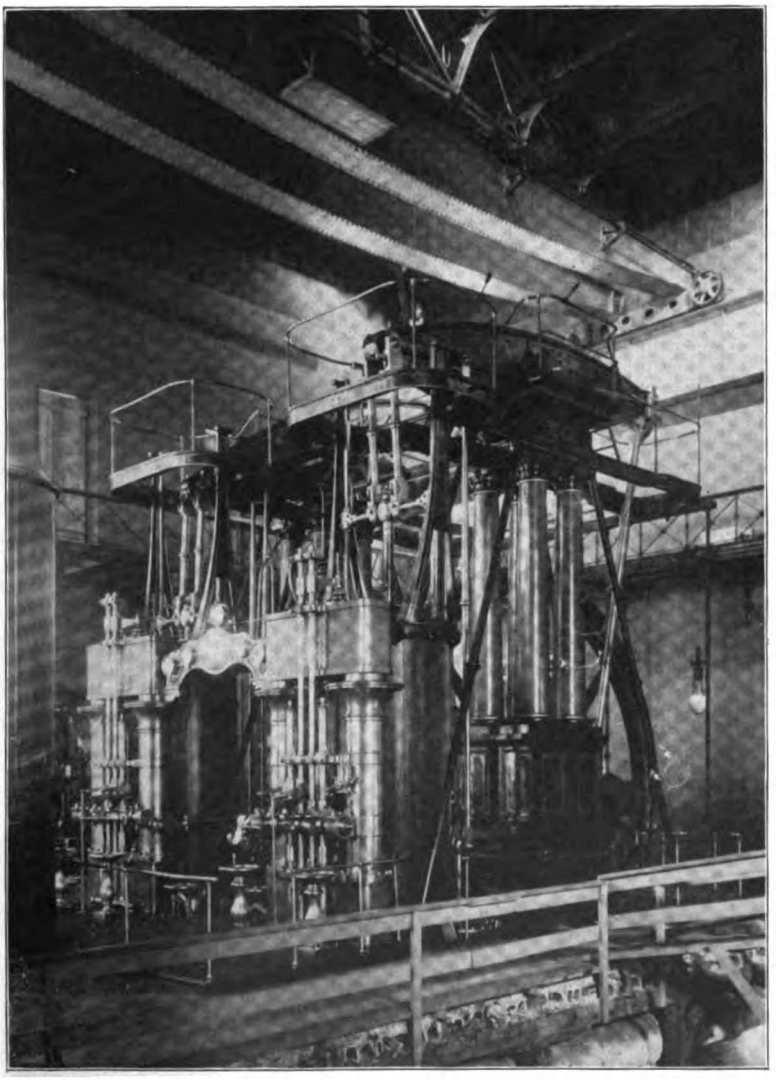
Plans and specifications for a new engine, boilers, etc., were prepared in 1864, and the contract for same was let in July, 1864, to George W. Quintard, Morgan Iron Works, New York City. This addition to the plant involved the gradual demolition of the old building and the erection of a new and more commodious one, which forms the bulk of the North side or Chicago avenue pumping station of today. The plans for the new buildings provided ample room for this machinery, as well as for additional engines. The style of architecture is castellated Gothic, with heavy battlemented corners, executed in solid rock, faced ashlar stone and cut trimmings. The dimensions of the engine-room are 142 feet long, 60 feet wide and 36 feet in the clear from the main floor to ceiling. A well for an additional engine was sunk in the south portion of the room. The outside diameter is 44 feet. Two boiler-rooms, each 36 x 46½ feet, were constructed with a single smokestack, 130 feet high, between them. A water tower, 154 feet high, was constructed west of the buildings. This contains a standpipe 36 inches diameter and 138 feet high, having six openings at the base supplied with 30-inch gates.

The foundations and well for the new engine were commenced in 1866, and the engine first put into operation July 20, 1867. The buildings and water tower were finished early in 1869. The engine has a daily capacity of 18,000,000 gallons, with two steam cylinders of 44 inches diameter by 8 feet stroke. The pumps are 28 inches diameter with 8 feet stroke. The length of each walking beam is 18 feet, weighing 7 tons. The diameter of the fly-wheel is 24 feet and weighs 24 tons. The total cost of the engine, with one boiler, was $112,500.

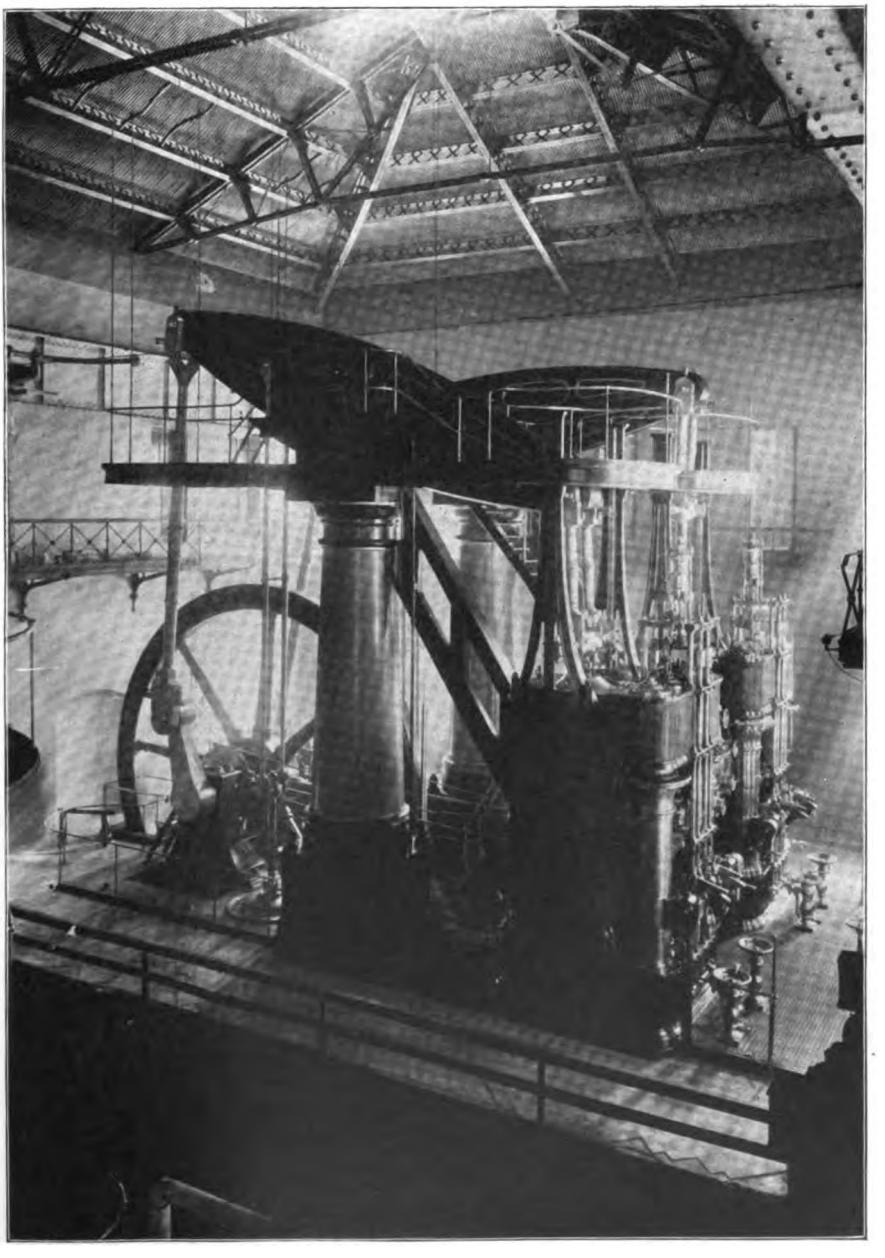
A 4½-foot tunnel was constructed, connecting the new lake tunnel with the pump well. The machinery at this time had a capacity of 38,000,000 gallons per day. The rapid growth of the City and the increased demand for water, per



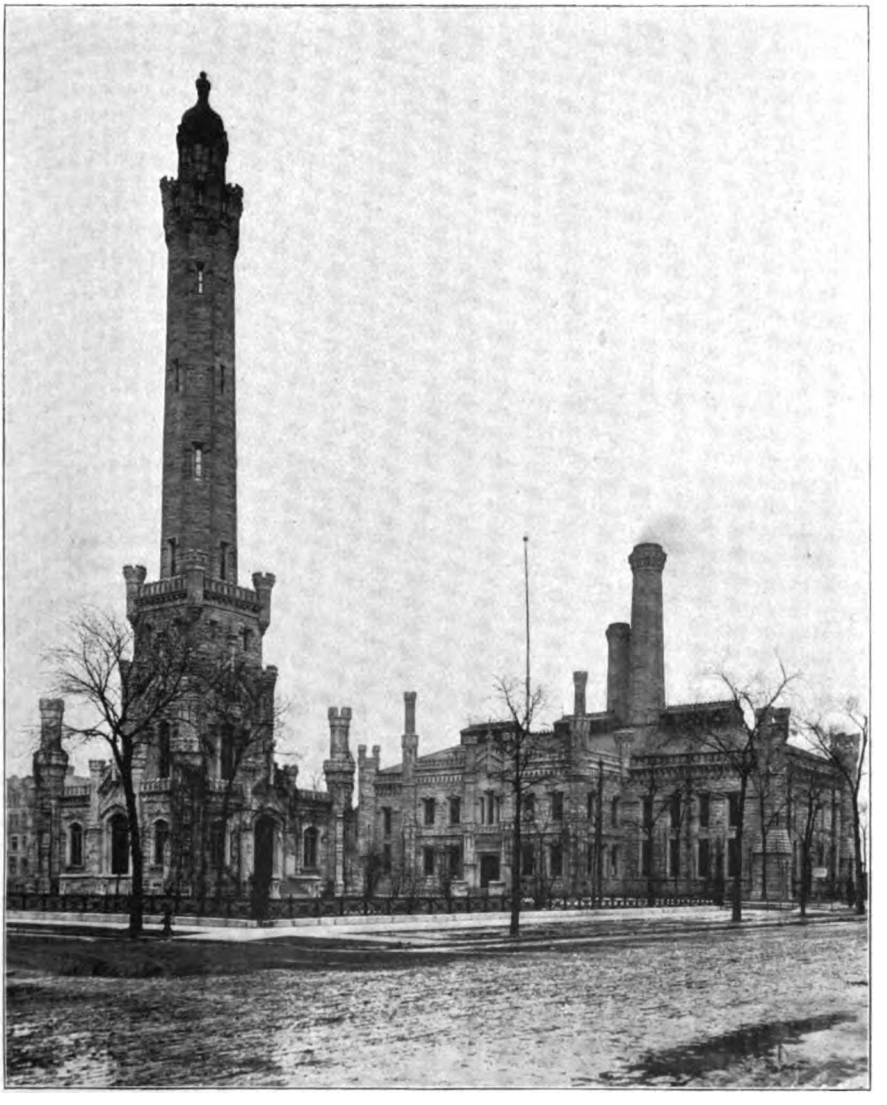
TWO-MILE CRIB.



1867 Engine, Chicago Avenue Pumping Station.



1872 Engine, Chicago Avenue Pumping Station.



CHICAGO AVENUE PUMPING STATION.

capita, soon necessitated the preparation of plans for an addition to the water supply. The Board of Public Works reported to the City Council, October 15, 1869, a comprehensive plan to meet the further wants of the City. This included the construction of an additional tunnel to start from the existing crib, to run parallel with the old tunnel to the Chicago avenue pumping station, thence in a straight line to some point on the South branch, not further east than Halsted street, nor further west than Ashland avenue. The diameter of this tunnel was to be 7 feet. Meanwhile, plans were made for a new engine to be installed in the south end of the existing station.

In July, 1870, a contract was awarded to the Fort Pitt Foundry Company, of Pittsburg, for the construction and erection of a double engine, with a capacity of 36,000,000 gallons in twenty-four hours. The well intended for the new machinery was constructed in 1868, without reference to the size or style of the engine to be built. The design of this engine necessitated the deepening of the well, which was accomplished in the following manner: The clay underlying the existing curb was excavated to a depth of 8½ feet below the shoe, and in order to guard against caving from sand pockets, etc., the excavation was made and the additional wall put in, in sections of about 6 feet in length. The wall is composed of a footing of stone 7 inches thick and 2 feet wide, upon which brick are laid in cement and are carried up to and connected with the curb of the cast-iron shoe. Two courses of 3-inch oak plank laid in cement cover the entire bottom. Upon these, two courses of 12-inch oak timbers are laid 3 inches apart and the spaces filled with concrete. These timbers are covered with a course of 3-inch oak plank, making a total of 33 inches of solid oak forming the bottom. The tunnel from the gate chamber to the pump well was partly constructed in 1867, leaving about 25 feet to be completed. The completion of the well and the extension of the tunnel to the well was accomplished by October 9, 1871. The foundations for the new engines were at once constructed. They consist of two main piers and two sub-piers. The former are each 12 feet broad at the base, 6½ feet at the top and 24 feet long. The latter rest upon offsets in the main pier and are 10 feet square at the base and 8 feet square at the top.

On October 8, 1871, occurred the great Chicago fire. It reached the pumping station the following morning. The buildings connected with the works were partially destroyed and the machinery disabled to such an extent that the pumps stopped working. The walls of the engine-house were but little injured, while the roof, floors and other portions, including the machine shops connected with the works, were all destroyed. The '67 engine was again in running order eight days after the fire, and the other engines by November 10th. Several of the stone piers forming the engine foundations were so badly burned as to involve nearly entire reconstruction.

At the time of the fire the bed plates of the new engine were in place, but fortunately were uninjured, and the erection of the engine was prosecuted with vigor and completed November, 1872, and first put into operation the 14th of that month.

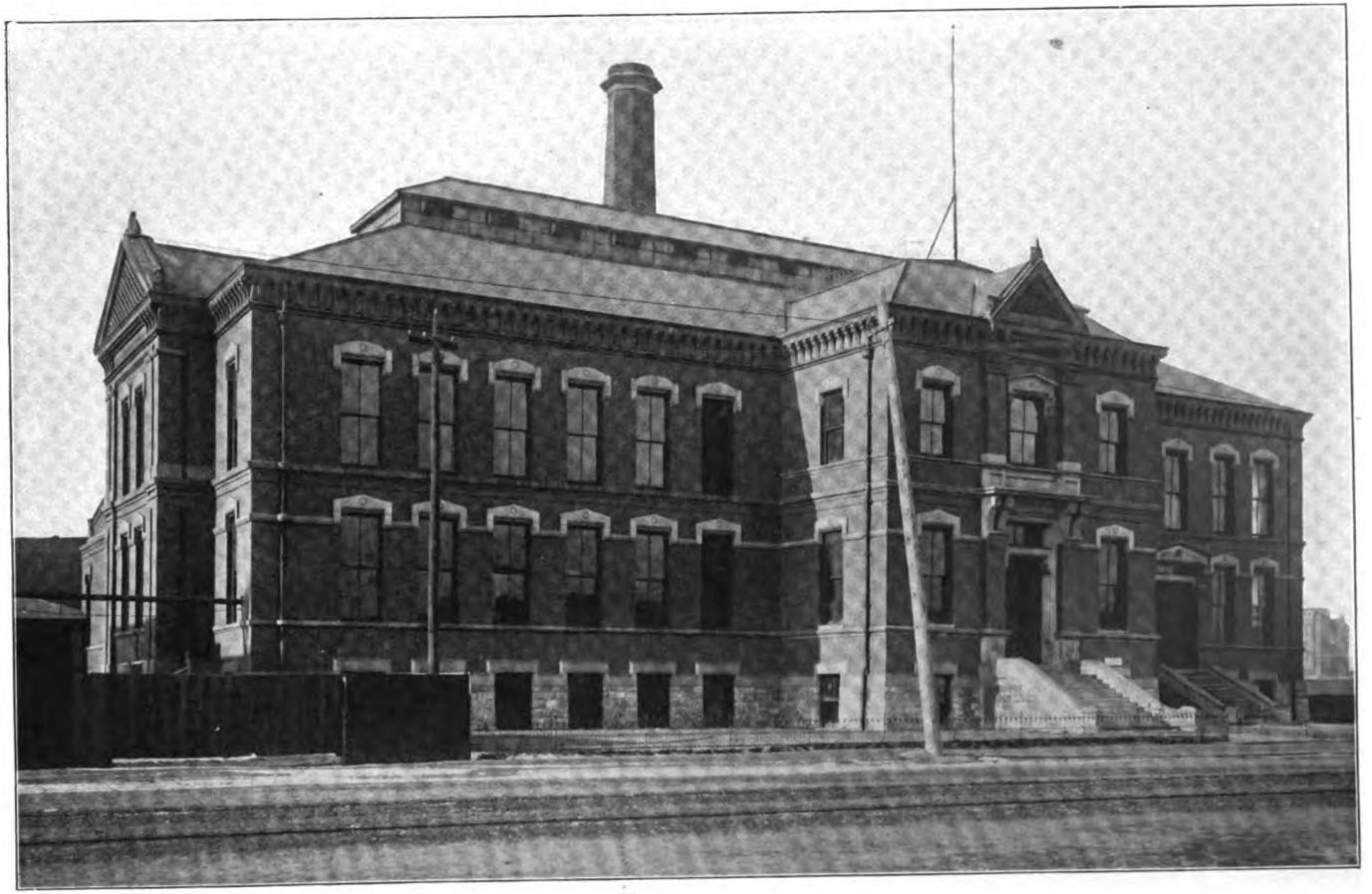
The steam cylinders are 70 inches diameter and 10 feet stroke. The steam chests are fitted with double balanced poppet valves of composition. The cylinders rest upon the upper plates, which are supported by four 9-inch columns extending from the lower plate. The walking beams are of cast iron, 26 feet

between end centers, 6 feet deep in the middle and 2 feet at the ends. The beams weigh about 20 tons each. The main columns are 34 feet 7½ inches from base of pedestal to top of cap, and weigh 17 tons each. The columns serve as air vessels, being connected to a check valve chamber by a 30-inch wrought iron pipe. The fly-wheel is 25 feet diameter and weighs 40 tons. The condenser is formed in the top section of the main column. The air pump is 45 inches diameter, 4½ feet stroke, and provided with rubber valves on composition seats. The pump chambers are 57 inches diameter, with 10 feet stroke, located directly under the steam cylinder. The pumps are double acting in their delivery, the plunger being solid for a portion of its length. The plunger is connected to and operated by the piston rod, 7¾ inches diameter, which passes through the bottom of cylinder. The working barrel of the pump is surrounded by an iron chamber, sufficiently large to make a channel for the delivery of the water discharged by the pump. The pumps are located below the surface of the water in the well. The upper end of the delivery chamber is provided with a circular nozzle, which is connected to a check valve chamber, having a double beat valve 36 inches diameter. To these chambers are connected the 36-inch discharge mains. The boilers (at present being replaced with new ones) are three in number, each 20 feet long, 12 feet in diameter, having sixty-six 5½-inch tubes. The entire cost of the engine and boilers was $188,400. The boiler pressure, per square inch, necessary to operate the four beam engines, is 30 pounds.

On July 12, 1872, in accordance with the recommendations made by the Board of Public Works in 1869, work was commenced on a second lake tunnel, extending from the existing crib to Chicago avenue station, and extending from that point across town to the present pumping station at 22nd street and Ashland avenue. The lake section is parallel with and 46 feet south of the first tunnel. Its diameter is 7 feet. The reasons for connecting with the old pumping station were as follows: 1st, To relieve the oldest pumps, the lift of which at times reached the limit, on account of the loss of head in the old tunnel, and to the increased pumpage. 2d. The saving in cost of pumpage by raising the water in the pump well. 3d, The great advantage of having two tunnels in case either one should need repairs or cleaning.

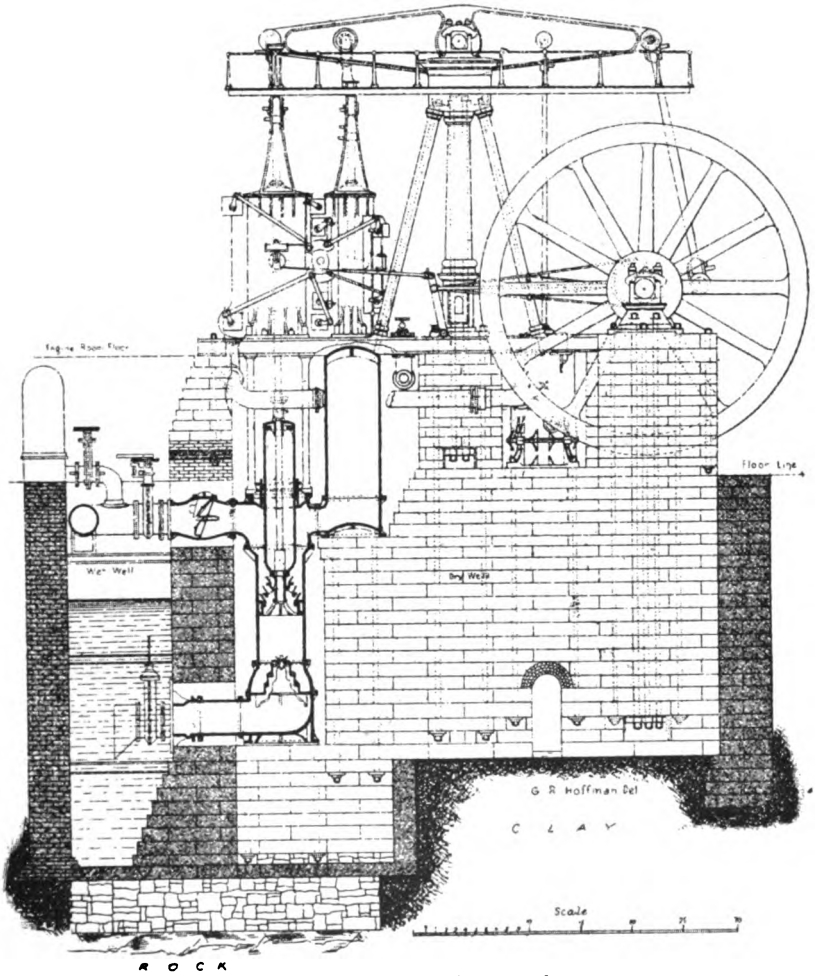
This lake tunnel was completed July 7, 1874, and the work on the land extension under another contract was commenced in July, 1873, and completed October 12, 1874. Its length, including the land extension, is 31,490 feet. The estimated velocity, when supplying 100,000,000 gallons per day, was 4 feet per second. The total cost approximated $1,000,000.

Meanwhile work was commenced on the new pumping station at Twenty-second street and Ashland avenue, designed to accommodate two new engines, and arranged to allow an addition to provide for additional engines in the future. The engine and boiler-house is built of brick, faced with pressed brick and stone trimmings on the front. The engine-room is 100 feet by 66 feet, and the boiler-house 100 feet by 40 feet. The chimney is 125 feet high. The tower is 190 feet high from ground to top of masonry. The inside of the tower is cylindrical and 12 feet in diameter. The standpipe inside the tower is 5 feet diameter, 167 feet high, connected originally to the discharge main from the engine with a 30-inch branch pipe on the west side of the tower, and with provision for a similar connection on the east side.



TWENTY-SECOND STREET PUMPING STATION

The foundations for the engines included a weir well, supply well and dry well. The weir well is semicircular in form, 26 feet in diameter. The land tunnel is connected with this well by a branch tunnel 7 feet in diameter. The supply well is 44 feet long by 10 feet wide, and separated from the weir well



1876 Engine—22nd Street and Ashland Avenue.

by a brick wall, at the bottom of which is a gate 5 feet by 3 feet (operated from the basement floor of the building) to admit water to the supply well. The foundations are built of large sized blocks of stones. The south part and the walls are built on the rock, which is 44½ feet below the surface of the ground. The north part of the foundations is built on blue clay, 29½ feet below the surface of the ground. The foundations of the buildings are on piles.

except the west wall of the engine-room, which is built on the wall of the wells, and the south wall, which, being temporary, was built on a foundation a few feet below the surface of the ground.

The contract for two compound condensing beam engines was let in 1875 to the Quintard Iron Works of New York. The general specifications for these engines provided that "each engine shall be capable of raising 15,000,000 U. S. gallons 155 feet high in twenty-four hours with a steam pressure on the boilers of 60 pounds per square inch, and develop a duty of 90,000,000 foot pounds based on 100 pounds anthracite coal." The boilers were to be three in number, any two to furnish the required steam.

The engines were first put into operation November 6, 1876, thus increasing the pumping capacity of the water works to 104,000,000 gallons. They are so arranged that they can be operated together or separately, connection being made by a cast iron coupling. The high-pressure cylinders are 48 inches in diameter, with a stroke of 6 feet. The low-pressure cylinders are 76 inches in diameter, with a stroke of 10 feet. Each walking beam is composed of two wrought iron plates 2½ inches thick, 36 feet long between centers of end pins and 7 feet deep at center. The plates are secured 15 inches apart by cast iron sockets and bolts running through and through. The beam pillow blocks are supported on two cast iron columns with four diagonal brace columns. Each fly-wheel is of cast iron, 32 feet diameter, weighing 60 tons. The condenser is placed below the bed plate, with the air pump inside the condenser, the hot well being in upper end of the condenser castings. The air pump is 38 inches in diameter and has 4½ feet stroke. Direct acting bucket and plunger water pumps are underneath the low-pressure steam cylinders and connected with them by bolts and columns. The plungers are 36 inches diameter, with a 10-foot stroke. The pump chambers are 51 inches in diameter. The pumps are placed in the dry well. The suction nozzle is 3 feet in diameter and connects with the supply well. The delivery nozzle from each engine is 30 inches in diameter. The air chambers placed immediately behind the pumps are 16 feet high by 5 feet diameter. With the engines were installed six horizontal return tubular boilers, each 6½ feet diameter, 17 feet long, with eighty tubes 4 inches in diameter. The boilers are set up in pairs, and are supplied with water by independent steam pumps connected with hot wells, supply well and water mains. A formal duty and capacity test of the new engines was made in January, 1877, in accordance with the requirements of the specifications, with the result that the west engine developed a duty of 99,083,000 foot pounds with a capacity of 16,160,470 gallons in twenty-four hours. The east engine showed a duty of 96,066,800 foot pounds with a capacity of 15,571,970 gallons.

It might be interesting to note at this point that the average daily consumption of water during 1876 was 41,931,481 gallons. This, based on the population of 407,000, shows a daily consumption per capita of 106 gallons. The total number of miles of mains was 416.4, the number of house services or taps was 57,130, and the water revenue was $831,555. Number of hydrants, 2,901; stop valves, 2,590, and meters, 1,446. Total cost of water works, $8,179,158. The area of the City through successive extensions had increased to 36.66 square miles.

Before the great fire three reservoirs were in use, being respectively the centers of distribution for the North, South and West sides. That on the North

side was located at Chicago avenue and Sedgwick street; the south reservoir was on the southeast corner of Adams and La Salle streets, and the west reservoir was on the southeast corner of Monroe and Morgan streets. They were wrought iron tanks, 60 feet in diameter, 28 feet high, resting upon stone and brick masonry, so that their tops were about 80 feet above the lake. Each contained about half a million gallons. They were finally abandoned, the last one (that on the West side) going out of existence in 1876, as they were then of little practical value to the water works system.

The pipe system as it existed at this time (1876) and for many years later was not the result of any carefully thought out or definite plan, formed at the inception of the works, but rather the result of a desperate attempt on the part of the engineers to keep up with the ever increasing demand and phenomenal growth of the City.

The most liberal estimates of increased population and territorial growth invariably fell far short of the reality. For many years, as fast as additions and improvements were planned to increase the supply, their completion found the City still facing the same old problem. Added to this was the uncertainty in which direction the greatest increase of population would occur, and what would be the demand for water in proportion to the population. Taking all these facts into consideration, the wonder is that the pipe system was as good as it was.

The original distribution system consisted of a 24-inch force main extending from the Chicago avenue station to North State street. From this point a 16-inch main passed along State street to Ontario street, and there reduced to 12 inches diameter. This size was continued south to the river, under which it passed after being enlarged to a 30-inch boiler iron pipe to connect with larger pipes in the future; thence a 12-inch cast iron pipe on State street to Adams street; thence along Adams to the south reservoir; thence further along Adams street and under the South branch by a wrought iron pipe and along West Adams street to Union street; thence north to Monroe street. On Chicago avenue a 16-inch pipe was continued westward, connecting with the north reservoir, crossing the North branch by a wrought iron syphon pipe to Union street; thence southward to Monroe street, where it united with the 12-inch pipe from the south reservoir, and thence along Monroe street to the west reservoir.

Hardly had the pumps of the new station been put into operation when attention was called by the engineers to the fact that the increase in population and the consequent increased consumption demanded additional pumping machinery. It was recommended that the original single beam engines installed in the Chicago avenue station in 1853 and 1857 be replaced with more modern engines of a larger capacity. As an alternative it was suggested that an addition be made to the Ashland avenue station large enough to provide for two more pumping engines similar in construction and capacity to those put into operation at this station in 1876.

During the month of January, 1879, the daily average pumpage was over 64,000,000 gallons, while the greatest amount for a single day, on the 4th of the same month, was nearly 74,000,000 gallons, and for several hours during that day the demand was at the rate of over 80,000,000 gallons. The population at this time being estimated at 450,000, the average quantity per capita pumped for the month above noted was 142 gallons. The City Engineer again recom-

mended that it was absolutely necessary that immediate steps be taken to procure additional pumping machinery. A glance at the statement of the pumpage, pumping capacity, increase in population, etc., showed that "the annual average increased demand would, in all probability and in a very short time, leave but a limited margin of the available capacity."

Meanwhile plans were made for the construction of a brick tunnel 9 feet by 6 feet 6 inches, under the South branch of the river at Harrison street, through which a 36-inch main was to be extended west on Harrison street to Blue Island avenue; thence southwest to Twelfth street, with an ultimate further extension to Twenty-second street and Ashland avenue, thus connecting the Chicago avenue and Twenty-second street pumping stations. It was also designed to eventually continue a line of 36-inch pipe from the west pumping station southeast, connecting with the large mains in the south division; also due west to the City limits, the west limits at this time being Western avenue. The brick tunnel at Harrison street was built in 1880, and the extensions mentioned above were completed during 1881. During the same year a tunnel was constructed under the North branch at Clybourn place, accommodating a 16-inch main, connecting mains of a like size on the east and west sides of the river. At the close of the year 1879 the mileage of water pipes of various sizes in use was 455½ miles; the number of valves was 3,105, and the number of hydrants was 3,361.

During 1881 the greatest quantity of water used for a single day (September 17) was 78,000,000 gallons, although the rate for several hours during this day marked as high as 83,000,000 gallons. This was within about 15 per cent of the maximum capacity of the two pumping stations.

The consumption of water reached 115 gallons per capita per day, estimating the population at 556,000.

In January, 1882, a contract for two additional engines, each with a capacity of 15,000,000 gallons, and to be installed in the addition to the west pumping station, was awarded to N. F. Palmer, Jr., & Co. of New York. These two engines, except as for the pump valves being of the double-beat type, are practically duplicates of those installed in 1876, the plant including six tubular boilers, each 8 feet long, with shells 7 feet in diameter, with sixty-eight tubes 4½ inches diameter, the total heating surface of each boiler being 2,454 square feet.

Each pump has fifteen double-beat or receiving valves, twelve double-beat delivery valves in the annular space around the pump barrel of the same dimensions as the foot valves, and one 36-inch check valve located in the discharge nozzle from the pump.

The engines are compound condensing, with high-pressure cylinder 48 inches diameter, by 6-foot stroke; low-pressure cylinder 76 inches diameter, with 10-foot stroke; water pump 52¼ inches diameter and of 10-foot stroke; air pumps 38 inches diameter, by 4.6-foot stroke; the fly-wheels were 32 feet diameter, weighing 60 tons each; and the walking beams 38 feet long, weighing 32 tons each.

These two new engines were put into operation July 21, 1884, thus increasing the maximum capacity of the water works to 134,000,000 gallons daily. The entire cost of this addition in machinery, building, wet wells and pipe connections was $371,681.

The contract for these new engines called for a daily capacity of 15,000,000 gallons each, raised 150 feet high, with a piston speed not exceeding 200 feet per minute. The duty to be developed was 90,000,000 foot pounds for each 100 pounds of best quality eastern bituminous coal, the steam pressure at boilers not to exceed 70 pounds per square inch. An expert test of the two engines was made in April, 1885, the southwest or No. 51 engine developing a duty of 98,453,246 foot pounds under a head of 155 feet, with a delivery of 17,948,712 gallons per twenty-four hours; engine No. 52 showed a duty of 106,818,492 foot pounds, under a head of 157 feet, with a delivery of 18,088,198 gallons per twenty-four hours.

In the annual reports of the Commissioner of Public Works for the years 1883 and 1884 attention was called to the fact that, notwithstanding the increase in the pumping capacity due to the erection of two new engines, immediate consideration should be given to the limit of capacity of the water tunnels, which was nearly reached, and that in view of the unprecedented annual increase in population recommendation was made that additional pumping machinery should be placed at the Chicago avenue station, necessitating an additional water tunnel with an independent intake.

In October, 1885, a contract was let to the Holly Manufacturing Company of Lockport, N. Y., for two Gaskill horizontal compound condensing engines, each with a daily capacity of 12,000,000 gallons, to be installed as an addition to the Chicago avenue station. The supply was to be obtained from the existing lake tunnels, through a 5-foot feeder tunnel extending from a shaft in the rear of the station to a wet well 12 feet in diameter placed between the two engines.

The specifications required that each engine was to deliver 12,000,000 gallons per twenty-four hours under a maximum head of 150 feet above the surface of the water in suction well, with a piston speed not exceeding 120 feet per minute and a steam pressure not to exceed 80 pounds per square inch in the boilers. A duty of not less than 95,000,000 pounds per 100 pounds of coal was to be developed.

The engines are of the compound condensing horizontal beam and fly-wheel type. Each half of each engine has two steam cylinders situated in a vertical plane and parallel to each other, the high-pressure being above the low-pressure. The pistons being connected by short links to the short vertical beam at opposite ends, travel in opposite directions. The low-pressure steam inlet valves are also the high-pressure exhaust valves, and the low-pressure exhaust valves are multiported on gridiron slides, worked by eccentrics from a lay shaft lying alongside the high-pressure cylinder. The high-pressure inlet valves are double-beat poppets, operated by a "drop" cut-off, adjustable by hand. The diameter of the high-pressure cylinders is 27 inches; that of the low-pressure cylinders is 54 inches and with a stroke of 40 inches. The diameter of the plungers is 30 inches. The fly-wheel is 17 feet in diameter, weighing 22 tons. Steam is supplied to the engines from six horizontal return tubular boilers, in brick setting, each 66 inches diameter, 18 feet long, with sixty-six 4-inch tubes, the grate area being 26.25 square feet and the heating surface 182 square feet for each boiler. The height of the chimney constructed is 125 feet, with a diameter of 7.5 feet.

The engines were first put into operation in June, 1887, and an expert test made in October of the same year showed for the west engine a duty of

98,928,108 foot pounds when working under a head of 151.9 feet and pumping at a daily rate of 12,523,464. The east engine developed a duty of 102,583,585 foot pounds, the average head being 151.3 feet when pumping at the rate of 12,517,032 gallons per twenty-four hours. The total pumping capacity of the City at this time aggregated 158,000,000 gallons per day. In 1886-1887 a third lake tunnel was built, of 7 feet inside diameter and 1,500 feet long, extending from the pumping station to a crib constructed to serve as a temporary intake to supply the "Chicago avenue" engines when the supply from the crib was endangered by ice. At the new intake a shaft was sunk and fitted with gates to control the supply, the main supply being still drawn from the old tunnels. Later, in 1891, this tunnel was extended to an intake crib and shaft placed at the northwest end of the Government breakwater, a distance of 3,408 feet. This work was completed February 1, 1892. After its completion, however, the new intake was practically useless, owing to the proximity of the intake to the shore, and its gates were rarely opened.

In order to meet the demands and provide for a reasonable supply of water, plans were made in 1887 for an additional tunnel system to supply two new pumping stations. These plans as finally developed comprehended a tunnel extending four miles under the lake nearly in line with Twelfth street to a new intake crib, to supply a new station located at Fourteenth street and Indiana avenue and another at Harrison street between Desplaines and Halsted streets. The contract for the tunnel system was let November, 1887.

As finally completed this system consists of a lake section, comprising 9,139 feet of 8-foot tunnel and 25,200 feet of 6-foot tunnel. The lake section ends at the Park Row shaft. From this point extend the two land tunnels. One of these is 7 feet in diameter, running north to the shaft sunk at Peck court originally for the starting of the lake tunnel, and then northwest until it strikes the old 7-foot tunnel at Desplaines street. A shaft was sunk at this junction and a 6-foot tunnel driven to the new Harrison street pumping station. The second land tunnel, consisting of 516 feet of 8 feet in diameter, and 2,320 feet of 6 feet in diameter, extends from the Park Row shaft to the Fourteenth street pumping station. In order to make proper connection with the old system of water tunnels, a 6-foot tunnel 625 feet long was built in Jefferson street.

On April 13, 1888, a contract was made with the E. P. Allis Company of Milwaukee for the installation of five vertical triple expansion engines, each with a daily capacity of 15,000,000 gallons; three to be placed in the Fourteenth street station and two in the Harrison street station. Nine return tubular boilers were to be installed in the former station and six in the latter.

The same year one of the old boilers in the center boiler-room at the Chicago avenue station was taken out and replaced by two horizontal tubular boilers 64 inches diameter, 18 feet long, each boiler containing sixty 4-inch tubes. These boilers were equipped with the Murphy automatic stoker and put into operation September 11th.

The four-mile tunnel system was completed December 7, 1892.

The Harrison street station commenced to give actual service July 14, 1890. Until such time as the four-mile tunnel system was completed, water was obtained from the old 7-foot land tunnel connecting the Chicago avenue and

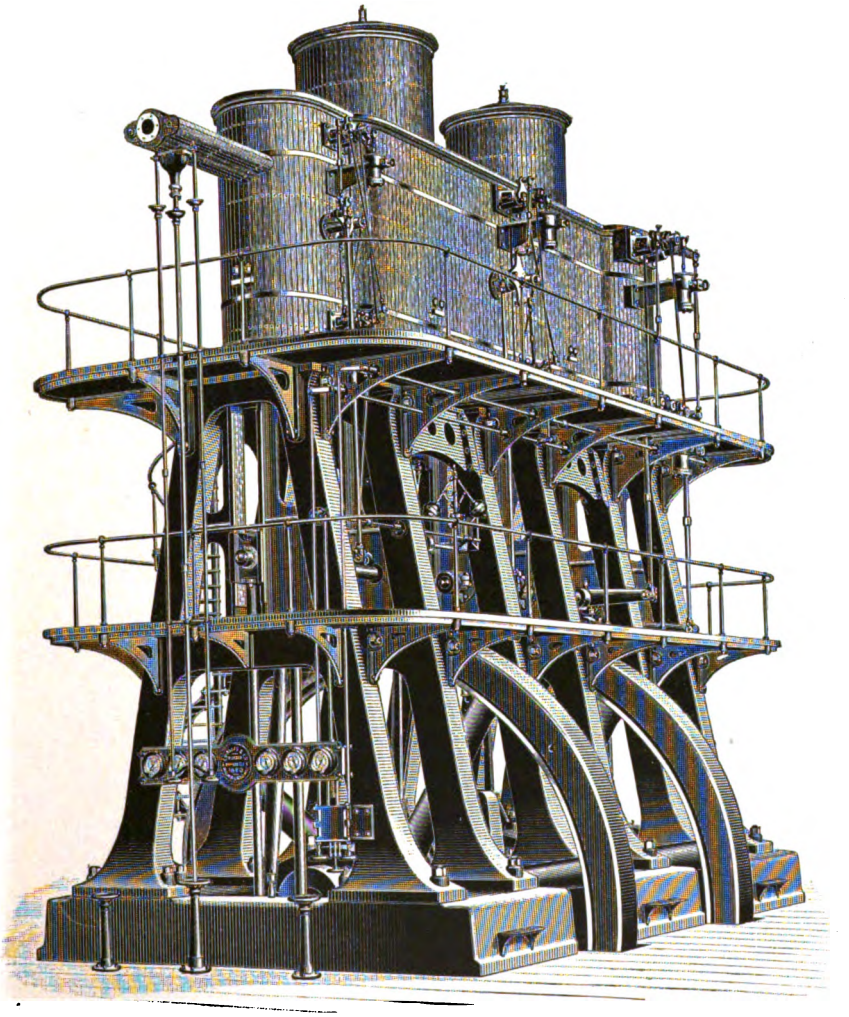
FOURTEENTH STREET PUMPING STATION.

FOUR-MILE CRIB.

Liverpool Street Railway Station

Twenty-second street stations. Only one engine as a rule could be supplied with water by this method.

The Fourteenth street station, with its three engines and appurtenances, was completed during 1891. Pending the completion of the new lake tunnel,



The Allis Engines at Fourteenth Street Pumping Station.

this station was at first temporarily supplied with water by means of the Jefferson street tunnel and the Park Row by-pass. This by-pass was constructed at the Park Row shaft, connecting the 7-foot tunnel north of it with the 6-foot tunnel south of it; .the openings of the two tunnels into the shaft were closed

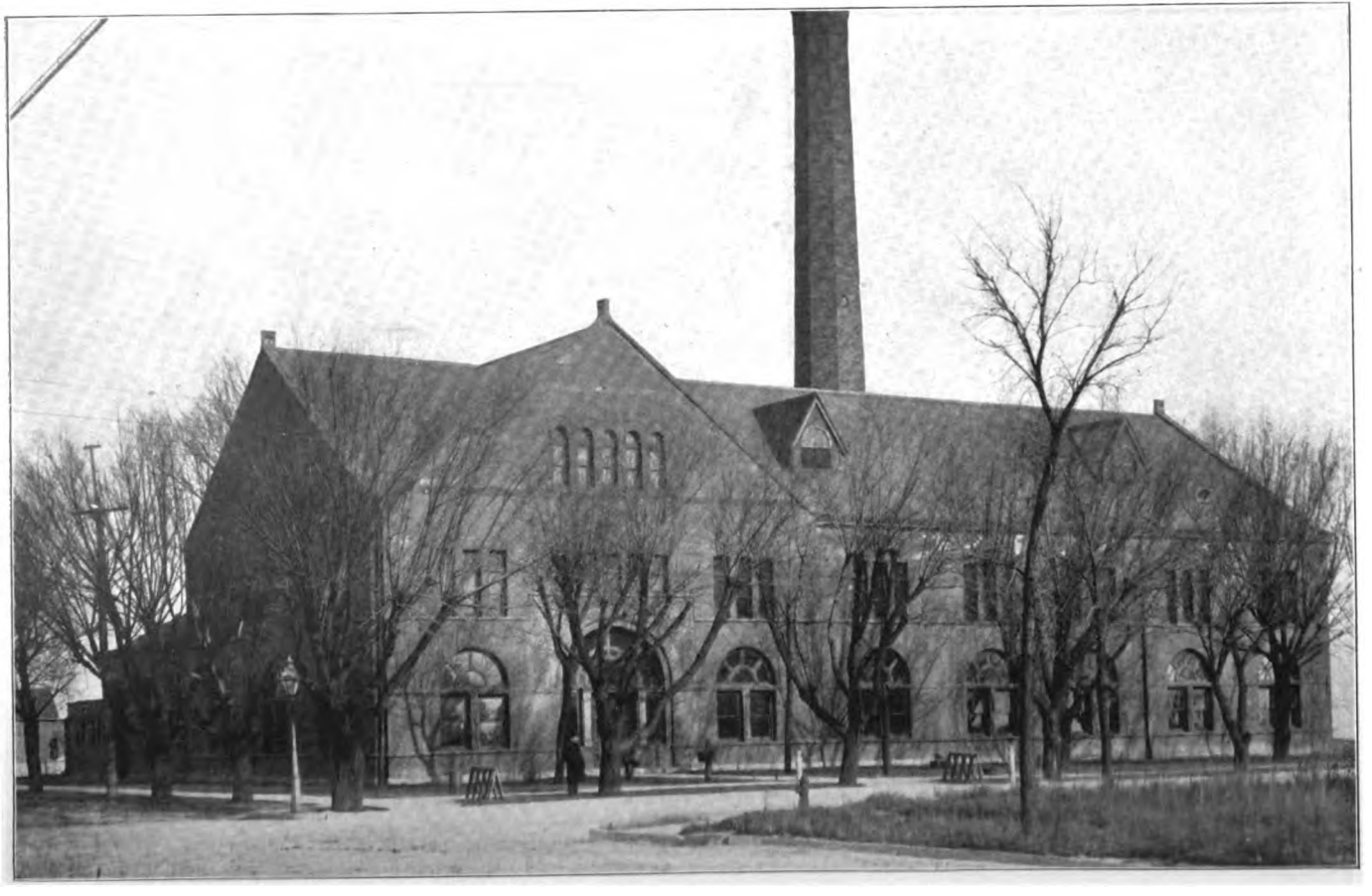
by bulkheads. This arrangement enabled the contractor to use the Park Row shaft in connection with the construction of the lake tunnel. The by-pass was 6 feet in diameter and 196 feet long. When water was first turned on the amount of percolation into the Park Row shaft was such as to preclude the use of the by-pass. It was subsequently lined with 3-16-inch steel, joined to the brick-work by Portland cement grout, put in under pressure. The supply to the station was admitted June 10, 1892. After this date such portion of the machinery was running as the supply of water would permit, but it became necessary to shut down altogether on account of the freshets in July, which compelled the absolute closing of the north shore inlet extension so that no water could be spared for this station. After the water was admitted to the four-mile tunnel the engines at both of the new stations were run regularly, drawing their water from the four-mile crib.

The specifications of the engine and boiler plants for these new stations required that each engine should pump 15,000,000 gallons per twenty-four hours against a head of 125 feet, steam pressure at boilers of 125 pounds, developing a duty of 125,000,000 foot pounds per 1,000 pounds of steam. Two-thirds of the boiler capacity was to be sufficient to supply steam to the entire plant. With the full boiler capacity the engines were each required to deliver 18,000,000 gallons per twenty-four hours.

The general dimensions of each engine are as follows: High-pressure cylinder, 27 inches diameter; intermediate cylinder, 46 inches diameter; low-pressure cylinder, 70 inches diameter; three single-acting outside packed water plungers, each 32¾ inches diameter; stroke of steam pistons and plungers, 60 inches. The air pump is worked from the main engine, and has a diameter of 22 inches, with a stroke of 60 inches. The boilers supplied with these engines are of the return tubular type, and at the Fourteenth street station are nine in number, each 62 feet by 20 feet, with forty-nine 4-inch tubes, and equipped with Hawley down-draft furnaces. At the Harrison street station six boilers of the same type and size were erected, but in this case were equipped with the Murphy smokeless furnaces.

On October 25, 1891, a formal test for capacity and duty was made at the Harrison street station. The result showed that when running with an average of 16.68 revolutions per minute, with steam pressure of 126.6 pounds, both engines delivered water at the rate of 31,534,043 gallons per 24 hours, against an average total head of 126.6 feet, showing a duty of 137,592,436 foot pounds per 1,000 pounds of steam, allowing 2 per cent for slip and leakage. The steam consumption was 12.67 pounds per indicated horse-power per hour.

The year 1889 was made memorable in the history of Chicago by the annexation of an extensive area to the original limits of Chicago. On June 29, by vote of the people, the city of Lake View and the towns of Hyde Park, Lake and Jefferson were annexed, thus increasing the area of Chicago 126 square miles, making the total area 170 square miles, the limits extending 24 miles north and south and 4½ to 10½ miles east and west. The population was increased by 220,000, making the total, as enumerated in 1890, 1,200,000. This increase in the territorial limits gave the City a frontage on Lake Michigan of 22 miles and a river frontage of about 58 miles for both sides. Through this annexation the City acquired two pumping stations—the Sixty-eighth street station (the old Hyde Park and Town of Lake stations merged into one), and



LAKE VIEW PUMPING STATION.

LAKE VIEW CRIB.

the Lake View station—with an aggregate engine capacity of 72,000,000 gallons per twenty-four hours; one lake tunnel 6 feet in diameter and 6,000 feet long, with a submerged intake for Hyde Park and Town of Lake; one lake tunnel in process of construction, 6 feet in diameter, for Lake View and Jefferson, and about 330 miles of water pipe of various sizes. The plant at Pullman was abandoned soon after annexation, and this district is supplied direct from the Sixty-eighth street pumping station.

Later, successive annexations brought within the limits the water works plants of Washington Heights, Norwood Park, Rogers Park and Cicero. The two latter are still operated by private corporations.

TheTown of Lake View first built works in 1875, the system including direct pumping and pumping to two tanks 12 and 15 feet in diameter, the bottoms of the tanks being 16 feet above the level of the lake. The water was taken from the lake through two intake pipes about 2,000 feet long. The first pumping engine was a "Flanders" high-pressure condensing, having two steam cylinders, each 15 inches in diameter, with a 15-inch stroke; two double-acting pumping ends, with plungers 14 inches diameter and 20-inch stroke. The capacity was 2,500,000 gallons per twenty-four hours.

In 1884 the plant was increased by the erection of a Worthington duplex horizontal compound condensing engine, with a daily capacity of 5,000,000 gallons. This engine has two high-pressure cylinders 21 inches diameter, two low-pressure cylinders 36½ inches diameter, two pump plungers 22 inches diameter, all having a stroke of 36 inches.

In 1888 a Gaskill compound condensing engine was added, having a daily capacity of 12,000,000 gallons. The high-pressure cylinders of this engine are 27 inches diameter; those of the low-pressure 54 inches, with water plungers 30 inches diameter and a stroke of 40 inches.

In order to provide a sufficient amount of water for future demands, and at the same time furnish a supply of satisfactory quality, a contract was let May 24, 1889, for the construction of a tunnel 6 feet in diameter, extending under the lake 5,000 feet and terminating in an intake crib. After annexation it was decided to extend the tunnel a mile farther, so that the intake crib is practically two miles from shore.

At this time the water was obtained near the shore through four intake pipes from 16 to 30 inches in diameter. As the shore ends were not laid deep enough, at low stages of the lake the water supply became insufficient. To remedy this the shore end of the 30-inch pipe, which consisted of a wooden box 30 inches square, with its top one foot above City datum, was changed in 1891 to a steel pipe of the same construction as the lake end, and with its top lowered sufficiently, so that subsequently there was rarely a shortage.

Owing to the slow progress made on the tunnel, the poor quality and at times insufficient amount of water obtained through the intake pipes, and the trouble from ice in the winter, a temporary crib was placed over the tunnel about 6,000 feet from shore. This crib was provided with an intake shaft with gates. The water through this intake was first obtained April 6, 1892, and the old intake pipes abandoned.

During 1892 this station received an additional Gaskill 12,000,000-gallon compound condensing pumping engine, being practically a duplicate of the one installed in 1888. During 1892 an entire new building was constructed, enveloping the

old one and providing sufficient room for the new engine and boilers. The old boilers were turned around and placed in line with the new ones, and all were equipped with the Hawley down-draft furnaces.

Annexation of the towns of Hyde Park and Lake added 53,000,000 gallons to the available pumping capacity of the City. These towns jointly first constructed a water works system in 1873. The station originally contained one Holly quadruple pumping engine, having a daily capacity of 2,000,000 gallons; also two Holly rotary engines and pumps, having a combined capacity of 2,000,000 gallons.

Lake water was obtained through a pipe 16 inches in diameter laid 1,000 feet into the lake, piles being driven around the outer end to protect the intake. Three tubular boilers, 60 inches in diameter and 16 feet long, furnished steam. In 1878 there was installed a Knowles horizontal compound condensing engine, having a daily capacity of 3,000,000 gallons. The steam cylinders were 24 and 37 inches in diameter, with plungers 20 inches diameter, and all of 36-inch stroke.

In July, 1882, the joint water works were separated, the town of Hyde Park building a pumping station of its own just west of the Town of Lake building. In this new station there was installed two Cope & Maxwell horizontal compound condensing engines, each having a capacity of 3,000,000 gallons, with four tubular boilers 60 inches diameter and 18 feet long. Each engine had high-pressure cylinders 20 inches diameter, low-pressure 40 inches, water plungers 17½ inches, all 36 inches stroke. These engines were abandoned and removed in 1898, being replaced by a new Holly engine.

In 1884-1885 a lake tunnel was constructed by the village of Hyde Park, terminating 5,036 feet from the short shaft in a submerged intake. This tunnel not being completed in time to be utilized by the new Hyde Park engines, the tunnel was bulkheaded at the Yates avenue shaft, the two intake pipes were connected with this shaft and that part of the completed tunnel between this shaft and the station supplied lake water by way of the old pipes to the new pumps.

In 1881 there was installed in the Town of Lake station two Holly vertical cross compound condensing engines, having a capacity of 4,000,000 gallons each, with four locomotive firebox boilers, built by the Chicago, Rock Island & Pacific Railway Company. Each engine had high and low-pressure steam cylinders of 24 and 48 inches diameter respectively, and pump plungers 18 inches diameter, all having a stroke of 36 inches.

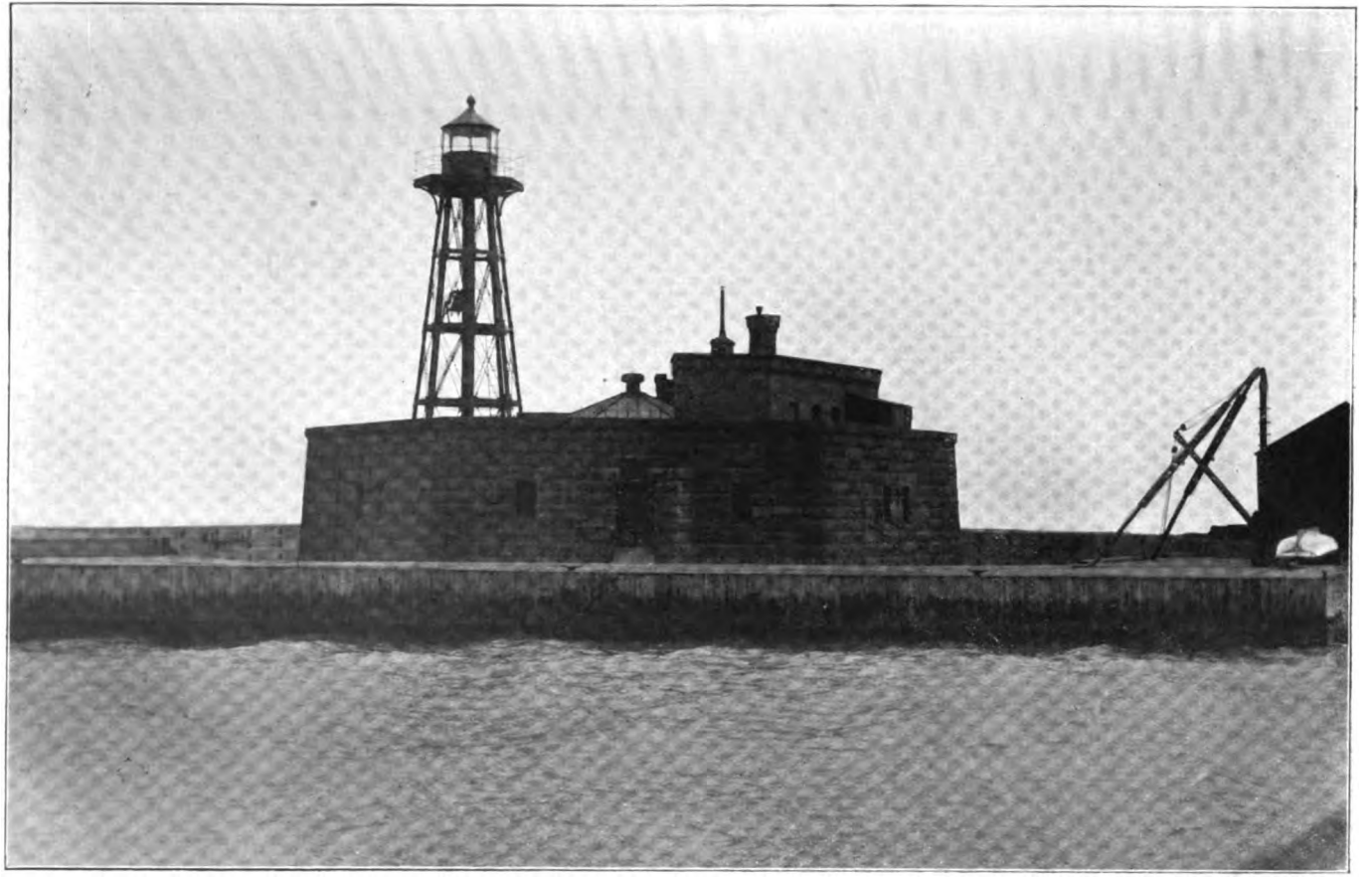
In July, 1885, lake water first flowed into the tunnel through the submerged intake. July 16, 1887, the Town of Lake connected the suction pipes of its station with the Hyde Park tunnel.

In 1885 the town of Hyde Park contracted for a 12,000,000-gallon horizontal high-duty Gaskill engine. This pump was put into operation in July, 1886.

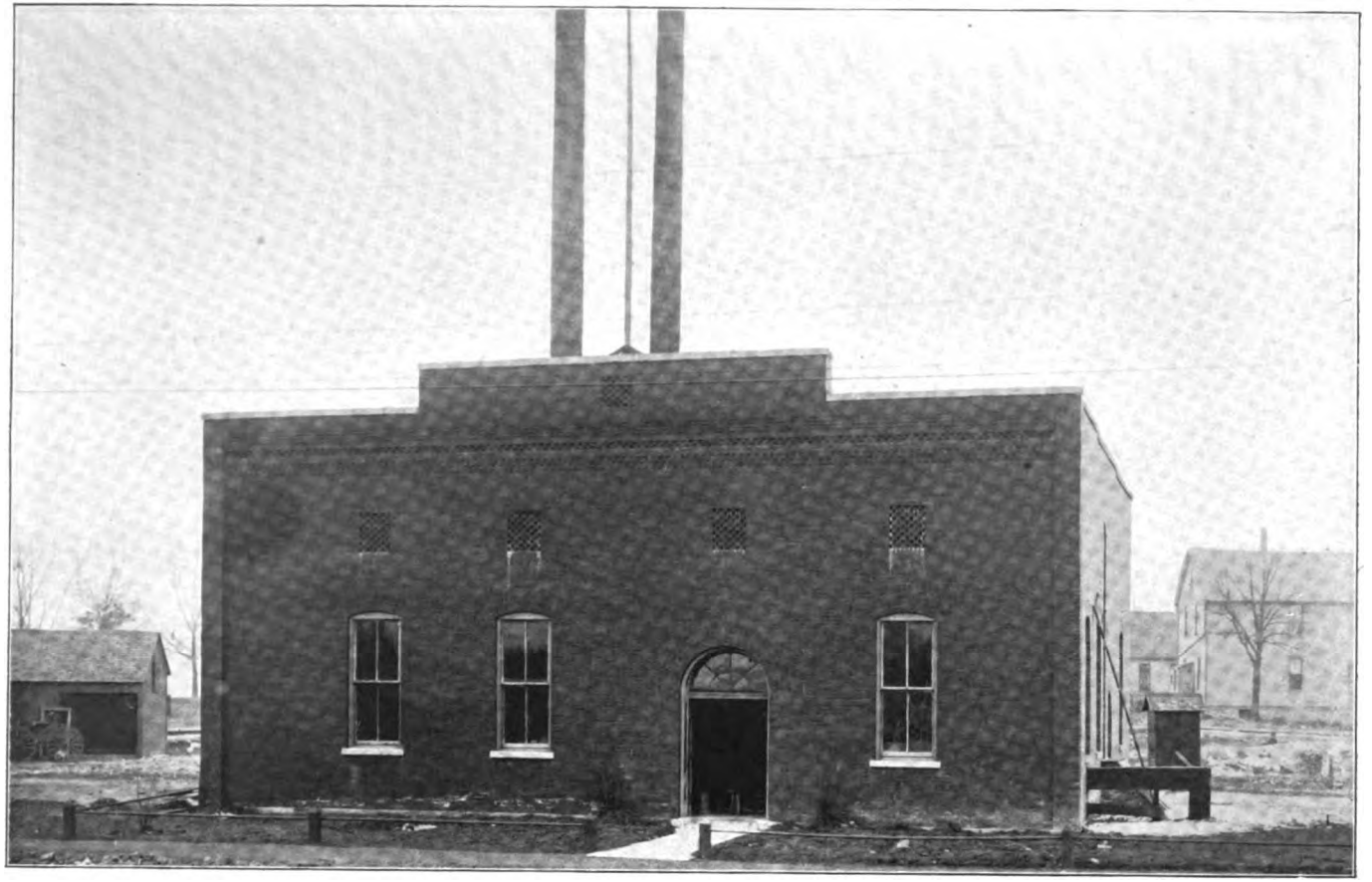
In 1889 Hyde Park contracted for a Worthington duplex horizontal high-duty engine with a capacity of 12,000,000 gallons, supplied with steam from four 66-inch tubular boilers 18 feet long.

The general features of the engine involved two high-pressure cylinders, 33 inches diameter; two low-pressure, 66 inches diameter; plungers 33 inches diameter, with a stroke of 48 inches. The engine was put into operation in May, 1890. An expert test, made March 12, 1891, showed a duty of 118,043,000

SIXTY-EIGHTH STREET PUMPING STATION.



SIXTY-EIGHTH STREET CRIB.



WASHINGTON HEIGHTS PUMPING STATION.

foot pounds, based on 100 pounds of coal, pumping at the rate of 12,582,600 gallons per twenty-four hours, against an average total head of 164 feet, and with a steam pressure of 75 pounds.

In February, 1889, the Town of Lake put into operation a horizontal compound condensing Gaskill engine of a capacity of 12,000,000 gallons, being practically a duplicate of the one installed in 1886.

In 1891 an arrangement was made whereby the City was to install two additional 12,000,000-gallon engines at this station in advance of ordinary needs, the pumpage of these engines to be entirely for the benefit of the World's Columbian Exposition, the Exposition Company to advance the funds needed for the new plant, to be repaid by the City at the close of the Exposition. In order to house these engines an addition was built on the south side of the Hyde Park station large enough to accommodate also the Town of Lake Gaskill engine, to be moved later. Contracts were accordingly let for two Gaskill horizontal compound condensing engines, with steam cylinders 30 and 54 inches in diameter, water plungers 31 inches in diameter and 40-inch stroke. Each engine was provided with four air pumps, with 20-inch plungers of 22-inch stroke. These were put into operation September 6, 1892.

The Gaskill engine was removed from the Town of Lake station in the same year and placed adjacent to the engines just described. This pump was again put into operation February 17, 1893.

In 1892 it was decided to construct a 7-foot extension of the original tunnel to an intake crib two miles from shore. As the water supply for the Columbian Exposition was to be drawn from this tunnel, it was decided to place an intermediate crib and shaft 6,500 feet from shore, thus allowing the work to be prosecuted from three headings. The original plan was to build the new 7-foot tunnel westward from the new intake crib to a point near the submerged intake and then to connect the two. This would have necessitated pumping the water out of the old tunnel. To supply water to the pumps during this time a 5-foot shore tunnel was built, terminating at a crib 900 feet from the shore. As the 7-foot tunnel could not be completed in time for the Exposition, the plan of connecting with the old tunnel was abandoned. The shore tunnel was meanwhile extended 600 feet farther to a temporary intake crib 1,500 feet from shore. This was then extended with a view of connecting it with the 7-foot tunnel. The new system was completed in June, 1894, and the Sixty-eighth street station consequently received its supply through the old 6-foot tunnel from the submerged intake, and through the 7-foot and 5-foot tunnels from the new two-mile crib.

On November 4, 1890, through annexation, the Washington Heights pumping station, located at One-Hundred-Fourth street and Vincennes avenue, was added to the City. This station was built in 1885, and in it was installed a Smith-Vaile pump of 400,000 gallons capacity; also a deep well pump, the water being obtained from an artesian well 1,350 feet deep. The water was first pumped into a cistern, and from there forced into a wooden tank 30 feet in diameter and 20 feet deep, placed on posts 60 feet high. The tank is located about one mile from the station on the high ground. The water was distributed through about 17 miles of mains 6 to 8 inches in diameter. In 1892 this station was enlarged. A new building was erected over and around the old one, large enough to receive additional pumping machinery in the future. The same

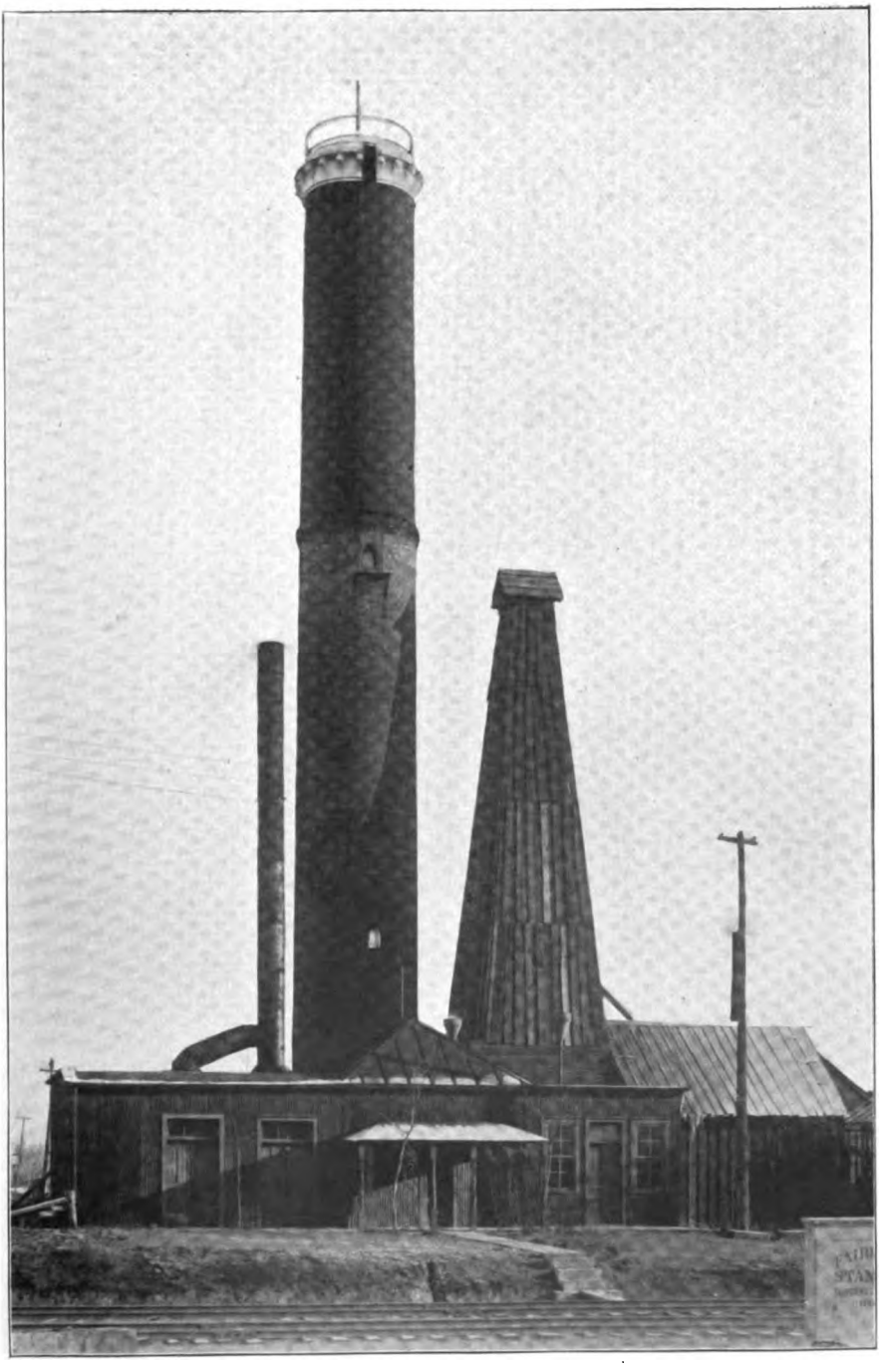
year a new Fairbanks & Morse pump of 1,000,000 gallons capacity, and one 60-horse-power tubular boiler, were added to the plant. In 1893 the capacity of this deep-well pump was increased by replacing the old 6-inch cylinder by a new one 10¼ inches in diameter. The normal level of the water in the well having gradually lowered on account of the increased demand for water, it became necessary in 1895 to supplement the well supply with lake water. A cistern was connected with the street main, through which water was delivered from the Sixty-eighth street pumping station.

The village of Norwood Park became annexed November 7, 1893. This suburb is supplied with water from an artesian well 1,600 feet deep, the plant consisting at that time of the following: One Deane duplex pump 9 x 5¼ x 10 inches, capacity of 250,000 gallons; one 36-inch tubular boiler 10 feet long; a standpipe, consisting of a brick tower about 60 feet high and 12 feet in diameter, on the top of which rests a wooden tank about the same diameter and 36 feet high. These works were built in 1889.

On April 4, 1893, the village of Rogers Park was annexed. The water works of this district are still operated by the Rogers Park Water Company. They were built in 1889, being put into operation August 15th of that year. The franchise term under which these works were constructed, and are being maintained and operated, is for thirty years from the day the works commenced to operate. Under the franchise, the City of Chicago has an option to purchase this system ten years after the same commenced to operate, and at each five years thereafter. The City is to give the company notice of its intention to exercise its option six months before the expiration of any one of the periods of time at which the option matures. The value of the plant is to be obtained by a board of three non-resident appraisers.

The source of supply of the system is Lake Michigan. It is taken through an intake pipe which extends 3,200 feet into the lake and is 20 inches in diameter. The machinery consists of two compound engines, manufactured by the Deane Steam Pump Company, Holyoke, Mass., which have a capacity of 1,500,000 gallons each. Four filters of a capacity of 1,000,000 gallons per day are used. They are of the pressure type, as now manufactured by the New York Continental-Jewell Filtration Company. The standpipe is 125 feet in height, 12 feet in diameter, and has a capacity of 125,000 gallons. The water is pumped to the standpipe, except in case of fire, when the standpipe is cut out and the direct pressure system used. The distribution system consists at present of 20 miles of main, varying in size from 12 to 6 inches. The average consumption per day at this time is about 400,000 gallons, with a maximum pumpage of 1,000,000 gallons. The pressure maintained is ordinarily about 55 pounds.

The annexation of the large territory in 1889 and 1890, and the acquisition of the several pumping stations already described, with the inadequate pipe systems of the several towns and villages, greatly complicated the water supply situation. As the pumping stations were all located along the lake shore, water had to be pumped for miles through mains which were laid necessarily without regard to the new conditions and demands that had arisen. The pipes were too small, and the necessity of additional large feeder mains was imperative in order to insure a proper distribution of the water as furnished by the pumping machinery. The annual increase in population and manufactures was far beyond expectations. The additional machinery that had been placed during



Norwood Park Pumping Station.

CARTER H. HARRISON CRIB.

1892 in the Lake View and Sixty-eighth street pumping stations, and the opening of the Fourteenth street and Harrison street stations in connection with the new four-mile lake and land tunnel system, failed to give relief to certain portions of the City. The pumps were forced to pump against a higher head than should have been necessary. The average daily pumpage during 1894 was 238,521,280 gallons, or 152 gallons per capita. The greatest amount pumped in one day was 276,886,135 gallons. The pumping capacity at this time was 357,000,000 gallons. Notwithstanding this large pumpage, the City Engineer reported that in the south end of Lake View, and on the North side, west of Lincoln Park, the pressure of water was very low. The north end of Hyde Park was in a similar condition. In the western portion of the City, extending from the extreme north to the extreme south, there was suffering from lack of an adequate supply, especially in hot weather. To relieve these conditions, which were rapidly becoming worse, the City Engineer recommended the placing of additional machinery in the Lake View and Sixty-eighth street station, and the construction of a new tunnel system to feed water to new stations to be located near the western limits of the City.

On January 24, 1895, the City Council ordered: "That the Commissioner of Public Works be, and he is hereby authorized and directed to make estimates and advertise for bids, and let contracts for the extension of the north shore inlet, and the construction of a tunnel to Garfield boulevard and West Forty-sixth street, or to such points as he may designate; also for the construction of a tunnel in the northwestern section of the City, in the neighborhood of Fullerton avenue. The amount to be paid for such work annually not to exceed $500,000."

On March 30, 1896, authority was given for a lake tunnel, including an intake crib necessary to feed the proposed land tunnels. The appropriation for the lake section, including shafts and cribs, was $774,500.

On March 15, 1897, authority was granted for the construction of two new pumping stations in connection with the new tunnel system. The plans for this new system, in accordance with which the land and lake tunnels were completed, was as follows:

The entire system was divided for contract purposes into four sections. The lake section, known as the "Northeast Lake Tunnel," extends from a shaft at the foot of Oak street northeasterly to a new intake called the Carter H. Harrison crib. Its length is 14,033 feet, with an internal diameter of 10 feet. The contract was let July 6, 1896, and the tunnel was completed in January, 1899. The entire crib was completed in November, 1899. The cost of the lake section, including the crib, was $590,000. Of this amount $225,000 was expended on the intake crib, being $250,000 less than the total cost of the four-mile crib, heretofore considered the most complete crib in use. The new crib is sunk in 35 feet of water, the outside diameter being 112 feet, with a well in the center 62 feet in diameter. Six ports, each 5½ feet by 5½ feet, located near the bottom, allow the water to enter the well. Within the well there is sunk an intake shaft about 100 feet deep. The upper part of this shaft is a cast iron cylinder 2½ inches thick and 12 feet outside diameter, provided with three gates with necessary screens, the gates being only a few feet below Chicago datum. The top of the cylinder is 8 feet above datum. Below the cylinder the shaft was constructed by the underpinning process, that portion being 11 feet inside diameter

and lined with four rings of brickwork. A second intake shaft was put into the well of this crib immediately after the completion of the first one. These two intake shafts are entirely alike, both as to diameter and depth, as well as in manner of construction.

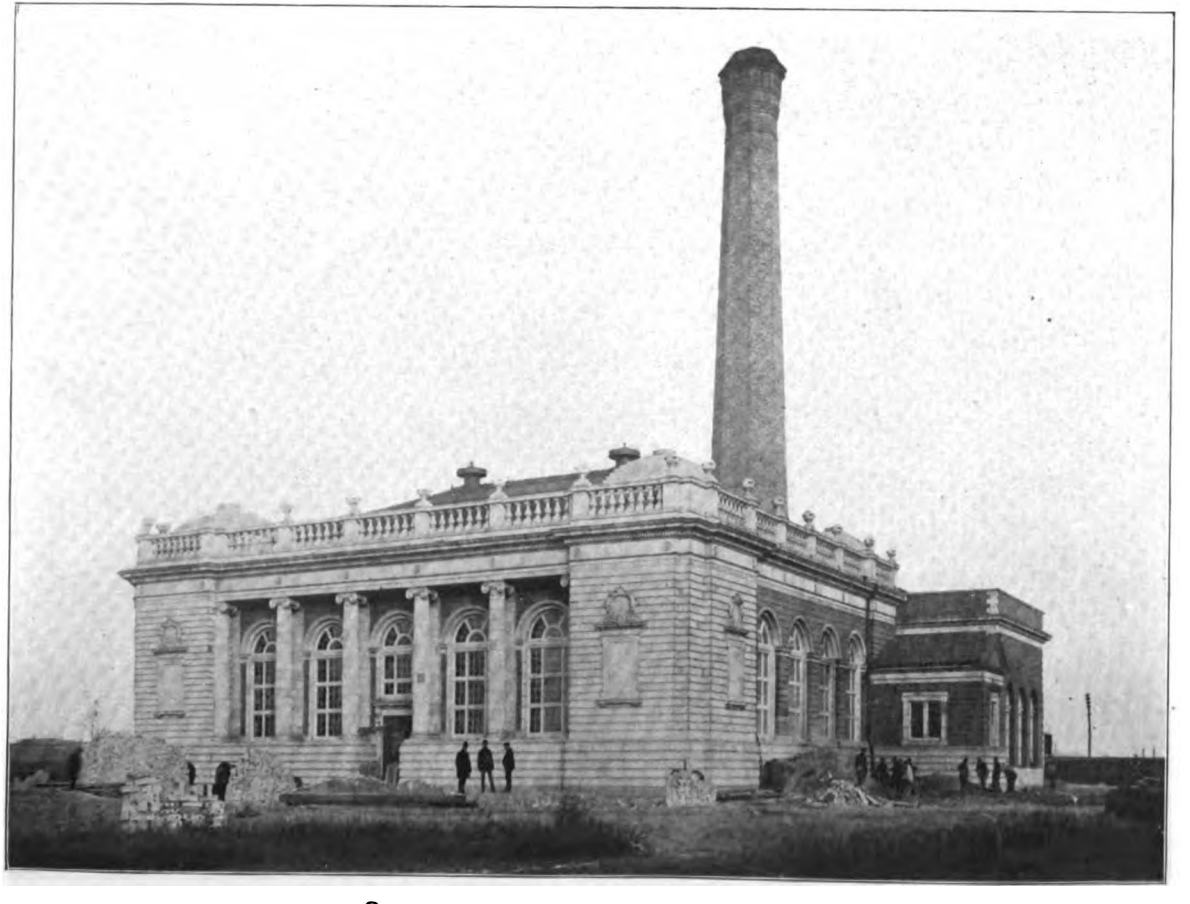
From this second shaft a stub tunnel 100 feet in length and 10 feet internal diameter was constructed. This second shaft is intended as a future intake for the three tunnels at present receiving lake water from the original two-mile crib.

The land system through which lake water is supplied to the new pumping station is divided into three sections. Section 1, 10 feet internal diameter, extends from the Oak street shaft, the western terminus of the lake tunnel, to Green street and Grand avenue, a total distance of 8,666 feet. From this latter point the main feeder divides into two auxiliary tunnels, each 8 feet in diameter, one extending southwesterly to a suction well at the Central Park avenue pumping station, located at Central Park avenue and Fillmore street; the other running northwesterly to the Springfield avenue pumping station, located at Springfield avenue and Bloomingdale road. The former, known as section 2, is 19,856 feet in length, of which 9,894 feet was constructed through earth and 9,962 feet was through solid rock. The latter, characterized as section 3, is 22,184 feet in length, of which 3,211 feet was constructed in earth, 3,464 feet through part earth and part rock, and 15,509 feet through solid rock.

The lake tunnel was completed in January, 1899. Section 1 of the land tunnel system was finished April, 1897, and sections 2 and 3 early in 1900.

Meanwhile other improvements and extensions to the existing tunnel system were in progress. The 7-foot shore tunnel, running easterly from the Chicago avenue pumping station, which in 1891 was extended to the northeast end of the Government breakwater, was, since its completion, practically useless, due to the close proximity of the intake to the shore. The two old tunnels terminating at the two-mile crib had been taxed to their utmost capacity, and in order to utilize the tunnel terminating at the breakwater and relieve the old ones, it was decided in 1895 to extend the former to the two-mile crib. A contract for this extension was made August 22, 1895. Owing to the insufficient port area and the small size of the well at the two-mile crib, a new intake shaft was sunk between the crib proper and its protection breakwater, protected with a pile crib filled with rip-rap. Water was let into this extension July 21, 1896, thus providing a third tunnel from the two-mile crib to the Chicago avenue pumping station, with necessary connections in order to reinforce the supply to the Twenty-second street station.

The capacity of the 5-foot tunnel of the Sixty-eighth street system being insufficient, it became necessary to draw part of the supply required by the Sixty-eighth street pumping station from the 6-foot tunnel leading to the submerged intake, although this intake was considered to be too near shore for safety. Accordingly, on the recommendation of the City Engineer, a contract was let for the construction of about 5,000 feet of 7-foot tunnel from a shaft located at the intersection of Sixty-eighth street and Yates avenue to the stub end of the existing end of the 7-foot tunnel running westward from the two-mile crib. This extension was continued by means of a 5-foot tunnel from the shore shaft to the existing Yates avenue shaft at the Sixty-eighth street pumping station, and was completed May 21, 1898. The total number of lineal feet of



SPRINGFIELD AVENUE PUMPING STATION.

CENTRAL PARK AVENUE PUMPING STATION.

7-foot tunnel constructed under this contract was 7,316; in addition, there was built 102 lineal feet of 5-foot tunnel. The entire water supply for the Sixty-eighth street pumping station is now taken from the tunnels receiving lake water by way of the Sixty-eighth street crib. The original submerged intake is permanently abandoned.

Contracts for the two new pumping stations in connection with the new lake and land tunnel system were let April 14, 1897. The buildings are practically duplicates and are constructed of pressed brick and terra cotta, with steel trusses and tile roof. The engine-room is 83 x 100 feet, the engine pit being the full size of the room. The floor on which the engine rests is 18 feet below datum. From an iron balcony 6 feet wide, and placed at about the street level, access is had by means of a circular stairway to the bottom of the engine pit. Each station has one smokestack, 175 feet high, the flue being 9 feet in diameter. The retaining walls of the engine pit are constructed of block rubble stone laid in Portland cement mortar on a concrete base; the top is 4 feet wide and the width at the base is 17 feet. At the Springfield avenue station these walls rest directly on the solid rock. At the Central Park avenue station the base of the walls is founded on a hard indurated clay.

January 23, 1897, a contract was let to Henry R. Worthington, of Brooklyn, N. Y., for the furnishing of six vertical triple expansion pumping engines, each with a daily capacity of 20,000,000 gallons, three to be installed in each station, steam to be supplied in each case by six horizontal return tubular boilers. The general design and features of these engines as erected are as follows: The engines are fitted with the well-known Worthington high-duty attachments, enabling a high rate of steam expansion to be maintained without regard to the piston speed; also insuring an easy flow of water to the mains and acting as a safety device, causing the engine to come to a state of rest without damage in case of a break in the water main. There are two high-pressure, two intermediate and two low-pressure steam cylinders, with diameters of 21, 33 and 60 inches respectively. Two reheaters, 27 inches by 2 feet 6 inches, and 27 inches by 4 feet, are provided. Each engine has two double-acting pumps, there being 54 valves in the suction chamber and the same in the discharge chamber. The plungers are outside packed, 34½ inches in diameter, and 8 feet 9 inches long. Each engine has one surface condenser placed on the suction pipe. The stroke is 4.1 feet. Each engine is designed and constructed to deliver 20,000,000 gallons per twenty-four hours at a plunger speed not exceeding 150 feet per minute, and against a head of 150 feet, with steam pressure at the boilers of 140 pounds per square inch. Under these conditions the engines are to develop a duty of not less than 135,000,000 foot pounds per 1,000 pounds of steam. The suction pipes of the engines are connected with a wet well, the foot valves of these pipes being at 30 feet below datum. The wet well is simply a continuation of the 10-foot shaft to which the tunnel is connected. This shaft is enlarged at a point 35 feet below datum to an elliptical shape about 22 x 25 feet. This enlarged shaft is carried to the level of the floor of the engine pit. Above this point the well is constructed of steel plates 5-16 inch thick and lined with three rings of brickwork, the base being a 6 x 6 angle resting on and bolted to the brickwork at the level of the engine-room floor.

The boilers, each of 250 horse-power, are of the internally fired horizontal return tubular type, 10 feet in diameter and 12 feet long, designed to carry a

working pressure of 200 pounds, provided with Morison corrugated furnace flues, and each boiler having attached a Hawley down-draft furnace. The boiler-room is also provided with water purifiers, auxiliary feed water heaters and high-pressure feed pumps. Each station is equipped with a complete coal conveying plant, by which the coal is taken from the cars, crushed and delivered in front of the furnaces, the ashes meanwhile being taken to a hopper in the coal room and dumped into cars for removal.

The conveyor is of the endless chain pattern with gravity buckets made of malleable iron. The buckets are made with an overlapping lip suspended between two chains and driven by a self-contained double cylinder engine and conveyor motor, taking steam from the regular boiler plant. Automatic dumping cams are placed over the coal and ash bins and arranged so as to properly distribute the coal at various points on the line of the conveyor. The coal bunkers have a capacity of 500 tons, and are provided with movable weighing hoppers which take the coal from any point under the bins and transfer the same to any point in front of the boilers. These hoppers have cut-off valves and self-contained scales.

Each station is also equipped with an electric traveling crane of 15 tons capacity, two bilge pumps, a 25-horse power electric light engine and generator, and a complete steam heating system.

The Central Park Avenue pumping station was first put into service June 29, 1900, and the Springfield avenue pumping station in the early part of January, 1901.

The results of the opening of these two stations had at once a marked effect on the water pressure along the western limits of the City.

Official tests on the three engines at the Central Park avenue pumping station were made on August 27th and 28th and September 3d and 4th and September 8th and 9th, 1902. The results of these trials show that the guarantee of ten (10) pounds evaporation per pound of combustible was fulfilled in each of the three trials, and that the capacity of each pump exceeded 20,000,000 gallons in twenty-four hours. In each case the duty exceeded 150,000,000 foot pounds of work per 1,000 pounds of steam.

The tests were made under superheated steam, the contractor having accepted a limitation 150,000,000 foot pounds when superheaters were installed and the City having agreed to the payment of one thousand dollars ($1,000) for each 1,000,000 foot pounds over the guaranteed 135,000,000 foot pounds of work per 1,000 pounds of steam. The contractors were awarded a bonus of fifteen thousand dollars ($15,000) on each of the three engines making a total of forty-five thousand dollars ($45,000) paid as bonus on Central Park avenue engines.

Tests were made on the three engines at Springfield avenue pumping station, one engine No. 3 on November 9-10, on engine No. 1 on November 12-13, and on engine No. 2 on November 16-17, 1903. The tests were made under superheated steam under the same limitations as for the Central Park avenue pumping station, viz: the limitation of bonus on duty over 150,000,000 foot pounds per 1,000 pounds of steam.

The report of experts showed a development of 161,676,942 foot pounds with engine No. 3, 157,133,021 foot pounds with engine No. 1, and 156,602,731 foot pounds with engine No. 2. Each pump exceeded its rated capacity of 20,000,000 gallons per twenty-four hours when pumping against an average head of 150 feet.

The guarantee of ten pounds evaporation per pound of combustible was fulfilled in each trial.

Early in 1897 it became apparent that, notwithstanding the ultimate increase in the pumping capacity through the construction of two new stations, additions and alterations would have to be made to the machinery in the various stations in order to give satisfactory service. An exhaustive examination of all the pumping plants at this time developed the fact that, through a practice of false economy in the previous years, necessary repairs to the different engines had not been made, with the result that a majority of the engines were not pumping the amount of water as figured from plunger displacement. The boilers were also in bad condition. Owing to the great demand for water and the many complaints on account of insufficient pressure, which called for the operation of practically the full equipment in all the stations, but little could be done during 1897 to remedy defects and do necessary overhauling. In order to have reserve machinery, plans were made in 1897 for installation of additional engines in the Lake View, Fourteenth street and Sixty-eighth street stations. Upon the completion of these new engines the machinery in all the stations was thoroughly overhauled, involving the placing of about twenty-five thousand new pump valves and the retubing of about fifty boilers. A large amount of pipe on both engines and boilers was renewed and remodeled. All the auxiliary machinery was overhauled and put into proper condition. The efficiency of the various plants was thus greatly increased and a consequent marked decrease in the cost of operation effected. The contract for a 14,000,000-gallon additional engine to take the place of the Flanders engine at the Lake View station was let January 27, 1897, to the Holly Manufacturing Company of Lockport, N. Y. This engine is horizontal, of the compound direct-acting crank and fly-wheel type, with outside packer plunger pumps, having two high-pressure and two low-pressure steam cylinders, the high and low pressure cylinders being connected to each plunger and by a connecting rod to the cranks of the fly-wheel shaft. All steam and exhaust valves are placed in the cylinder heads. The cut-offs of the high-pressure cylinders are controlled by a governor, while the cut-offs of the low-pressure are adjustable.

The air pumps are connected directly to the walking beams. The steam cylinders are 30 and 54 inches and the pump plungers 32 inches in diameter, all with a stroke of 40 inches. Steam is supplied from two horizontal tubular boilers 66 inches in diameter, 18 feet long, with one hundred and eight 4-inch tubes. They are equipped with Hawley down-draft furnaces.

The contract required the engine to develop a duty of 110,000,000 foot pounds for each 1,000 pounds of steam while pumping at the rate of 14,000,000 gallons in twenty-four hours against a head of 150 feet, with a steam pressure not to exceed 85 pounds per square inch. The engine was first put into operation in July, 1897, and an expert test made in October of the same year developed a duty of 126,600,000 foot pounds per 1,000 pounds of steam.

On October 26, 1897, a contract for an engine of the same type and like capacity was let to the Holly Manufacturing Company to be installed in the Sixty-eighth street station in place of the old Cope & Maxwell pumps, which were disposed of to the contractor. The engine with its boilers and appurtenances were exact duplicates of the new Lake View engine, and it was put into operation in 1898.

On October 26, 1897, a contract was made with the Lake Erie Engineering Works of Buffalo, N. Y., providing for the installation in the Fourteenth street station of a 30,000,000-gallon vertical, triple-expansion, direct-acting, crank and fly-wheel engine. The engine has three steam cylinders 34, 60 and 94 inches in diameter, in which the pistons are double-acting, and three single-acting water plungers 60 inches in diameter, all having a stroke of 60 inches. The steam cylinders are placed side by side on "A" frames vertically over the pumps, and each piston is connected rigidly to its corresponding water plunger. Between the steam cylinders and the pumps is the crank shaft, carrying two fly-wheels. The cranks are 120 degrees apart and each is connected by a connecting rod to its corresponding cross head. Each piston is connected to its cross head by two piston rods, and the connection from cross head to water plunger below is made by four rods, two on each of the crank shaft. The suction pipe enters the pump chambers under the high-pressure cylinder. All steam and exhaust valves are of the Corliss type and are placed in the cylinder heads. The cut-off of the high-pressure cylinder is controlled by a governor, while the cut-offs of the intermediate and low-pressure cylinders are adjustable by hand. The cylinders are all steam jacketed, with reheaters placed between them. The feed pump, air pump, etc., are driven from an arm on the low-pressure plunger cross head. Steam is supplied from two Babcock & Wilcox water tube boilers equipped with Roney mechanical stokers. The engine was required to develop a duty of not less than 135,000,000 pounds of water raised one foot high for each 1,000 pounds of steam, and to pump not less than 30,000,000 gallons of water per twenty-four hours against a head of 150 feet, with steam pressure at the throttle not to exceed 150 pounds per square inch. The engine was put into commission October, 1898, and an expert test made March, 1899, showed a duty of 152,952,000 feet pounds per 1,000 pounds steam.

In order to properly distribute with the least loss through frictional resistance the additional supply from the new stations, and also to provide necessary feeders in connection with the new engines installed in the Fourteenth street and Sixty-eighth street stations, it was necessary to construct an extensive system of distributing mains. This work was designed with a view of reaching directly, as far as possible, and indirectly by connecting with existing mains, all parts of the City, thus more nearly equalizing pressures and materially reducing friction. The main portion of this new system, constructed during 1898 and 1899, extends generally from Montrose boulevard on the north, connecting at that point with the large main running westward from the Lake View station to Sixty-seventh street on the south, and following closely the line of Central Park avenue. At regular intervals connections are made with the old east and west mains. A new feeder system was also laid in the downtown district, extending from the Fourteenth street pumping station by way of Fourteenth street, north on Michigan avenue to Adams street; in Adams street from Michigan to Wabash avenues, and on Harrison street from Michigan to Fifth avenues, connecting with the old 36-inch mains. An additional feeder was also laid westward from the Sixty-eighth street station, extending to Chicago Lawn at Sixty-third street and Central Park avenue. One result of this extension was to supply Chicago Lawn, a territory of about 4,000 inhabitants, with lake water. This district had previously obtained its water from cisterns and wells.

A system of 24 and 16-inch mains was laid in 1899 on North Ashland avenue

and North Clark street, extending from the existing 36-inch main on Montrose boulevard to the north limits of the City.

In order to provide adequate service for that portion of the North side, north of Oak street and adjacent to the North branch and Goose Island, a new feeder system was laid in this district during 1900. It extends from the old 24-inch Oak street main north on Larrabee street to Belden avenue, thence west on Belden avenue to and connecting with the 16-inch main on Halsted street. This system also includes a new 12-inch main on Garfield avenue from Cleveland avenue to Clark street. During 1899 over four miles of 12-inch main were laid from Avenue M and 107th street to Buffalo avenue and 133d street, to supply the town of Hegewisch.

The construction of these new distribution systems involved the laying of 55 miles of pipe, ranging from 36 to 12 inches in diameter, and an expenditure of over $1,000,000 for labor and material.

During the past three years 22 miles of 4-inch pipes, which were too small to supply the increased demand for water, have been taken up and replaced with larger pipe. These improvements to the water pipe system, in connection with the installation of the new pumping machinery, have resulted in effecting a satisfactory water pressure practically in all portions of the City excepting in the extreme southwestern portion.

In extreme weather that portion of the City west of Pullman and south of 107th street does not obtain a satisfactory supply of water. This district during the past few years has grown so rapidly in manufacturing industries, and consequently in population, that the Sixty-eighth street station has been taxed to its limit, with the result that immediate steps must be taken to furnish adequate service to this district. The only positive relief will be obtained through the construction of another independent lake tunnel extending cross town to a new pumping station located somewhere in the vicinity of 103d and State streets.

During the period from January 1, 1897, to January 1, 1905, inclusive, the water pipe system was increased by the addition of 287 miles of pipe, 2,964 hydrants and 3,188 valves, the total number of miles of pipe in service at the close of 1904 being 1,978, with 20,349 hydrants and 16,095 stop valves.

As before stated, the water pumped at the Norwood Park station is obtained from an artesian well. On account of the gradual lowering of the normal level of the water in this well, it was decided to install the air lift method. For this purpose an air compressor and a new boiler were installed during 1897. In order to provide for the increasing demands of this district, a new well, 1,800 feet deep, 15 inches in diameter at the top, decreasing to 6 inches at the extreme depth was sunk in May, 1901. A double-acting deep well pump was installed. The well is guaranteed to furnish 350,000 gallons per twenty-four hours.

During 1900 a horizontal compound condensing pumping engine, built by the Laidlaw-Dunn-Gordon Company, was installed in the Washington Heights station. It has a capacity of 1,500,000 gallons, and replaced the small Smith-Vaile engine.

The old wooden tank being in an advanced stage of decay, a contract was entered into with the Chicago Bridge & Iron Company for the erection on the grounds of the station of a steel tank of 128,500 gallons capacity, to be

set on latticed steel posts 100 feet high. The tank was put in service November 28, 1901, and the old wooden tank about a mile west of the station was permanently abandoned. The cost was $8,177.92.

For many years the annual reports of the City Engineer dwelt on the urgent necessity of replacing the four beam engines in the Chicago avenue station with modern machinery. The boilers supplying steam to the engines had greatly deteriorated, requiring continual repairs, involving large annual expenditures. The plans, as recommended by the City Engineer in 1898, called for the installation of three vertical triple expansion engines, each of a 25,000,000-gallon daily capacity, to take the place of the four beam engines, steam to be supplied from six 250-horse-power horizontal return tubular boilers, four to be sufficient to furnish steam to the three proposed engines. This would involve the construction of three new suction wells, and the rearrangement and simplification of the existing tunnels leading from the shafts in the rear of the station. The plans for the new plant also included coal conveyors necessary hoppers, bins, and the reconstruction of the coal sheds, including an addition to the existing boiler-rooms. The estimated cost was $350,000. Subsequently, as a result of the placing of additional machinery in the Lake View, Sixty-eighth street and Fourteenth street stations, and the opening of the new stations, the demand on the Chicago avenue station was lessened, and at the present time the pumpage does not exceed 50,000,000 gallons daily. It was further recommended, therefore, that the two Gaskill engines be transferred to and placed in the Lake View station. The pumpage at this station is at present about 35,000,000 gallons daily, the maximum capacity being 44,000,000 gallons. The addition of these two engines would increase the pumpage to a total of 68,000,000 gallons, sufficient to provide the rapidly growing territory depending on this station with an ample supply for some years to come.

Assuming that the Rogers Park station would shortly be acquired by the City, the Lake View station would be able to supply this district and the Rogers Park plant be abandoned. With a velocity of 3⅜ feet per second, the present Lake View tunnel is able to supply the maximum capacity required by this proposed increase in the pumping machinery. It might be added that with this addition the present engines would have to be lowered about 5 or 6 feet in order to keep the maximum lift within a reasonable limit.

The four beam engines at the Chicago avenue station in running order at this date are expensive to operate and require constant repairs in order to keep them in continuous service. About 1,000 horse-power is developed daily, requiring nearly five pounds of coal per horse-power per hour. With the old boilers about 22,000 tons of coal are required to operate the station at a total annual cost of about $75,000, fifty per cent of the coal used being anthracite. Late duty trials of triple expansion condensing engines show that with the best quality bituminous coal they can be operated with a coal consumption of 1½ pounds per horse-power hour. The triple expansion engines at the Fourteenth street and Harrison street stations are operated in everyday practice with a consumption of 2½ pounds of coal per horse-power hour. On the basis of 1,000 horse-power developed by the pumpage of 50,000,000 gallons daily with this type of engine against a head of 110 feet, and using boilers equipped with smoke-preventing devices, 31 tons of bituminous coal would be required daily at an average daily cost of about $100, or a saving in fuel over present

conditions of about $40,000 annually. The removal of the Gaskill engine would effect an additional annual saving in salaries at this station of about $20,000.

In accordance with the recommendation of the City Engineer, the annual budget for 1899 included an appropriation of $350,000 for proposed improvements of the Chicago avenue station, of which $50,000 was to be expended during that year. Detail plans and specifications were at once prepared providing for a new boiler plant. The requirements called in general for six horizontal internally-fired return tubular boilers, each with a capacity of 225 horse-power, each horse-power to mean 34½ pounds of water evaporated per hour from feed water of a temperature of 212 degrees into steam at atmospheric pressure, and to be properly proportioned for a maximum steam pressure of 200 pounds per square inch. The boiler plant was specified to include necessary feed pumps, purifiers, heaters, feed water measuring tanks and necessary steam piping, all in duplicate. A complete coal conveying machinery plant was also called for. A contract was let July 18, 1899, to John Mohr & Sons, of Chicago, for six boilers of the capacity specified, each to be 10 feet 6 inches in diameter, 15 feet 3 inches long, and each to have two Morison corrugated furnace flues 48 inches in diameter. The efficiency guaranteed was the evaporation from and at 212 degrees of 12 pounds of water per pound of combustible when using Pocahontas coal. The stokers accepted are of the Hawley type and guaranteed to prevent 90 per cent of the smoke. The detailed plans of the contractor as finally accepted include coal bunkers with a total capacity of 500 tons, having down spouts leading to each of the Hawley furnaces. Necessary conveying and coal-crushing machinery is also included. Three purifiers of the Baragwanath horizontal type are supplied. Two single Deane feed pumps, 12x7x12 inches, of the pressure pump pattern, each of ample capacity to feed all three batteries, are also being installed. The installation of these new boilers required an addition to the present rooms 36x47 feet, the reconstruction of the roofs to give proper head room for the coal conveying machinery, and certain other changes by which the new batteries are all housed in one room.

The official test on these boilers made August 8, 1902, showed an evaporation of 12.76 pounds per pound of combustible from and at 212 degrees F., or 6.3 per cent more than the guaranteed evaporation, and an efficiency of 78 per cent which represents the heat units absorbed by the water in comparison with the total possible heat units obtainable from the coal.

On October 13, 1902, a contract was let to the Allis-Chalmers Company of Chicago for the furnishing and erection in the Chicago avenue pumping station of three vertical triple expansion engines, each having a capacity of 25,000,000 gallons per twenty-four hours. These pumps are provided with Reidler valves. The plungers are 24⅛ inches in diameter with a stroke of 48 inches. The steam cylinders are 15, 29 and 48 inches in diameter, with the same stroke as the water plungers. The engines are operated with superheated steam having a pressure of 175 pounds at the boilers against a maximum head of 125 feet and making sixty-two revolutions per minute.

In connection with the installation of the new engines the first engine installed took the place of the old '53 and '57 engines. The engines were removed and a contract awarded August 15, 1903, to William E. McCarthy & Company for the construction of the foundations for the first new engine.

At the present time the first engine is being operated successfully, and arrangements are being made for the removal of the '72 engine and the placing of the second engine in its place.

On July 21, 1902, a contract was let to the Whiting Foundry Equipment Company for the furnishing and erection of a 20-ton electric crane to be installed in the Chicago avenue pumping station.

On December 29, 1902, a contract was let to John J. O'Brien for the remodeling of the tunnel system adjacent to the station. This contract included the construction of three circular brick shafts, each 12 feet in diameter, and each approximately 90 feet deep; about 180 feet of circular brick tunnel 6 feet inside diameter; about 458 feet of a circular brick tunnel 5 feet in diameter, and the furnishing and placing of a 6-foot gate valve. The work was completed by December 31, 1903.

In order that the new system might be connected with the old two-mile tunnel it became necessary to pump the latter out. This was done during the first part of June, 1903, and an examination of it made from the shore shaft to the crib proved it to be in excellent condition and containing but little dirt.

A brass plate stating the condition of the tunnel, etc., when pumped out during January, 1882, was found about 2,000 feet from the shore end. This plate was given to the Chicago Historical Society. A similar plate, giving the present date of pumping out, condition of tunnel, with the names of the Mayor, the Commissioner of Public Works, and the City Engineer and Assistant, was placed in the main drift 20 feet from the shore shaft. The tunnel was allowed to fill on June 17, 1903.

In order to provide a sufficient supply of water for western portions of the City on account of the rapidly increasing population a contract was awarded to the Henry R. Worthington Company, Brooklyn, N. Y., for the construction and erection of two 40,000,000-gallon vertical triple expansion pumping engines, one to be installed in the Springfield avenue station, and the other in the Central Park avenue station. The general design and features of these engines are practically the same as the three 20,000,000-gallon engines at present operating in each of these stations, the contract for which was let January 23, 1897.

Detailed plans and specifications require two high-pressure, two intermediate and two low-pressure cylinders, 27 inches, 42 inches and 76 inches in diameter, respectively. Two reheaters, 2 feet 8 inches by 4 feet 3 inches and 2 feet 8 inches by 5 feet 9 inches, are provided. Each engine will have two double acting pumps with 126 valves in the suction chamber and the same number in the discharge chamber. Plungers are outside packed, 45 inches in diameter 8 feet 3 inches long. Each engine is provided with one surface condenser. The stroke is 5 feet. The engines are designed to deliver 40,000,000 gallons per twenty-four hours at a plunger speed of 170 feet per minute and against a head of 120 feet, with a steam pressure at the boilers of 140 pounds per square inch. Under these conditions with the use of superheated steam the engines are to develop 175,000,000 foot pounds per 1,000 pounds of steam.

On the 13th of January, 1904, a contract was awarded to the S. Freeman & Sons Manufacturing Company of Racine, Wis., for the furnishing and erection in the Fourteenth street pumping station of six internally fired horizontal return tubular boilers, fitted with stokers, a complete coal-conveying machinery plant, coal storage bins, and all other appurtenances. These boilers replace nine old

tubular boilers which had been in service since 1891. The boilers are 250-horse-power, each 10 feet 6 inches in diameter and 12 feet 6 inches long, designed to carry a working pressure of 150 pounds per square inch. Each boiler contains one hundred and thirty-seven tubes, 3½ inches in diameter, 12½ feet long, and two Morison furnaces, which are fitted with Hawley down-draft furnaces. There are two feed-water heaters, 48 inches in diameter, and 84 inches long, with one hundred and forty-four 2-inch copper tubes 60 inches long. One purifier of the live steam open horizontal gravity feed type is provided for each boiler.

The station is provided with coal crushing machinery with a capacity of 40 tons per hour, and coal-conveying buckets on an endless chain capable of handling the same amount. The storage bins are four in number with a total capacity of 600 tons. Each boiler is provided with a hopper to deliver coal by means of a down spout leading from the coal bunkers, and are further provided with a Richardson automatic coal scale for weighing the amount of coal used in each furnace.

An important improvement, for which plans are on file, and which has been recommended annually for the past three years, and work on which will be commenced during 1905, is the extension of the three tunnels, terminating at present at the old two-mile crib in one tunnel, to the intake shaft already constructed in the Carter H. Harrison crib. The old crib built in 1865 is not only rapidly deteriorating, but, on account of the position of the ports, requires an annual expenditure of $18,000 for labor and tug service, the greater portion of which is necessary to fight the ice that every winter threatens to endanger the water supply obtained from this crib. The estimated cost of this extension, including the removal of the crib is $210,000.

No mention has yet been made in this paper of the numerous tunnels built to accommodate the water mains under the Chicago river and its branches. There are seventeen in all, located at the following points, all of which have been built or are maintained by the City of Chicago, with the exception of La Salle street:

Adams street and river.
Archer avenue and river.
Ashland avenue and west arm of South fork.
Chicago avenue and river.
Clybourn place and river.
Division street and canal.
Division street and river.
Eighteenth street and South branch.
Harrison street and river.
Kedzie avenue, West branch South fork, Sanitary Canal and Illinois and Michigan Canal.
La Salle street and river.
Ninety-fifth street and Calumet river.
North Western avenue and river.
Rush street and river.
State street and river (24 inch main abandoned).
Thirty-fifth street and river.
Throop street and river.

During 1904 there was pumped a daily average of 398,985,350 gallons, which, based on a population of 1,962,251, as given by the City Statistician, represents a daily average of 203 gallons per capita. The number of miles of water mains in service at this time is 1,978, the number of meters is 8,188, and the number of valves is 16,095 and 20,349 fire hydrants. Lake water is taken from five cribs and through 37 miles of tunnels. There are ten stations operated by the City, the total pumping capacity at present being 529,500,000 gallons daily. The number of engines available is thirty-four, steam to which is supplied from eighty boilers. An average of three hundred and seventy-five men are employed in the operation, maintenance and repairs of building, engines, boilers, etc., of the various stations, involving a daily outlay for salaries of over $1,000. An average of 340 tons of coal are consumed daily, calling for an annual expenditure for fuel of $340,000.

The total cost of the water works plant to date is placed at $36,000,000. The net water receipts for 1904 were $4,462,000.33.

DISCUSSION.

By John Ericson, M. W. S. E., City Engineer, Chicago, June 5, 1901. Corrected to January 1, 1905.

It would seem that with a pumping system, the nominal capacity of which is 529,500,000 gallons per day of twenty-four hours, and the present daily pumpage of about 400,000,000 gallons, making an average daily per capita supply of about 203 gallons, there would be no need for any further extension of the system (except distributing and service pipes) for some years to come.

Notwithstanding the many improvements that have lately been made and that have been so fully described by Mr. Spengler, I have received complaints from West Pullman and Washington Heights and other districts about a shortage in the water supply. I immediately started an investigation with a view of ascertaining the cause for the apparent shortage. Referring to that part of the City lying south of Eighty-seventh street, and where the situation now demands attention, I find that the population, as per the school census, has increased from 47,693 in 1892 to 70,636 in 1900, while the consumption per capita for the whole City has increased from 134 gallons in 1892 to 161 gallons in 1900, in a manner as shown by the accompanying diagram. (Plate I.)

When it is further taken into consideration that towns like Hegewisch, West Pullman and Washington Heights are located from 9 to 11 miles from the pumping station, necessitating the forcing of the water these long distances, thus causing great loss in head through friction and loss of water through leakage, it will become at once apparent that what may have been sufficient as regards the water supply a few years ago cannot be so now without some further improvements. (Plate II.)

In order to meet the present emergency I propose the following:

First, that in order to derive as much benefit as possible from the Central

Park avenue pumping station in this district, a 24-inch main be laid in Fifty-first street between California and Western avenues, connecting with the 24-inch mains in these streets.

Second, that the 16-inch main in Ashland avenue be extended south from Seventy-fifth street to the Washington Heights pumping station.

Third, that an additional 16-inch main be laid in Ninety-fifth street from State street west to Eggleston avenue, then south in Eggleston avenue to 103rd street, then west in 103rd street to South Halsted street.

Fourth, that an additional main 16 inches in diameter be laid in 119th street from State street to Center avenue.

Fifth, that an additional 16-inch main be laid in Commercial avenue from Ninety-eighth street to 114th street.

These improvements, however, will afford only temporary relief, and it becomes apparent at once, when the rate of increase in population is considered, that a more heroic treatment must be resorted to in order to bring permanent relief to this rapidly developing section of the city.

The most feasible scheme that suggests itself to me is the construction of a new pumping station somewhere in the neighborhood of 103rd street and the Illinois Central Railroad, to be fed by a tunnel terminating at or near the Sixty-eighth street crib. The mains suggested to give temporary relief may serve as feeders from this plant when installed.

The ultimate maximum capacity of the Sixty-eighth street station after a new pump shall have been installed will be 95,000,000 gallons per day.

Assuming this station to supply all that district lying south of Thirty-ninth street, we have an area of 96.6 square miles depending entirely on this one station; while the northern portion of the City, comprising 94 square miles (less than one-half of the total area), is equipped with eight pumping stations with a present available capacity of 446,000,000 gallons per day, and which can be largely increased by additional pumping machinery, provision for which has already been made at several stations as regards room, tunnel capacity, etc.

Since the completion of the Central Park avenue pumping station, it may be claimed that the southern portion of the City derives some benefit from the 24-inch main in California avenue supplied by this station. Deducting for this the district lying between Thirty-ninth and Forty-seventh streets, amounting to 7.6 square miles, we still have an area of 89 square miles entirely dependent on the Sixty-eighth street pumping station. It may be here stated that observations of the water pressures lately taken show the low pressure line to be between Forty-third and Forty-seventh streets.

The population of the City (school census, 1900) was 2,007,695, of which 348,467 is south of Forty-seventh street, and the balance of 1,659,228 being north of Forty-seventh street. If this latter amount be equally distributed over the entire north territory, the population would amount to 16,300 inhabitants per square mile. On this basis a supply of 150 gallons per capita per day would call for 1,455,000 gallons per square mile, an amount the Sixty-eighth street pumping station could not deliver to the south side. As a matter of fact, however, the population is not equally distributed; but, for the purpose of intelligently estimating the ultimate needs of the southern portion of the City, it would

be well to consider each square mile of territory capable of sustaining 16,300 inhabitants, this being about one-fifth of the population per square mile of the older portions of the City. The district lying between Division street and Twelfth street and Paulina street and the river has a population of 83,800 per square mile. The amount of water necessary to supply this district at some future date would then be 16,300x89x150, equal to 128,605,000 gallons per day. Of course, provision need not be made at once for all of this increase, but the tunnel and the pumping station should certainly be of sufficient capacity to ultimately take care of this whole district, with whatever assistance can be obtained from the Sixty-eighth street station.

In order to provide for a probable territorial expansion on the west, which has not yet been taken into consideration, the pumping station should be located as near to the present western boundary as practical without making the tunnel unnecessarily long.

The building should be designed to provide for additional pumps in the future, and the tunnel should be of sufficient size and capacity to meet all future requirements of this section.

When considering the great quantity of water used per capita, my thoughts were turned in another direction, and it seemed to me well to take up a new question relating to the system for study and investigation, viz., the relative proportion of waste and legitimate use of the water pumped. That a large proportion of the water pumped at great expense is wasted has long been suspected, but, so far as I know, there has never before been an attempt to ascertain even the approximate amount, and therefore no systematic attempt to prevent such waste.

Before a remedy can be intelligently applied, a diagnosis of the causes of a trouble or disorder should be ascertained. In order to ascertain approximately the relative amounts of water used and wasted, I have prepared a diagram showing the hourly pumpage per capita for a period of ten days, commencing at midnight between February 28th and March 1st, and ending at twelve o'clock midnight on March 10, 1901, embracing a period when the thermometer registered above and below the freezing point, and when there should be no extraordinary waste on account of too cold or too hot weather. In this I have followed closely the method adopted by Mr. John R. Freeman, C.E., New York City, in his report to Comptroller Coler of New York. The temperature of the external air for each hour, as recorded by the United States Weather Bureau of Chicago, has also been platted, and the variations are indicated by a broken line on the plat. (Plate III.)

While no definite conclusions should be drawn from any one set of observations, it is, however, significant and interesting to know from the accompanying diagram that whenever the temperature went below the freezing point, both the night and day pumpage increased, tending to show that even at a time when the winter was nearly over, the average temperature being rather above the freezing point, if a few days of freezing weather occurs the waste immediately increases to a considerable extent.

It will be further noticed that the greatest pumpage occurs between the hours of about 8 A. M and 5 P. M., and the least between the hours of 1 A. M.

and 5 A. M., also that the pumpage is considerably less on Sundays than on other days. It is probable that very little water is used between the hours of 1 A. M. and 5 A. M., the tanks no doubt being nearly all filled at the hour of 1 A. M.

Special inquiry made at my request by Mr. Lanagan, Mechanical Engineer, Bureau of Engineering, Chicago, tends to show that no tanks are being filled after 1 o'clock A. M., and that but little water is used by manufacturers' establishments during these hours.

Careful investigation made by Mr. Freeman and others, in cities where nearly all water used is metered, show a consumption between the hours of 2 A. M. and 4 A. M. of from 9.5 to 12 gallons per capita per twenty-four hours. This includes the waste of water after passing the meters, and Mr. Freeman comes to the conclusion that the actual necessary use of water between these early morning hours is possibly only at the rate of 4 gallons per capita per twenty-four hours.

In order not to overestimate the waste, and owing to the many large manufacturing establishments in this City, I have assumed the consumption of water during the quietest hours of the night at the rate of 23 gallons per capita per twenty-four hours, which I consider an exceedingly liberal estimate.

By referring to the diagram (Plate III), there is shown an upper portion, bounded by an irregular upper line and marked "Water for necessary use," which is about 15¼ per cent of the total pumpage. Next below is a narrow belt, marked "Doubtful whether used or wasted," and taken as 8½ per cent of the total pumpage. Lastly, at the lower part of the diagram is shown a solid portion, marked "Water probably wasted," and amounting to 76¼ per cent of the total pumpage. It is to be noted that this diagram represents the pumpage, consumption and useless waste at a time of year when there should be comparatively little waste on account of cold weather, and none on account of hot weather, and no sprinkling required; and that out of a total pumpage for ten days, 76¼ per cent is surely wasted, or if the doubtful portion of 8½ per cent be added, the waste amounts to 84¾ per cent of the total pumpage.

As the cost of fuel alone for pumpage in a year at present amounts to over $350,000, the cost of the fuel consumed to pump the water that is wasted must necessarily represent a considerable sum of money. It is, therefore, of considerable importance to study and investigate the causes for this enormous waste, and to apply remedies as far as it is possible and practicable to do so.

The waste may be ascribed to the following various causes, no attempt being made to mention them in the order of their importance:

1st. Defective joints and pipes in 1,978 miles of mains. The mains laid in annexed territories previous to annexation, mostly by contract under poor inspection, and mains laid under special assessment previous to 1898, when there was imperfect or no inspection, unquestionably cause great leakage. Electrolysis and old deteriorated pipes are also causes for considerable waste.

2nd. Defective, leaky and abandoned service pipes between the mains and the curb walls.

3rd. Defective house plumbing.

4th. Leaving faucets unnecessarily open in winter to prevent freezing, and in summer to keep water and other matter cool.

5th. Unnecessary and willful waste, overflowing tanks, etc., etc.

While the waste of water cannot be entirely prevented, the amount can, however, be materially reduced. The advisability of placing meters on all service connections deserves to be seriously considered. I am of the opinion that a large per cent of the waste can be prevented by such a step.

As an illustration to show that this is not an exaggeration, it is interesting to note the experience of an engineer of Hartford, Conn., described in the *Water and Gas Review* for May, 1901. On the 14th day of March a water meter was put into the house of this engineer. A series of readings was immediately commenced to ascertain the total water passing the meter, the waste, and the difference or actual use. To determine the amount of waste, readings were taken late at night, after all use had ceased, and early in the morning just before use had commenced. The results are graphically shown on the accompanying diagram. The family consists of four adults and two children. Water is used freely. The plumbing in the house is characteristic of a well-to-do household. As the readings the first five days indicated considerable waste, a careful examination of the plumbing fixtures was made. One small stream was found running down the back of the bowl of one of the closets. A few of the faucets were found to drip at the rate of about one drop in one or two seconds. A plumber was called and stopped every visible leak. The leak in the closet was due to a worn valve, a very common defect. The effect of the repairing of the plumbing was very marked, as is shown by the diagram. The night readings of the meter now show that no water passed the meter at all. The readings after the 19th may all be considered legitimate use, and are about what may be expected with liberal usage.

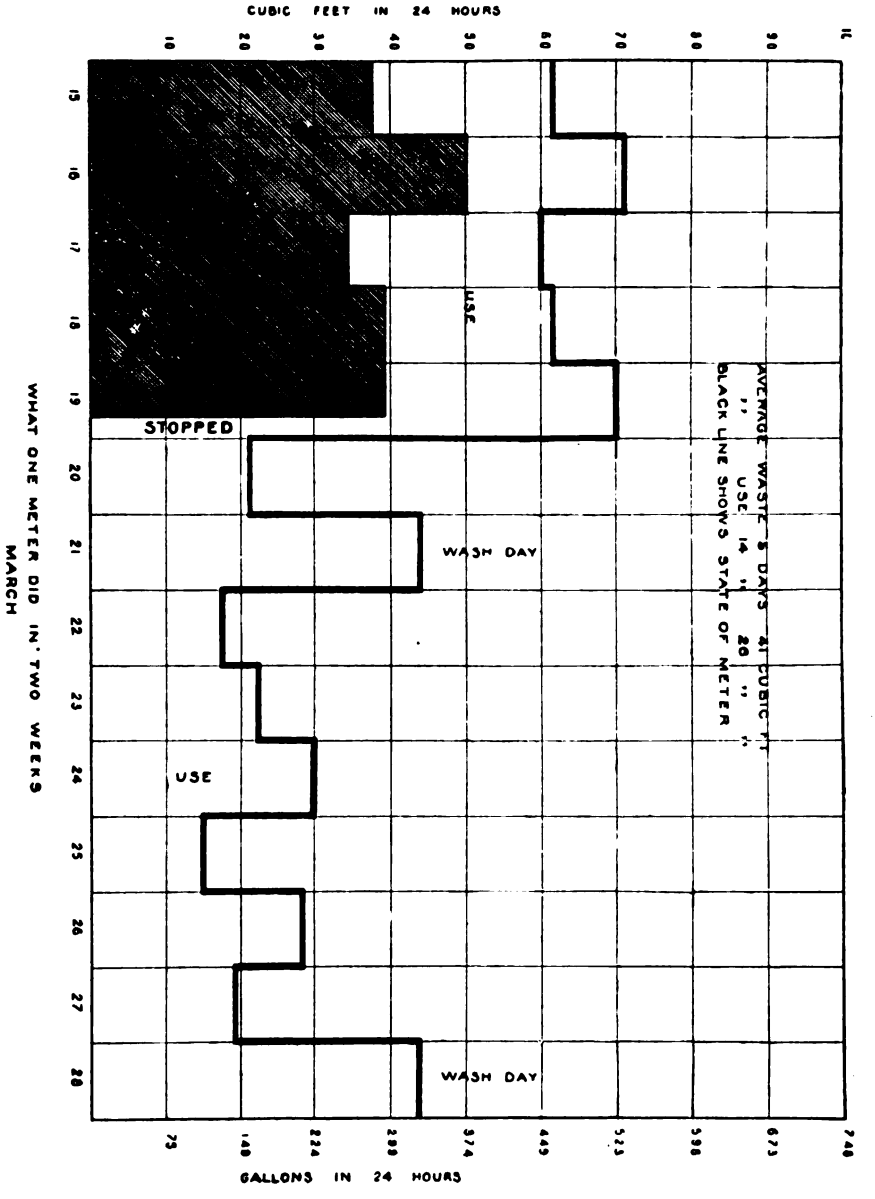
When the great number of householders in Chicago is considered, it can be readily understood what an enormous amount of water is wasted on account of defective plumbing alone.

The revenue from the water system would be greatly increased by the adoption of meters, and it would be a step in the right direction to discover and thus to prevent waste in other parts of the system.

The amount of water used for domestic, manufacturing and other purposes in and around the buildings could thus be obtained, and by subtracting this amount from the total pumpage, some close approximation of the waste outside the buildings could be arrived at, there being ample facilities for estimating the amount of water used outside the buildings.

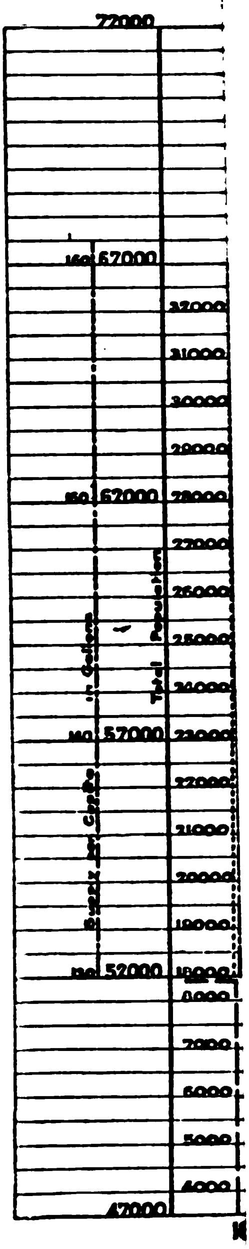
Plumbing would be kept in good repair, since every property owner, manufacturer and other consumer of water would undoubtedly find it to his interest to prevent waste of the water for which he would have to pay.

To ascertain the amount of waste through leaky joints in mains, abandoned and leaky service pipes, etc., outside the houses would require considerable time, expense and labor. The best method would probably be to divide the City into small districts and to meter all water entering into each district, and then sub-



tract the quantity registered by house meters, which first should have been placed. This could probably be done cheapest and in the shortest time by the so-called Pitot tube method. In this manner the importance of the leakage for each district could be obtained, and such steps taken to prevent same as would seem advisable and necessary.

Diagram



REPORT ON WATER WASTE AND METERS.

By JOHN ERICSON, City Engineer.
November 13, 1902.

HON. F. W. BLOCKI, Commissioner of Public Works.

DEAR SIR: On May 9, 1901, I presented to you a report showing that in the City of Chicago there is an enormous waste and leakage of the water pumped at our water works, probably exceeding 75 per cent of the total pumpage. This report appears in the discussion of the water works system of the City of Chicago.

The City Council on October 13, 1902, ordered "that the Commissioner of Public Works be and he is hereby instructed to present to this Council within four weeks a plan for the installation of meters, with all necessary information as to cost, etc." In order to fully cover the subject, the aforesaid report should be made a part of this report. In this report I propose to show:

1st, Present conditions cannot continue for any considerable length of time from a financial and engineering point of view.

2d, The *necessary* per capita daily consumption, including reasonable waste and leaks, does not exceed 70 or 75 gallons.

3rd, Any *restriction* in the legitimate use of water is not attempted and should not be encouraged.

4th, Buying and selling water by measure is more equitable and cheaper than by present method.

5th, Only forty per cent of the taps in use need to be metered to save the City at least half a million dollars a year after ten years.

6th, With a natural increase in population to 2,800,000 ten years hence, and the introduction of meters at the rate of 3.65 per cent per year for ten years only, the total pumpage then will be over 40 per cent less than it is to-day.

In order first to realize what a waste and leakage of 75 per cent of the total pumpage means to the taxpayers of Chicago it is well to bear in mind that the total pumpage for the year 1901 was 125,298,115,196 gallons, and 75 per cent of this quantity equals 93,973,586,397 gallons. Many of our citizens reason that because we have an inexhaustible supply of water right at our doors, water delivered through the pipes should be practically as free and abundant as the air we breathe and as the sunlight from above.

Mr. Rudolph Hering, the eminent Eastern hydraulic engineer, has calculated that in 1901 every million gallons of water pumped at the water works of Chicago cost, including interest on investment, depreciation, operating expenses, expenses for distribution, and maintenance, $19.50. (See Proc. Am. Soc. C.E., Vol. XLVI, page 422.) The cost, including the above charges, of the water wasted and leaking away in 1901 and that could have been saved if proper precautions had been taken from the beginning, is, according to this estimate, therefore $1,832,483. Do the citizens of Chicago receive any return for this large extra expenditure? If the water thus wasted were necessary to the health and the comfort of our citizens nothing should further be said about this matter. If restriction of the waste and leakage prevents the citizens from obtaining a necessary and lavish supply of water, then emphatically no restriction should be attempted.

Mr. Dexter Bracket, C.E., Engineer of the Massachusetts Metropolitan

Water Board and a recognized authority on water supplies, has compiled a table showing the amount of water used (including waste) in a great number of houses in various cities in the United States and Europe, where the total consumption is metered. Said table is reproduced below.

CONSUMPTION PER CAPITA IN BOSTON, BROOKLINE, NEWTON, FALL RIVER, WORCESTER, YONKERS AND LONDON, AS DETERMINED BY METER MEASUREMENT.

City or town.	No. of houses.	No. of families.	No. of persons.	Consumption gallons per family.—Capita.		REMARKS.
Boston	81	402	1,461	221.0	59.0	Highest cost apartment houses in City.
Boston	46	628	2,524	185.0	46.0	First-class apartment houses
Boston	223	2,204	8,432	123.0	32.0	Moderate class apartment houses.
Boston	39	413	1,844	80.0	16.6	Poorest class apartment houses.
Boston	339	3,647	14,261	139.0	35.6	Average of all apartment houses supplied by meter.
Boston	40	.....	1,699	.....	46.1	Boarding houses.
Brookline	.....	828	4,140	221.5	44.3	Average of all dwellings supplied by meter.
Newton	490	490	2,450	132.5	26.5	All houses supplied with modern plumbing.
Newton	.....	619	3,005	.....	6.6	These families have but one faucet each.
Newton	.....	278	1,390	34.5	6.9	These families have but one faucet each.
Fall River	28	34	170	127.5	25.5	The most expensive houses in the city.
Fall River	64	148	740	42.0	8.4	Average class of houses, generally having bath and water-closet.
Fall River	.....	.....	70,000	.....	12.3	Total domestic consumption.
Worcester	.....	20,514	90,942	.....	16.8	Whole domestic consumption.
Worcester	.....	81	327	80.2	19.9	Woodland street, best class of houses.
Worcester	.....	37	187	118.1	23.4	Cedar street, best class of houses.
Worcester	.....	93	447	95.0	19.8	Elm street, houses of moderate cost.
Worcester	.....	245	1,104	55.1	12.2	Southbridge street, cheaper houses.
Worcester	.....	229	809	55.0	15.6	Austin street, cheaper houses.
Yonkers, N. Y.	.....	.....	31,000	.....	21.4	.....
London, Eng	727	.....	5,089	.....	18.6	Middle class, average rental $200.
London, Eng	1,169	.....	8,183	.....	25.5	Houses renting from $250 to $600; each have bath and two water closets.

(See Transactions Am. Soc. C. E., Vol. XXXIV, Page 189.)

With an addition of 10 per cent to cover loss in the registration of meters, the average consumption per person in these various districts is but 20 gallons, with every person having all the water that can possibly be used. Similar records taken for the purpose of determining the quantity used for trade, manufacturing and public purposes show that the actual requirements at present do not exceed 40 gallons per capita for business, manufacturing and mechanical purposes, and certainly not more than 5 gallons for public purposes. Making the liberal allowance of 30 gallons per capita for domestic purposes, the total consumption ought not therefore to exceed 75 gallons per capita per day. Mr. John R. Freeman, C.E., another eminent Eastern hydraulic engineer, estimates the necessary quantity of water for all purposes, including reasonable waste, at from 50 to 77 gallons per capita per day for New York. The sanitary conditions in cities where these quantities prove sufficient are as good as or better than, the sanitary conditions in cities where the supply of water is several times this amount.

The City of Chicago in 1901 supplied water at the rate of 164.8 gallons per capita per day, based on a population of 2,082,695.* Buffalo supplies about 275 gallons per capita; Philadelphia, 230 gallons; Pittsburg, 175 gallons; Albany, N. Y., 225 gallons. These cities are all practically unmetered and represent a higher per capita consumption than any other cities in the world. The health conditions in any one of these cities are not superior to, in fact, not so good as, those of Chicago. As regards the claim that the waste is necessary for the flushing of sewers, this matter has been investigated by very competent engineers, and it has been found that the leakage and waste in a water system does not flush the sewers. When it is considered that the total pumpage in Chicago corresponds to a rainfall of only $\frac{1}{192}$-inch an hour, or ⅛ inch per day, it is readily seen that such is the case. If the leaks and waste are restricted, there will be plenty of water and pressure to effectively flush the sewers in a proper manner.

At a liberal estimate not more than 80 gallons per capita per day, including reasonable waste, could possibly have been used in the City of Chicago in 1901, leaving 84 gallons, or about 51 per cent absolutely lost without doing any useful service. *In these 51 per cent is not included water which is lavishly used, but only that which is willfully or negligently permitted to escape.* The cost of these 51 per cent, according to the estimate of Mr. Hering, is $\frac{51}{100}$ x 125,298,115,196 x $19.50 or $1,246,089.95. The cost of fuel alone to pump this useless quantity of water in 1901 was $\frac{51}{100}$ x $334,560.19 or $170,625.70. To this should be added cost in salaries, supplies and maintenance of at least $100,000.

The effect otherwise of this unnecessary pumping is a great reduction of the pressures all over the City, since the velocity of the water through the pipe system is greatly increased, and the loss of head through friction is proportional to the square of the velocity. This again necessitates larger pipes and consequent large expenditures. Under these conditions, ought not something be done to stop this waste?

In my report of last year I recommended that water meters be installed as a means of reducing this waste. I am fully aware of the unpopularity of such a recommendation in the City of Chicago, as it has also been in every City where the question of meters has first been brought up. But I fail to find anything but

*The per capita consumption for the year 1904 was 203 gallons.

satisfaction with the system wherever it has been introduced. I have a number of communications from superintendents of water works where meters have been generally installed, stating that the general feeling among the citizens is strongly in favor of meters as being the most equitable way of buying and selling water. A system whereby a widow living alone is required to pay as much for her water supply as a family of five or six is manifestly unfair. It has been argued that the installation of meters will have a tendency to restrict lavish and even legitimate use of water, which, as stated, should under no circumstances be encouraged. Assuming a cottage with an average family of five persons, the lavish and legitimate use per day is as shown not more than $5 \times 20 = 100$ gallons per day or 36,500 gallons per year. The cost of this water at a meter rate of ten cents per 1,000 gallons is $3.65 per year. The present rate is $5.50 for an average one-story cottage without any extra fittings whatsoever. Assuming again a modern residence of three stories, the frontage rate without any extra fittings or garden hose is $14. If we assume twelve persons in the family the quantity used is about $12 \times 20 = 240$ gallons per day or 87,600 gallons per year. This at ten cents per 1,000 gallons amounts to $8.76. In a majority of cases it can be shown that buying the water at meter rates will be cheaper than by the present method. In order not to encourage restriction in the use of water a minimum rate of say $3 should be established. As to the effect of reducing the waste by the installation of meters, the almost universal testimony is that a very large percentage is saved by this method. The City of Milwaukee has at the present time (1902) about 36,000 meters in use installed during the last decade. The City Engineer informs me that irrespective of increase in population and in the useful consumption of water, the pumpage to-day is no more than ten years ago. Judge Hillyer, President of the Water Board of Atlanta, Georgia, a city that has been placed more completely under the meter system than any other, in 1898 gives the following results: The conditions of water supply there were difficult. The water, being at times very muddy, had to be filtered. As filtering the water was very expensive, it was decided to place the city under the meter system and avoid filtering the great waste which was believed to exist. The pumpage at that time was 6,000,000 gallons per day and the engines were kept running to their utmost capacity. Even under these circumstances the fire engines had to take water under suction. Such a thing as fighting a fire with the hydrant pressure was unknown. After the meters were put in the pumpage immediately fell from 6,000,000 gallons to 1,250,000 gallons per day and the pressure increased from 20 lbs. per square inch to 60 and 80 lbs. And similar testimony comes from all cities where meters have been installed.* To apply the remedy in Chicago as elsewhere is not therefore so much of an engineering proposition as a question of what is the *will* of the public. In providing for the health and comfort of a community, the Engineer has to be governed by what the public *will* do and not by his own theory of what they *ought* to do. The object of this rather lengthy report is therefore to add if possible something to the information of the public on this important question.

From a financial point of view the question presents itself to me as follows: By examining the increase in population in the past the City of Chicago ten

*Since this report was written much additional information showing similar results has been obtained.

years from now (1902) will probably have a population of about 2,800,000. The yearly increase in the consumption of water per capita during the last few years would indicate that ten years hence the consumption will be at the rate of at least 200 gallons per capita. (There is a per capita daily consumption of 203 gallons in 1904.) If present conditions are allowed to continue, therefore in 1912 the daily necessary pumpage will be 560,000,000 gallons per day. The present average daily pumping capacity, leaving out a reasonable number of the pumps for reserve is about 360,000,000 gallons. Assuming the same reserve capacity as at present, the City will therefore have to increase its plant over 37 per cent in the next ten years. The estimated cost of the water works plant as it stands to-day is about $32,000,000, of which the pipe system is estimated at about $16,000,000.

Leaving the distribution pipe system out of consideration, according to these figures, there will still have to be expended in extensions of the plant during the next ten years $5,920,000, or an average of $592,000 per year.

There was expended during the last ten years for tunnels, pumping stations and machinery for pumping $7,012,973.62, or an average of $701,297.36 per year, exclusive of pipes.

By platting the information received from annual reports and from superintendents of water works in various cities of the United States, Mr. John R. Freeman, C.E., has established a relation between the percentage of metered services and the consumption per capita that can, I believe, be applied to Chicago, as it indicates the condition correctly as it exists to-day. At any rate it certainly is a good indication of what may be expected. I have therefore taken the liberty of reproducing said diagram herewith. From an examination of this diagram it will be seen that with the increase of taps metered from 0 to 25 per cent the decrease in consumption per capita is very rapid, from 25 to 50 per cent the decrease in consumption is less rapid, and from 50 to 100 per cent still less, being about 65 gallons per capita with 50 per cent of taps meters and 55 gallons per capita with 100 per cent of taps metered, or a gain of only 10 gallons per capita for the last 50 per cent of meters placed. Chicago at present has about 3.5 per cent of the taps metered, which corresponds to about 165 gallons per capita on the diagram the actual consumption being also about 165 gallons. By increasing the number of meters from 3.5 per cent to 40 per cent the consumption, according to this diagram, which, as stated, is based on the actual condition in a great number of cities, should fall from 165 to 70 gallons per capita per day, if the meters are judiciously placed. It has been shown that in the poorer and medium classes of dwellings much less water is wasted than in the better class of dwellings and other places, and as comparatively little is therefore gained after increasing the number of meters over 40 per cent, my calculations will be based on this percentage.

Assuming that these meters will be installed during the next ten years, I find that it would be necessary to install about 93,270 meters in that time or 9,327 per year. The Superintendent of the Water Office, Mr. H. O. Nourse, estimates the taps in use at present (1902) at 190,000 and with an increase in population to 2,800,000 in 1912 the proportionate number of taps that year would be 250,000, 40 per cent of which is 100,000, and excluding the 6,730 taps already metered, the total will be 93,270, as stated. If this suggestion should be followed, instead of expending at least $6,000,000 in the next ten years in extensions of the tunnel

system and pumping plants in order to increase the average daily pumpage to 560,000,000 gallons, the consumption, instead of increasing, will from year to year decrease irrespective of the natural increase in population, as can be seen by the following table:

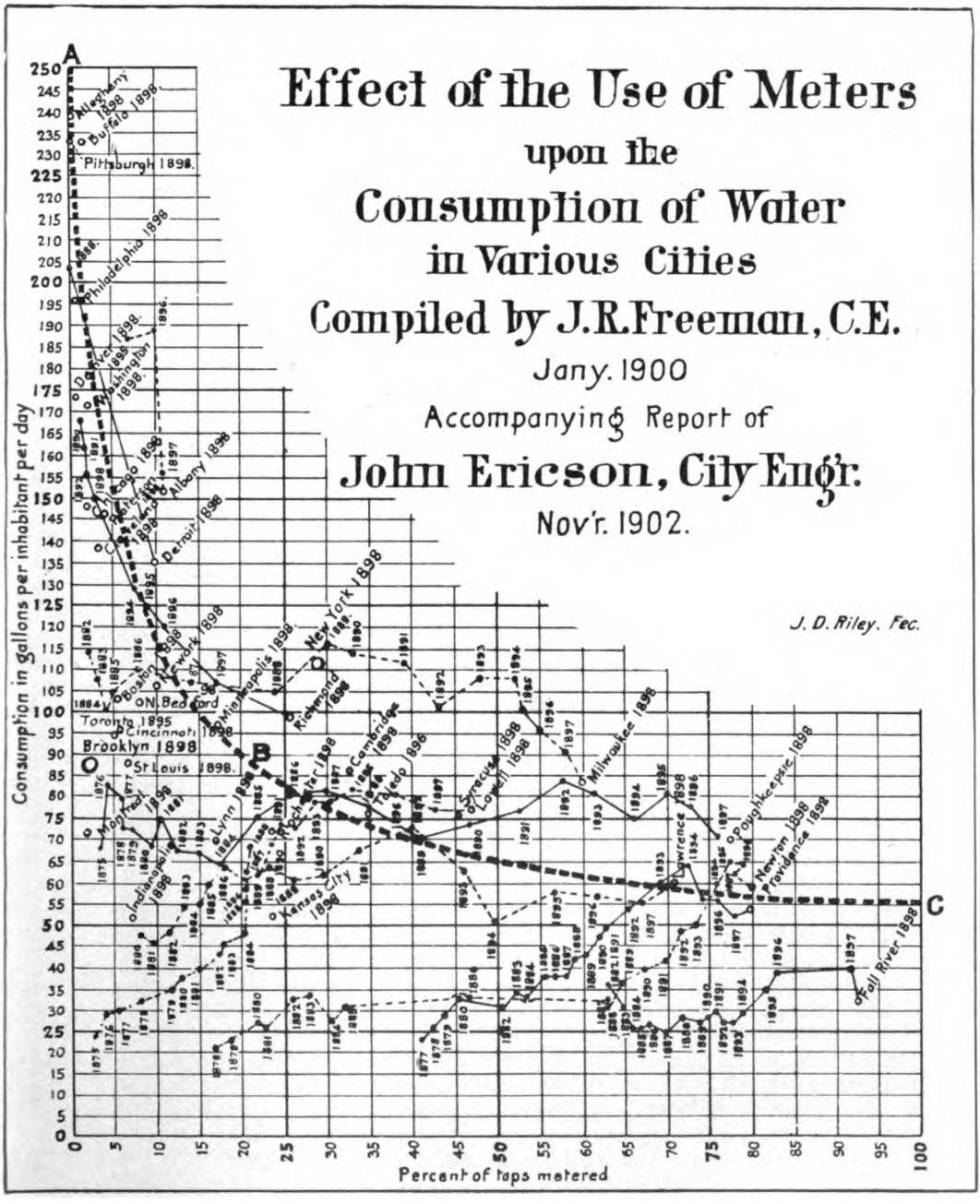
TABLE SHOWING INCREASE IN POPULATION, DECREASE IN PUMPAGE AND CONSUMPTION OF WATER IF ABOUT 3.65 PER CENT OF THE TAPS ARE METERED EACH YEAR FOR TEN YEARS.

Year.	Population.	Per cent of taps metered, total.	Consumption per capita per day.	Total pumpage, gallons.
Present (1902)	2,100,000	3.05	165	346,500,000
1st	2,170,000	7.15	133	288,610,000
2d	2,240,000	10.80	115	257,600,000
3d	2,310,000	14.45	100	231,000,000
4th	2,380,000	18.10	92	218,960,000
5th	2,450,000	21.75	87	213,150,000
6th	2,520,000	25.40	82	206,640,000
7th	2,590,000	29.05	77	199,430,000
8th	2,660,000	32.70	75	199,500,000
9th	2,730,000	36.35	73	199,290,000
10th	2,800,000	40.00	70	196,000,000

According to this table, which is based on the conclusions drawn by eminent engineers after observing facts as they are in other cities to-day, the pumpage, if nine or ten thousand meters are installed each year for ten years, will steadily decrease until, when 40 per cent of the total number of taps in use have been metered, the pumpage will be about 43 per cent less than it is to-day. It can therefore be seen that not one cent would have to be expended in extensions of the pumping plants for many years to come, while if nothing is done to change present conditions an expenditure of an average of at least $600,000 per year will have to be made for tunnels and pumping plants alone.

From information obtained from a number of cities where meters are used I estimate the cost as follows:

Average cost of meters placed inside curb $16.00
Average cost of repairs per meter per year ..... .50
Reading meters monthly for manufacturing plants and quarterly for domestic, including computing meter bills ..... .60
(The City of Cleveland lately (1902) paid for ⅝-inch meters 6.75
For ¾-inch meters 9.45
For 1-inch meters 13.50
Setting meters inside 3.35
Outside curb between $7.00 and $8.00.)



The yearly expense per meter per year I estimate as follows:

Interest on cost of meters and setting at 3 per cent on $16	$0.48
Depreciation and renewals per meter (life assumed at 20 years)	.80
Maintenance and repairs	.50
Computing meter rates and reading meters	.60
Total	$2.38

By allowing for increase in material and labor say $2.75 per meter per year.

The total expense per year will then be as follows:

Year.	Cost of meters each year, including setting.	Yearly expense, all charges.	Total expense per year.
1st	$149,232.00	$ 25,649.25	$174,881.25
2d	149,232.00	51,298.50	200,530.50
8d	149,232.00	76,947.75	226,179.75
4th	149,232.00	102,597.00	251,829.00
5th	149,232.00	128,246.25	277,478.25
6th	149,232.00	153,895.50	303,127.50
7th	149,232.00	179,544.75	328,776.75
8th	149,232.00	205,194.00	354,426.00
9th	149,232.00	230,843.25	380,075.25
10th	149,232.00	256,492.50	405,724.50

or by placing meters outside the curb and using vitrified sewer pipes for setting, which may be preferable to placing the meters in cellars, the cost, including all charges is estimated at $216,655 the first year, increasing gradually until it reaches the sum of $447,696 the tenth year. After the tenth year, when 40 per cent of the taps shall have been metered, the annual expense, consisting of interest, depreciation, repairs, renewals, reading of meters, computing meter rates, etc., will not exceed $257,000 if meters are placed inside curb in cellars, or $280,000 if placed outside the curb. The saving over present conditions, if they were allowed to exist until ten years hence, in the cost of fuel and operation alone, assuming the cost per million gallons per foot head to remain as at present, would be at least $450,000 per year; add to this the cost of improvements and additions necessary each year, the saving ten years hence per year would approach the sum of $1,000,000, irrespective of interest on investment. In addition the City would have a much more satisfactory service.

In order to assist in judiciously placing meters and as an aid in detecting leaks in mains and service pipes outside the curb, the pitometer, an instrument for determining the velocity of flow in pipes and developed by Mr. Edward S. Cole, M.E., of Chicago, could be employed at a very nominal cost. This consists in measuring the flow through the mains to various districts and by ascertaining the quantity of water used the leakage from the mains can be ascertained and probably checked.

Respectfully submitted,

JOHN ERICSON, *City Engineer.*

REPORT OF THE PITOMETER COMPANY.

THE PITOMETER COMPANY,
220 Broadway,
New York.

JNO. A. COLE,
EDW. S. COLE,
Consulting Engineers.

MR. JNO. ERICSON, *City Engineer, Chicago, Ill.*

DEAR SIR:—Acting on your instructions, we have conducted a series of tests with the pitometer, to investigate the flow of water in the large mains at various points in the Chicago water works system. These tests were begun July 1, 1904, and have been continued up to the present time, following the general outline approved by you. The work has been under the personal supervision of our Mr. Edw. S. Cole throughout, with the assistance of Mr. T. C. Phillips, C. E., and Mr. Jno. W. Crissey, C. E., of the Pitometer Company, during the months of August, September and October. In July we were assisted by Mr. B. B. Rodgman, C. E., also of the Pitometer Company.

Our arrangement was originally for the use of four pitometers with one assistant engineer in addition to our own supervision, but as it was found necessary to use more than four instruments, the City authorized the rental of two additional pitometers August 1st. At the same time, an assistant from your department was transferred to us for a few weeks during August and September (Mr. A. Wain).

The work outlined under your direction involved the measurement of flow in large mains leaving the various pumping stations, in order to determine the amount of water actually delivered to the City, and the loss of action or "slip" in the pumps. As the slippage of pumping engines involves not only a loss of capacity, but a waste of fuel, it is important in the beginning of a water waste investigation to first determine the pumping station losses.

In addition to these pump tests, we arranged to lay out several large districts on the South side, carefully isolating these from surrounding territory by closing main gates along the boundary lines, but leaving a few large feeders open in order to supply the district. On these open mains pitometers were placed which photographically recorded the flow night and day into the district. The per capita consumption for each district was obtained by a comparison of this measured supply with the population of each district taken from the recent school census. The object of these district tests is to show the relative consumption and waste of typical large areas of the City, in order to decide whether it is advisable to proceed with more detailed measurements of waste in them. A large section may be subdivided by closing street valves until its waste is localized within narrow limits, if the preliminary test shows that such work is called for.

In comparing the per capita consumption statistics of cities, and especially of various sections within a single city, it is important to make allowance for metered consumption, which usually comprised the large manufacturing uses. In spite of the variation in the domestic per capita consumption, it is possible to form some opinion of the relative waste of water in the various sections, if we take into account the total number of fixtures in the average house and the relative lavishness in the use of water.

The districts tested were so chosen as to serve a double purpose. The gaugings of total consumption to each not only furnished information as to the per capita consumption, but also showed the hourly rate of discharge in the various trunk mains supplying the South side. These continuous records of flow are valuable as they show the extent to which the carrying capacity of each is taxed and will be of assistance in planning any future extensions of the main distribution system. In this way the trunk mains supplying South Chicago, West Pullman, Hyde Park north of Sixty-seventh street and east of Cottage Grove avenue, and that district lying between Thirty-ninth and Forty-seventh streets from Halsted street to Ashland avenue were investigated.

The pitometer, which formed the basis for these tests, is essentially a recording water meter for large mains. It consists of two brass tubes, provided with curved orifices at their lower ends. These tubes are attached to a water main through a 1-inch standard corporation cock, which is inserted under pressure by the ordinary water works "tapping" machine. The orifice tubes pass through stuffing boxes and a cap which screws directly upon the corporation cock in the main. On opening the cock, the pitometer orifices may be pushed down to the center of the main, and when pointing directly up and down stream they communicate any difference of pressure to a suitable glass U tube connected therewith. This tube is partly filled with a liquid slightly heavier than water, which responds with extreme sensitiveness to any difference in pressure produced by impact of the flowing current in the pipe upon the upstream orifice. This impact action is known as the "Pitot tube" principle, which has for many years been utilized in the accurate river gaugings by engineers of the French and United States Governments. The application of this well-known principle to closed conduits or pipes under pressure has, however, been of comparatively recent development.

Perhaps the first experiments were made about twenty years ago by Mr. Hiram H. Mills, C. E., of Boston, and by Jno. R. Freeman, C. E., of Providence, in large steel pipes supplying water power at Lawrence, Mass. Unfortunately these experiments were not published.

A few years ago several engineers became interested in applying the Pitot tube to water mains under pressure, and conducted, quite independently of each other, a large amount of research work, which has greatly extended the use of this valuable principle in hydraulic engineering.

The pitometer as used by us has, in addition to the meter and U tube already described, a photographic attachment which continuously records the U tube "deflections." This is done by passing a ray of light through the rising side of the tube, which is placed before a narrow slot in the recorder box. A drum carrying Velox paper revolves behind the slot and receives a shadow record as the light is intercepted by the rising and falling liquid.

The accuracy of the pitometer has been thoroughly established by careful calibration tests made by Prof. Arthur N. Talbot, C. E., of the University of Illinois Hydraulic Laboratory, and by others. This instrument has been largely used in important work during the past eight years, and has many times been subjected to the most searching tests, with the result that its accuracy is now unquestioned.

The New York Water Department adopted the pitometer for use in an extensive water waste investigation carried on under our direction, from November, 1902, to December, 1903. The operation of the pitometer was favorably reported upon by Chief Engineer N. S. Hill, Jr., of the New York Water Department, and by the engineers of the "Commission on Additional Supply," to whom we reported.

Mr. I. M. DeVarona, Chief Engineer of the Brooklyn Water Supply Department, ordered two careful comparison tests of the pitometer with standard weirs placed upon pipe lines 20 and 48 inches in diameter, respectively. These tests showed an agreement of within 2½ per cent of the weir discharge as reported by Mr. DeVarona in his official report of 1903. These, in addition to other tests made with new and tight pumping engines, have firmly established the accuracy of our instrument.

We wish to call attention to the fact that such investigations as have been described have been hitherto impossible except at enormous expense for the installation of permanent meters upon the mains at great inconvenience to the city. The development of the pitometer has opened a field of exact measurement for the investigating of many perplexing problems which the water works engineer has been practically unable to solve. The economical supply and distribution of water in a great city involves the saving of a large amount of money, which it is now impossible to secure by the careful use of this new and powerful method of analysis.

Pumping engine tests were conducted at the following stations: Sixty-eighth street, Lake View, West side and Central Park avenue.

As "slip" of pumping engines is due to leakage and "churning" of the water around the plungers and through the numerous water valves, it is practically impossible to avoid a certain amount of this loss of action even with a new engine, and we might expect a loss of from 2 to 5 per cent even under the most favorable conditions. It is, however, not uncommon for pumps to develop a leakage of 10 to 15 per cent with a few years' wear, especially with the horizontal inside packed engines, which are much used in the older Chicago stations.

The following table is a brief summary of stations. In each case the figures given are based upon several independent tests on different days, in order to secure reliable results.

It was found impracticable, except at Sixty-eighth street station, to measure the entire pumpage without confining it somewhat by closing certain main gate valves outside of the station. Thus it became necessary to insure the tight closing of such valves and to guard against the possibility of any open cross connections. The complicated connections around a water works station requires us to use the greatest care in laying out proper gauging points of the pitometers, and repeated tests are often made necessary by some unexpected condition of valves and connections underground.

Station.	Date of Tests.	No. and Make of Pump.	Gals. per 24 hours.		Dif. or Slip.	Per cent of Slip.
			By Pumps.	By Pitometer.		
68th st.....	June 22, 28, 30	1 2 3 Holly 5 6 4 Worthington	72,500,000	64,000,000	8,500,000	11.7
Lake View..	Sept. 1, 12, 13, 23	1 2 Holly	23,600,000	20,800,000	2,800,000	11.8
	Oct. 18	4 Holly	9,750,000	8,940,000	810,000	8.3
West side...	Sept. 2, 14	1 Quintard	32,805,000	26,000,000	6,800,000	20.7
22d st.....	Sept. 2, 14	2 Quintard	35,800,000	25,600,000	10,200,000	28.5
Central Park Ave.	Sept. 12	3 Worthington	20,000,000	19,410,000	590,000	2.9

At Sixty-eighth street the pitometers were set so as to give the combined slip of the station as a whole, but at the other stations the various engines were tested separately by closing certain main gates as shown in accompanying sketches.

The Lake View tests were made with unusual care and an effort was made to verify our results on No. 4 pump by opening one end and measuring the leakage through plunger and valves by means of a tank and trough. This test was carefully arranged and probably gave a fair determination of the leakage with the *pump valve at rest*. The pressure maintained on the plunger was about 50 per cent less during this test than under regular running conditions, but, after making proper connection, the trough and tank still gave a somewhat less leakage than was indicated by the pitometer test with the pump in full operation. A comparatively small leakage was observed for the valves, as might perhaps be expected with the pump at rest and under the steady downward pressure acting upon them. It seems probable that this discrepancy represents the additional loss of action in valves of this class when *in operation*. The improved valves which you are introducing at the Sixty-eighth street station would undoubtedly be of value at this station. We were informed that the No. 1 pump at this station has badly worn plunger rings and that new ones are already purchased and ready to be fitted.

At the West side station our tests indicate a much higher loss of action than would be necessary with a more modern type of pump. These engines have long been in service and are still doing good work, but their water ends could probably be remodeled at moderate expense, so as to greatly reduce the slippage and materially increase the capacity of the station. As nearly all slip tests by the pitometer are based upon the necessary assumption that no loss of water occurs between the pump and gauging point, it is evident that care should be used to avoid wrong conclusions. We therefore have applied a special test at this station, closing the main discharge gates at the pump in order to observe the rate at which it could be moved without raising the water pressure above the normal point. It was found possible to turn the pump over under

steam at a slow and somewhat irregular speed without difficulty. It is believed that the pump filled with water at each stroke because of the fact that its "bucket" stands submerged at the lower end of the stroke. As near as the speed could be taken, there seemed to be a very reasonable agreement with the amount of slippage indicated by the pitometer test. The east half of engine No. 2 was chosen for this test. It is fitted with very large double beat metallic valves, which are now practically obsolete in pumping engine design. Engine No. 1 has the large slotted bucket valves covered with thick rubber rings several feet in diameter, a design which is now little used.

The speed test of No. 2 pump was also confirmed by the use of a 4-inch by-pass, which supplied water around the closed discharge valves, but failed to fully raise the pressure on the blocked plunger, even with the force injection valve to condenser closed. A careful calculation, based on the data furnished by this latter test, confirms our belief that these tests have been correctly reported and that the pumps should be thoroughly remodeled. In order to compare these results with others which we have found in various cities, we add the following partial list, which will be of interest.

Capacity, Million gallons daily.	Make of Pump.	CITY.	DESCRIPTION.	Per cent of Pumpage.
10	Worthington	Norfolk, Va.	High duty inside packed.....	4.2
4	Gaskill	Norfolk, Va.	High duty inside packed.....	11.9
1	Flanders	So. Bend, Ind.	Power drive, inside packed.....	57.
1	Flanders	So. Bend, Ind.	Power driven, valves newly overhauled.....	20.
6	Deane	So. Bend, Ind.	Comp. St. inside packed.....	24.
3	Deane	So. Bend, Ind.	Comp. St. inside packed.....	19.
1½	Deane	Oskaloosa, Ia.	Comp. ring and plunger.....	30.
5	Holly	Columbus, O.	Ring and plunger, inc. jet condensers.....	33.
5	Holly	Columbus, O.	.....	33.
5	Worthington	Cleveland, O.	Inside packed.....	12.
5	Holly	Cleveland, O.	Inside packed.....	10.12
10	Blake	New York	Vertical triple inside packed, (Valves were adrift).....	55.
1	Worthington	Brooklyn	Well pumping station.....	25.
10	Holly	Dayton, O.	New vertical triple single action plungers, outside packed....	1½

In regard to the total pumpage of the City, which will probably average about 400,000,000 gallons daily for 1904, our tests indicate a total loss of action in all pumps of about 25,000,000 gallons daily, which leaves 375,000,000 gallons for the actual daily supply to the City. This represents a per capita consumption of over 230 gallons per twenty-four hours, taking the population 1,600,000 by the recent school census,

	District No. 1.	District No. 2.	District No. 3.	District No. 4.	District No. 5.
Date	July	Aug.	Sept.	Aug.	Sept. & Oct.
Total Population	51,263	23,863	.....	56,133	3,000 Est.
Average daily supply gals. 24 hours	6,771,000	4,890,000	1,130,000	9,500,000	16,800,000
Average daily metered supply gals. 24 hours	1,170,000	.....	.....	1,500,000	14,140,000
Average daily unmetered supply	5,601,000	.....	.....	8,000,000	2,660,000
Per capita total supply daily	132	206	.....	169	.....
Per capita metered supply daily	23	.....	.....	27	.....
Per capita unmetered supply daily	109	.....	.....	142	.....

DISTRICT BOUNDARIES.

DISTRICT No. 1.—All of the Eighth ward and part of the Seventh ward south of Sixty-seventh street and east of Stony Island avenue.

DISTRICT No. 2.—All of the Thirty-third ward and part of the Seventh ward south of Sixty-seventh street and west of Stony Island avenue.

DISTRICT No. 3.—The South Park system from Sixty-seventh street to Thirty-ninth street supplied by a single 16-inch main, from Sixty-eighth street station.

DISTRICT No. 4.—All of Sixth ward east of Cottage Grove avenue, Seventh ward east of Cottage Grove avenue, north of Sixty-seventh street.

DISTRICT No. 5.—Thirty-ninth street to Forty-seventh street and Halsted street to Ashland avenue, including a small area west of Ashland avenue near Forty-second street.

DISTRICT TESTS FOR TOTAL AND PER CAPITA CONSUMPTION.

The five large districts already mentioned were enclosed and their total supply measured with the result shown on the following table.

The per capita consumption in districts No. 1 and No. 4, as will be seen, are very much below the average of 230 for the whole City. The large figure for district No. 2 is probably due to the great amount of water used for manufacturing purposes, largely metered but for which the figures are not at hand. The unmetered per capita consumption of districts No. 1 and No. 4 show a higher rate of use and waste than the average character of these districts would seem to indicate, especially in district No. 1.

We believe that a subdivision of these sections would discover that a small part of the area of each is responsible for the greater part of the waste. This has been our general experience in district analysis. Much time and money are saved by thus localizing the wasteful streets, for the expensive and annoying house-to-house inspections are avoided where they are not needed.

District No. 5, extending from Thirty-ninth street to Forty-seventh street and Halsted street to Ashland avenue, includes also a small area west of Ashland avenue along Forty-second street where some large meters are located. We recorded the total supply day by day into the district and compared with the

total consumption shown by the meters. For this test we operated five pitometers in the mains leading into the district, closing all other pipes along the boundary lines. A small residence population was necessarily included within the boundary south of Twenty-seventh street and along the west side of Halsted street. A considerable residence area, however, was excluded just east of Ashland avenue and north of Forty-seventh street.

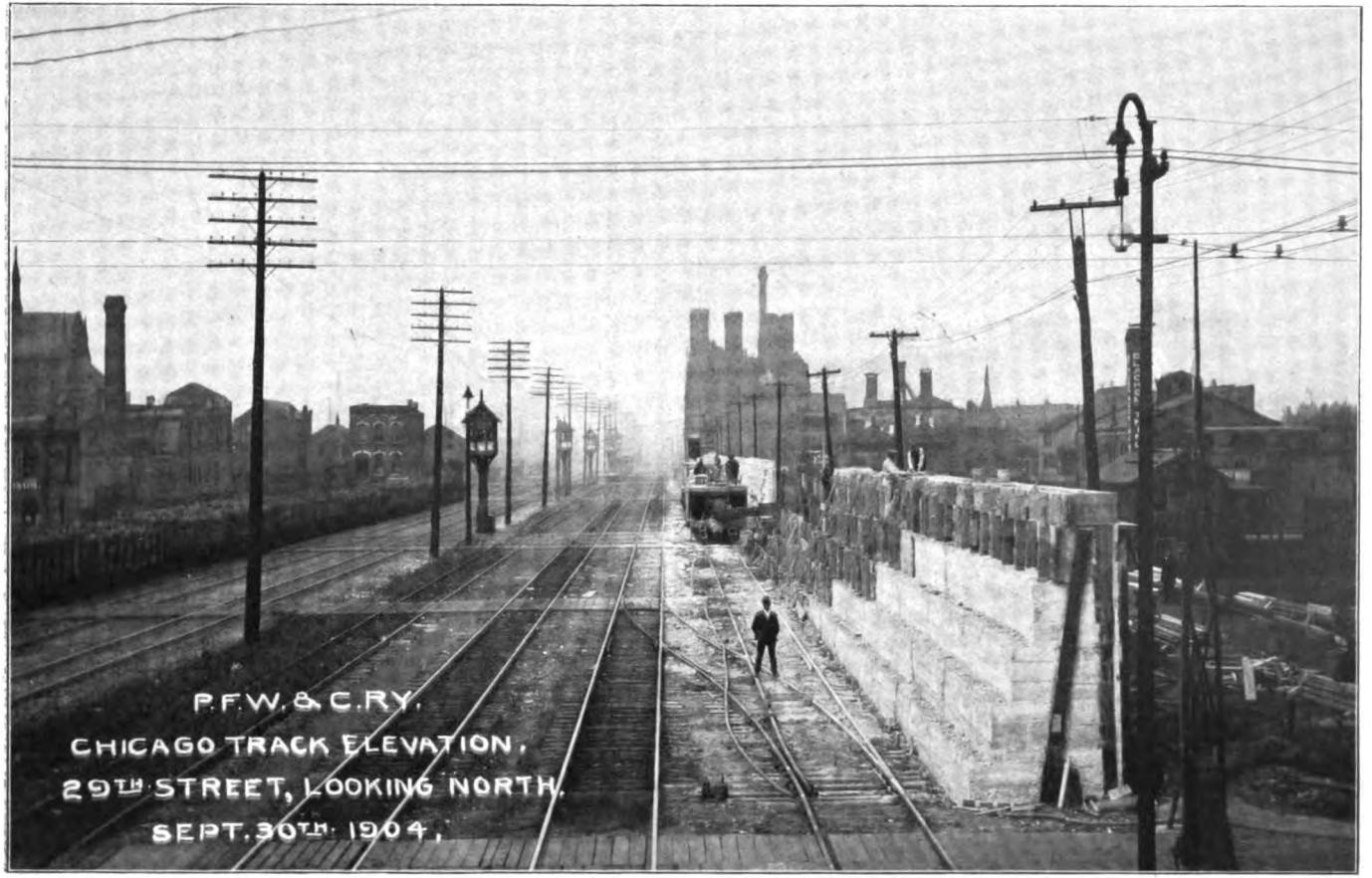
It was found necessary to use the monthly statements from the Meter Department which were taken for the month September 17th to October 17th. These showed an average consumption of 14,147,000 gallons daily, while our gaugings of total supply gave an average of 17,000,000 gallons daily from October 8th to date. We are now waiting for a second set of meter readings, which the department has been requested to make on the first of November, and which will form a better basis of comparison.

We believe the importance of this test will justify a more careful study of this district.

Respectfully submitted,

THE PITOMETER COMPANY,

(Signed) Edward S. Cole.



ANNUAL REPORT

Bureau of Water

CITY OF CHICAGO

1904

H. O. NOURSE
Superintendent

BUREAU OF WATER.

HON. F. W. BLOCKI,

Commissioner of Public Works.

DEAR SIR: The conduct of the affairs of the Bureau of Water during the year 1904 is shown in the following tables with explanatory footnotes, transmitted to you in accordance with the usual custom.

In all previous annual reports the recommendations of the Superintendent of this bureau have been made to follow the report, and being at the latter end do not have as prominent a position and as prompt attention as would in my judgment seem necessary. I therefore wish to make the most important recommendation at the beginning of this report, viz., the installation of meters to stop the waste of water, which is not only 100 per cent more expensive to the average taxpayer than the installation of meters would be, but at the same time deprives the people on the third floors and in higher stories of buildings of the opportunity to get water at all.

In five previous annual reports the importance of this necessary improvement to the department has been called to the attention of the officers; and I do not hesitate in predicting that some very serious consequences will result if the Aldermen are not impressed with the necessity of this step.

Additional pumping machinery will not accomplish the desired result of getting water to the third stories, but it will accomplish an increase in the waste of water by forcing it from the leaky places more rapidly as a result of increased pressure.

I take the liberty in this connection of calling your attention to the suggestions of the City Engineer from year to year on this subject. It has been established beyond question that 75 per cent of the water pumped in the City of Chicago goes to absolute waste.

In a recent communication from the City Engineer, addressed to the Commissioner of Public Works, referred to the undersigned, in answer to the inquiry from you as to what recommendations that officer would make with regard to the report of what is known as the "Pitometer Test," he suggests as a remedy the application of meters to 40 per cent of the services throughout the City. Should the Engineer's suggestion

be carried into effect, the expense, even if the City paid for the meters out of the water fund, would be more than offset by the saving in pumping machinery, fuel, and the expenses incident to large pumpage, twice over, as has been demonstrated beyond question in the neighboring cities of Milwaukee, Cleveland and other metered cities, too numerous to mention.

This City has expended annually an average of $500,000 for increased pumping capacity. At this rate the amount for the past ten years would be represented by $5,000,000. Milwaukee, Wis., has not expended one dollar for increased pumpage capacity within the past ten years. The cost of metering the City to the extent as suggested by the City Engineer would not be to exceed one-fifth of the amount plus the interest thereon for the time.

INSPECTION DIVISION.

The work performed by the force in the Inspection Division shows an improvement over the year 1903, during which year 112,747 inspections were made. In 1904 there were 136,546 inspections made.

House-to-house examinations were made in the year 1903 in eight wards. During 1904 six wards were covered, being wards 1, 14, 15, 16, 17 and 31.

The increase to the general assessment for the years 1903 and 1904 was as follows:

1903	$72,844.55
1904	60,633.80

During the year 1903 the examinations were confined almost exclusively to the sparsely settled outlying wards, where most of the new building is going on. This will explain why, with a lesser number of examinations, the increase to the assessment for the year 1903 is greater than for the year 1904.

METER DIVISION.

There are in service 8,102 meters, of which number 804 (net increase) were installed during 1904. There have been repaired 3,320 meters.

The net collections from all sources of this division of the bureau for the years 1903 and 1904 are compared below:

1903	$1,422,945.19
1904	1,603,111.86
Increase	$ 180,166.67

There have been investigated about 1,400 complaints, growing out of alleged excessive meter bills. Fully 90 per cent of these complaints were proven to be the result of leakage.

In this connection permit me to say that the same proportion of leakage in the unmetered services in the City would very rapidly account for the waste of 75 per cent of the water pumped.

ASSESSOR'S DIVISION.

Contracts were let for laying water service pipes in seventy-eight streets, as compared with sixty streets for the previous year.

Estimates for laying service pipes in seventy-seven streets have been prepared and returned to the Board of Local Improvements, as compared with one hundred and twelve streets for the year 1903.

During the year three plat books of one hundred and forty pages each have been added to the eighty-two completed at the beginning of the year 1904.

COLLECTION DIVISION.

The work in the Collection Division has been quite satisfactory, considering the increased growth of the City and the consequent increased number of accounts. The work is up to date, having been accomplished without any increase in the force.

The collections for the year from assessed rates were $2,350,011.69, as compared with $2,260,808.99 for the year 1903, showing an increase of $89,202.70.

SHUT-OFF DIVISION.

The work of the Shut-off Division has been greatly facilitated by removing from the ward ledgers, under order of Council previously referred to, back taxes against properties where water had never been introduced, and very satisfactory results in the shape of inroads on stubborn delinquents have been accomplished.

GENERAL.

It may be observed in the tables detailing the information that the collections of the year passed the four million mark. The expenses in the meantime have been minimized, being to collections only 6½ per cent.

Permit me again to call your attention to the inadequate floor space. Some provision should be made for increased space, particularly in the Assessor's, Permit, and Meter Divisions of the bureau. The

crowded condition not only hinders the force in the performance of their duties, but is a burdensome and unsanitary inconvenience to the public.

The vault space of the bureau is crowded to overflowing and is totally inadequate for the safekeeping of the records, so that they may be of easy access. I again recommend provision for more vault space.

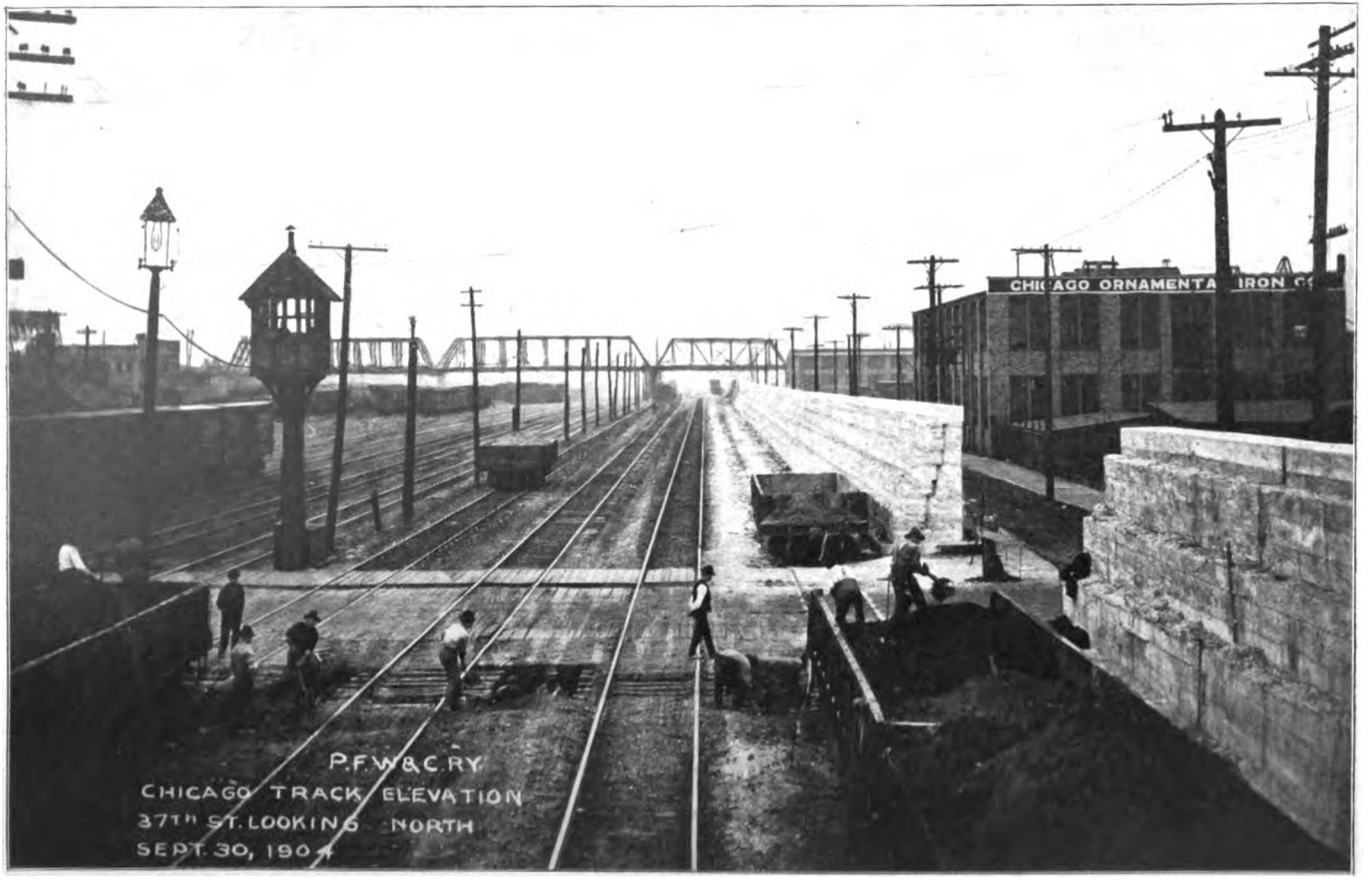
Permit me to call your attention particularly to the amount due from the County of Cook for water used in its various institutions, aggregating $74,466.75, upon which the Corporation Counsel has promised to secure payment, and I would respectfully suggest that you urge payment to be made at an early date.

TABLE No. 1.

SHOWING AMOUNTS UNCOLLECTED DECEMBER 31, 1898, DECEMBER 31, 1899, DECEMBER 31, 1900, DECEMBER 31, 1901, DECEMBER 31, 1902, DECEMBER 31, 1903, AND DECEMBER 31, 1904, IN COMPARISON.

AMOUNT STANDING AS UNCOLLECTED.	1898	1899	1900	1901	1902	1903	1904
On the ward ledgers	$424,431.86	$378,949.29	$357,755.98	$330,028.74	$761,689.87	$760,585.86	$632,038.37
On the meter rate ledgers	84,252.41	63,019.34	70,180.78	121,839.16	136,826.31	125,006.90	165,046.88
On the meter mechanical ledgers	3,642.56	4,752.47	4,704.58	4,179.02	3,164.63	3,146.00	3,236.85
In suspense account No. 1	.....	.....	.....	.....	.....	28,292.33	34,994.86
In suspense account No. 2	.....	.....	.....	.....	.....	18,664.75	19,144.50
Total	$512,326.83	$446,721.10	$432,641.34	$456,046.92	$901,680.81	$935,695.84	$854,461.46

For the purpose of better comparison I have compiled two tables of uncollected amounts, the one showing the balance at the close of the assessment year, viz., April 30th, and the other the balance at the close of the fiscal year, viz., December 31st. The purpose of this additional table is to show balances at the close of collection periods.



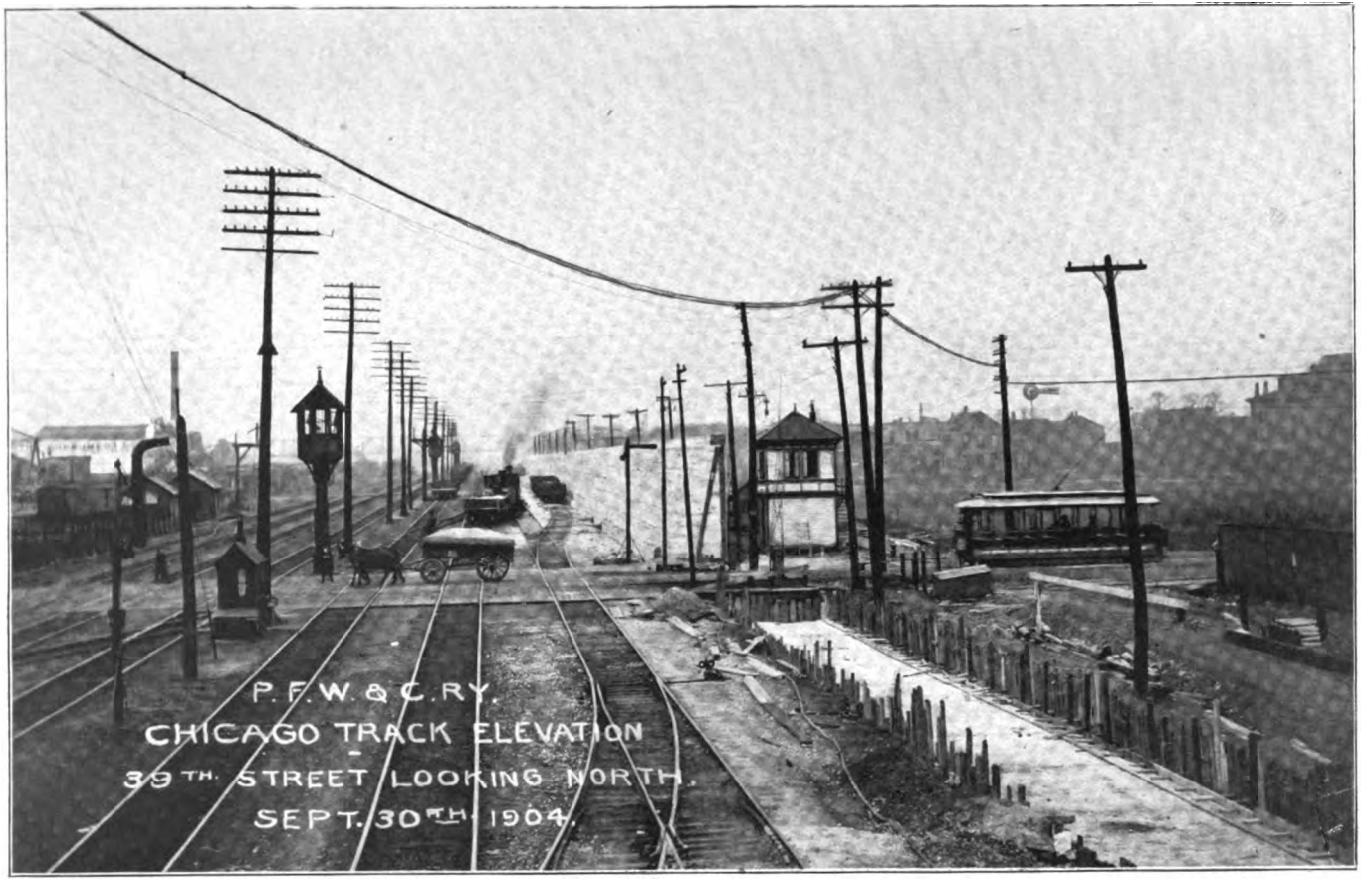


TABLE No. II.

SHOWING AMOUNTS UNCOLLECTED APRIL 30, 1898, APRIL 30, 1899, APRIL 30, 1900, APRIL 30, 1901, APRIL 30, 1902, APRIL 30, 1903, AND APRIL 30, 1904, IN COMPARISON.

AMOUNT STANDING AS UNCOLLECTED.	1898	1899	1900	1901	1902	1903	1904
On the ward ledgers	$473,092.40	$261,184.52	$262,778.34	$252,738.35	$229,644.59	$233,515.84	$129,221.32
On the meter rate ledgers	127,125.43	90,130.48	111,233.04	126,679.26	143,814.83	178,972.61	224,943.47
On the meter mechanical ledgers	4,121.36	3,966.30	4,401.96	4,902.21	4,955.38	2,476.93	4,290.56
In suspense account No. 1	.....	.....	.....	.....	.....	.....	31,305.02
In suspense account No. 2	.....	.....	.....	.....	.....	.....	18,707.33
Total	$604,389.19	$355,281.30	$378,413.34	$384,319.82	$378,414.80	$414,965.38	$408,467.70

Of the uncollected amount shown upon the ward ledgers about $50,000 should be decreased from the books, and your approval of a request from this office to the Council is pending before that body. About $10,000 is represented by claims of various institutions to exemption under section 24 of the ordinance, which also must have Council action before the Bureau can make the proper credits.

Of the amounts standing as uncollected on the meter ledgers $74,466.75 is due from the Cook County institutions.

TABLE No. III.

SHOWING BUILDINGS EXAMINED BY THE DIVISION OF INSPECTION.

1904	One-Story	Two-Story	Three-Story	Four-Story	Five-Story and Over	Special Examinations	New Buildings Examined	Examinations for Vacancies	Pipe Petition and Pipe Deposit Examinations	Barn Examinations	Examinations for Leaks	TOTAL
January	2,501	4,248	1,395	154	34	1,794	1,045	311	4	1,332	.....	12,818
February...	328	685	125	46	26	5,475	751	222	10	867	.....	8,535
March	1,731	3,391	506	119	2	2,118	845	93	320	1,498	.....	10,623
April.....	2,038	3,578	847	180	24	880	704	35	628	1,618	.....	10,532
May	1,252	3,024	1,336	198	9	1,054	1,588	9	1,401	1,447	.....	11,318
June	956	2,270	1,264	292	91	1,731	1,061	357	2,597	1,537	.....	12,156
July	959	1,720	926	199	64	2,379	1,629	285	1,363	1,203	.....	10,727
August.....	775	1,731	846	312	104	2,180	894	412	1,692	914	3,984	13,844
September..	278	709	449	174	38	1,710	1,349	96	859	766	4,041	10,469
October	684	1,751	908	389	175	4,170	1,220	42	742	712	1,787	12,780
November..	556	563	611	693	2,225	1,906	1,952	158	365	772	694	10,495
December..	807	839	868	780	1,760	2,558	1,572	415	1,422	847	586	12,454
Total...	12,865	24,504	10,081	3,536	4,552	27,955	14,610	2,485	11,403	13,513	11,092	136,546

An annual (house to house) examination has been completed in the following wards: First, Fourteenth, Fifteenth, Sixteenth, Seventeenth and Thirty-first.

TABLE No. IV.

SHOWING NUMBER OF SERVICES METERED AND UNMETERED, METER RATES PER 1,000 GALLONS, POPULATION AND PER CAPITA CONSUMPTION PER DAY OF FOLLOWING PRINCIPAL CITIES.

NAME OF CITY.	Services Metered.	Services Unmetered.	Meter Rates Per 1,000 Gallons.	Estimated Population.	Consumption Per Capita Per Day.
*New York	35,000	65,000	$0.13⅓	3,770,400	121 gallons.
Philadelphia	1,775	250,000	.04	1,381,100	237 "
St. Louis	4,635	75,000	.80	619,500	125 "
Boston			.15 3/10	607,700	120 "
Baltimore	2,532	100,600	.06	535,700	125 "
Cleveland	25,537	40,773	.05⅓	422,000	138 "
Buffalo	1,393	66,138	.06	387,000	300 "
San Francisco	11,000	37,500	.33⅓	358,500	70 "
Pittsburg	598	33,400	.18	349,600	271 "
Cincinnati	3,607	33,695	.10⅔	340,800	125 "
Milwaukee	36,000	4,000	.06	319,600	80 "
Detroit	5,847	55,618	.05⅝	314,300	150 "
New Orleans	216	10,918	.25	303,300	50 "
Chicago	8,102	220,000	.10 (*a*)	1,932,315	200 "
Chicago			.08 (*b*)		
Chicago			.06 (*c*)		
Chicago			.04 (*d*)		

*Manhattan borough.

(*a*) Rate for first 165,000 gallons used on one premises in one month.
(*b*) Rate for all in excess of 165,000 gallons used on one premises in one month.
(*c*) Rate for all in excess of 5,000,000 gallons used on one premises in one month.
(*d*) Rate for all in excess of 10,000,000 gallons used on one premises in one month.

TABLE No. V.

WATER SERVICE PIPES LAID BY CONTRACT DURING THE YEAR 1904.

STREET.	FROM	TO	Taps Inserted.	Amount.
Alma avenue	Chicago avenue	Augusta	27	$ 351.00
Belle Plaine avenue	Western avenue	Campbell avenue	20	211.64
Berteau avenue	Western avenue	Campbell avenue	28	270.60
Ballou	Fullerton avenue	Milwaukee avenue	52	562.50
Curtis avenue	111th	113th	32	387.20
Cortland	Kedzie avenue	Central Park avenue	26	320.16
Cornell avenue	Sixty-ninth	Seventy-first	39	461.62
Central Park avenue	Fullerton avenue	Milwaukee avenue	77	1,071.05
Cortland	Hamlin avenue	Central Park avenue	45	493.95
Central avenue	Chicago avenue	Thomas	25	240.87
Clark	Lawrence avenue	Devon avenue	135	1,468.70
Cornelia	Fifty-fourth avenue	Central avenue	24	272.24
Drake avenue	Fullerton avenue	Milwaukee avenue	40	457.52
Franklin boulevard, E. S.	Chicago avenue	Cornelia	Not	complete.
Franklin boulevard	Kedzie avenue	Albany avenue	28	292.74
Forty-first court	Addison	Grace	33	319.18
Forty-second avenue	Milwaukee avenue	Grace	41	456.30
Francisco	Addison	Grace	63	707.66
Foster avenue	Western avenue	Lincoln avenue	6	83.64
Grace	Fortieth avenue	Forty-second avenue	5	65.63
Homan avenue	W. Twenty-sixth	W. Thirty-first	70	861.14
Hoyne avenue	Lawrence avenue	Clay	27	266.76
Homan avenue	W. Twelfth	C. & Gt. W. R. R.	Private	contract.
Harvard	Lawndale avenue	Douglas boulevard	20	208.23
Hermitage avenue	W. Sixty-first	W. Sixty-third	55	528.94
Honore	W. Fifty-ninth	W. Sixty-third	139	1,410.87
Hermitage avenue	Garfield boulevard	200 ft. S. Fifty-eighth	65	631.41
Hermitage avenue	W. Sixty-third	W. Sixty-seventh	51	540.15
Iowa	Austin avenue	Willow avenue	30	334.95
Kamerling avenue	N. Forty-second avenue	N. Forty-fourth avenue	94	1,018.41
Laflin	W. Sixty-first	W. Sixty-third	38	393.86
Lincoln	W. Fifty-ninth	W. Sixty-third	148	1,476.55
Millard avenue	W. Twenty-eighth	W. Thirtieth	34	380.48
Monticello avenue	W. Fullerton avenue	W. Diversey avenue	50	599.42
Marshall boul., W. and S. Side	W. Nineteenth	Chicago river	93	505.92
Marshall boul., N. and E. Side	W. Nineteenth	Chicago river	108	587.52
Magnolia avenue	Lawrence avenue	Argyle	42	431.42
Nelson	Perry	E. Ravenswood park	43	505.53
Normal avenue	Seventy-fourth	Seventy-fifth	7	91.59
Oakley avenue	Roscoe	Belmont avenue	38	395.96
O'Brien avenue	Grand avenue	Wabansia avenue	19	226.73
Paulina	W. Sixty-first	W. Sixty-third	61	642.91
Paulina	Garfield boulevard	W. Fifty-eighth	60	627.76
Paulina	W. Sixty-third	W. Sixty-fifth	44	445.36
Polk	Douglas boulevard	Central Park avenue	60	611.38
Park avenue	Ohio	Chicago avenue	24	254.60
Prospect avenue	W. Ninety-fifth	W. 107th	195	2,784.64
Ridge avenue	C. & N.-W. R. R.	Clark	47	454.73
Richmond	Addison	Irving Park boulevard	58	718.10
Rice	Fifty-fourth	Central avenue	Not	completed.
Rhodes avenue	Seventy-first	Seventy-third	63	640.47
Ridgeway avenue	North avenue	Potomac avenue	74	811.97
Sacramento avenue	Humboldt boulevard	Diversey avenue	41	554.98
Sixty-first	Ashland avenue	Lincoln	25	274.00

TABLE No. V—Continued.

STREET.	FROM	TO	Taps Inserted.	Amount.
Sixty-fifth place.....	Jackson avenue.....	I. C. R. R.....	26	$ 288.10
Sawyer avenue	W. Twenty-sixth....	W. Thirtieth.....	90	1,170.00
Sacramento avenue...	W. Twenty-third....	W. Twenty-sixth....	24	263.13
Spaulding avenue....	W. Twenty-sixth....	W. Thirtieth.....	42	494.40
Seipp (E. Bond).....	Sixty-ninth.....	Seventy-first.....	26	283.48
Twenty-third place system....	Rockwell.....	Marshall boulevard..	85	1,092.78
Twelfth place.....	Homan avenue.....	St. Louis avenue....	31	375.80
Twenty-fifth	Western avenue	Campbell avenue....	12	198.90
Taylor.	Central Park avenue	Lawndale avenue...	11	106.59
Turner avenue.....	W. Twenty-sixth....	W. Thirtieth.....	55	596.61
Troy.....	W. Twenty-sixth....	W. Twenty-eighth ..	29	329.38
Twenty-second.....	Harding avenue	S. Fortieth avenue...	10	89.30
Thirteenth place.....	Homan avenue	Central Park avenue	52	534.38
Talman avenue.....	W. Twelfth.....	Ogden avenue	13	146.33
Vincennes Road	W. Ninety-fifth	W. 107th	99	728.95
Wood.....	W. Fifty-fourth	W. Fifty-fifth.....	13	155.48
Whipple.....	W. Twenty-second...	W. Twenty-sixth....	20	209.60
Western avenue.....	Montrose avenue....	Lawrence avenue...	29	217.50
Wood.....	W. Fifty-ninth.....	W. Sixty-third.....	135	1,378.19
Wood.....	W. Sixty-third	W. Sixty-fifth.....	44	468.00
Winchester avenue...	W. Sixty-seventh....	W. Sixty-ninth.....	56	579.79
Waveland avenue....	Robey.....	Lincoln.....	28	308.88
Winona	Clark.....	E. Ravenswood park.	36	371.48
Winchester avenue...	W. Thirty-fifth.....	W. Thirty-ninth.....	23	249.12
Total.....	.....	.....	3,657	$ 39,346.06

3,657 pipes laid in 1904 at an average cost per pipe of $10.75
3,399 pipes laid in 1903 at an average cost per pipe of 11.00
4,820 pipes laid in 1902 at an average cost per pipe of 10.72

TABLE No. VI.

DIVISION OF PERMITS.

SCREW FERRULES INSERTED DURING THE YEAR 1904.

MONTHS.	⅝-inch Ferrules Inserted.	¾-inch Ferrules Inserted.	1-inch Ferrules Inserted.	Total of Ferrules Inserted.
January	18	35	11	64
February.....	10	16	10	36
March.....	65	35	36	136
April.....	194	496	50	740
May.....	435	1,045	33	1,513
June	620	991	59	1,670
July.....	377	695	84	1,156
August.....	398	588	62	1,048
September.....	374	622	62	1,058
October	359	678	46	1,083
November.....	203	460	85	748
December	170	189	32	391
Total.....	3,223	5,850	570	9,643
1903.....	2,049	5,454	282	7,785

TABLE No. VII.

RE-TAPS INSERTED DURING THE YEAR 1904.

5/8-inch	1,419
3/4-inch	587
1-inch	99
Total	2,105

The number of ferrules inserted for water service pipes during the past year (exclusive of City contracts and re-taps), was as follows:

	Inserted 1904.	Inserted. 1903.
In old part of City	892	925
In Calumet	245	185
In Cicero	276	495
In Hyde Park	783	664
In Jefferson	635	603
In Lake View	605	576
In Town of Lake	512	466
Total	3,948	3,914

TABLE No. VIII.

PERMIT DIVISION.

PERMITS WERE ISSUED DURING THE YEAR 1904 AS FOLLOWS:

	Permits Issued during 1904.	Permits Issued during 1903.
For tapping water mains for pipes to inside curb for future use	3,590	3,390
For tapping water mains for water service pipes to houses for immediate use	3,948	3,914
For connection to service pipes inside curb	1,448	727
For controlling service pipes by meters	953	333
For miscellaneous or special permits	1,428	.....
For 12-inch cast iron pipes to be used as service pipes	....	1
For 10-inch cast iron pipes to be used as service pipes	....	2
For 8-inch cast iron pipes to be used as service pipes	4	3
For 6-inch cast iron pipes to be used as service pipes	8	14
For 4-inch cast iron pipes to be used as service pipes	33	41
For 3-inch cast iron pipes to be used as service pipes	10	10
For 2-inch "strong" lead pipes to be used as service pipes	104	95
For 1½-inch "strong" lead pipes to be used as service pipes	115	66
For 1¼-inch "strong" lead pipes to be used as service pipes	187	119
Total	11,828	8,715

TABLE No. IX.

TABULATED STATEMENT SHOWING THE NUMBER OF FERRULES INSERTED EACH YEAR FOR THE LAST TWENTY-FIVE YEARS AND THE TOTAL NUMBER IN USE DECEMBER 31, 1904.

Year.	Original Town.	*Lake View.	Hyde Park.	*Town of Lake.	*Calumet.	*Cicero.	*Jefferson.	Total.
*a*1880	63,510	.....	.....	.....	.....	.....	.....	63,510
1880	4,439	.....	.....	.....	.....	.....	.....	4,439
1881	5,678	.....	.....	.....	.....	.....	.....	5,678
1882	5,213	.....	.....	.....	.....	.....	.....	5,213
1883	6,656	.....	.....	.....	.....	.....	.....	6,656
1884	6,637	.....	.....	.....	.....	.....	.....	6,637
1885	6,555	.....	.....	.....	.....	.....	.....	6,555
1886	8,083	.....	.....	.....	.....	.....	.....	8,083
1887	8,808	.....	.....	.....	.....	.....	.....	8,808
1888	10,089	.....	.....	.....	.....	.....	.....	10,089
1889	.....	.....	*b*8,775	.....	.....	.....	.....	8,775
1889	7,617	889	1,730	1,286	.....	.....	.....	11,522
1890	10,127	3,440	3,833	3,951	152	289	20	21,812
1891	10,237	2,458	5,658	4,165	234	59	570	23,381
1892	7,224	3,173	4,813	3,882	271	63	2,146	21,572
1893	7,990	2,334	3,586	4,223	308	153	1,435	20,029
1894	6,642	2,271	2,770	1,922	392	843	1,044	15,884
1895	5,015	2,262	3,152	1,750	410	750	1,326	14,665
1896	3,551	1,927	2,792	1,838	292	1,663	869	12,932
1897	2,607	851	891	2,552	197	1,004	1,837	9,939
1898	1,183	527	1,765	662	242	516	1,312	6,207
1899	2,259	966	1,228	790	504	652	1,116	7,515
1900	1,239	588	893	1,420	919	2,350	1,635	9,044
1901	1,127	946	1,049	773	857	1,042	1,215	7,009
1902	1,619	585	936	895	1,118	1,637	1,458	8,248
1903	1,385	394	783	802	1,001	851	2,088	7,304
1904	1,889	539	421	993	1,213	1,030	1,453	7,538
Total	197,379	24,150	45,075	31,904	8,110	12,902	19,524	339,044

* Number of ferrules inserted in suburbs previous to annexation unknown.
a Number of ferrules inserted previous to 1880.
b Number of ferrules inserted in Hyde Park previous to annexation.

TABLE No. X.

DIVISION OF PERMITS—INCOME ACCOUNT.

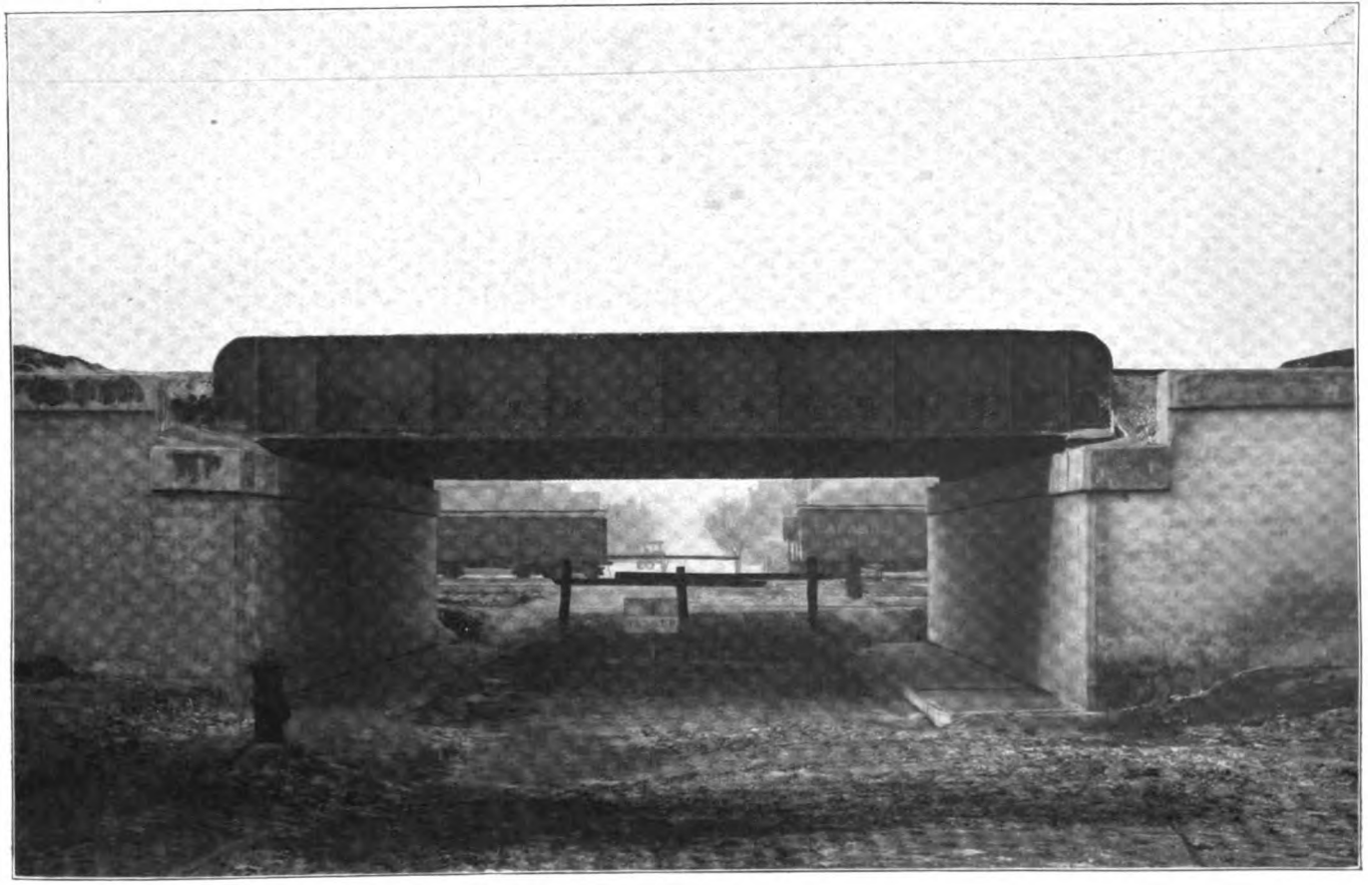
DEBIT.

Stock account, January 1, 1904, per inventory		$ 1,440.09	
Amount paid for ferrules	$ 4,101.82		
Amount paid for fittings, pipe and miscellaneous material	894.43		
		4,996.25	
Amount paid for printing and stationery	$ 40.00		
Amount paid for transportation	782.35		
Amount paid for tools, etc	877.81		
Amount paid for miscellaneous	19.93		
		1,720.09	
Salaries of clerks	$ 2,199.97		
Salaries of inspectors	9,012.64		
Salaries of tappers	12,999.61		
Salaries of expressmen	12,142.00		
Salary of foreman	900.00		
Salaries of laborers	9,342.00		
		46,596.22	
			$54,752.65

CREDIT.

Amount received for inserting ferrules	$17,554.90		
Earnings for material furnished and labor performed for Bureau of Engineering, etc	7,221.38		
		$24,776.28	
Stock on hand January 1, 1905, as per inventory		1,254.65	
			$26,030.93
Net loss to the division			28,721.72

Net loss to the division, 1904	$28,721.72
Net loss to the division, 1903	33,424.72
Net loss to the division, 1902	37,131.08



P. F. W. & C. Ry., Chicago Terminal Division.—Forty-sixth Street Subway, from the East.—January 20, 1905.

TABLE No. XI.

METER MECHANICAL DIVISION—INCOME ACCOUNT.

DEBIT.

Stock account, per inventory, January 1, 1904:			
Comprising material	$ 9,624.67		
And bills receivable	8,146.00		
		$12,770.67	
Amount paid for covers and frames	$ 2,542.76		
Amount paid for fish traps, etc	118.00		
Amount paid for fittings, etc	8,436.04		
Amount paid for lumber	794.76		
		11,891.56	
Amount paid for transportation	$ 103.70		
Amount paid for horse feed, etc	270.55		
Amount paid for tools	163.67		
Amount paid for sundries	82.52		
		620.44	
Salary of foreman	$ 1,500.00		
Salaries of clerks	2,160.00		
Salaries of meter setters	9,082.50		
Salaries of laborers	2,313.55		
Salaries of expressmen	4,761.22		
		19,817.27	
			$45,099.94

CREDIT.

Earnings from labor performed and material furnished in setting of large meters, etc	$ 3,515.88		
Net cash received from material sold from stock on hand and repairing meters	24,362.77		
		$27,878.65	
Amount due and uncollected for repairs		3,236.85	
Amount uncollected for repairs, transferred to Suspense Account No. 2		309.75	
Stock on hand, as per inventory, December 31, 1904		12,802.17	
			$44,227.42
Net loss to the division			*$872.52

*Shop work performed by Water Works shops amounting to $2,834.70, not included.

TABLE No. XII.

METER MECHANICAL DIVISION.

Number of meters in service Dec. 31, 1903	7,298	
Number of meters set in new location during 1904	915	
Total number of meters in service during 1904		8,213
Number of meters removed—property assessed—during 1904	17	
Number of meters removed—supply cut off—during 1904	92	
Number of meters removed—and not replaced—during 1904	2	
Total number of meters removed permanently during 1904		111
Total number of meters in use Dec. 31, 1904	8,102	
Total number of meters in use Dec. 31, 1903	7,298	
Increase in number of meters in use year ending Dec. 31, 1904		804
Number of meters set in new location during 1904	915	
Number of meters set—replacing others—during 1904	54	
Total number of meters set during 1904		969
Number of meters in stock Jan. 1, 1904	140	
Number of meters placed in stock during 1904	5	
Total number of meters furnished by private parties during 1904	969	
Total number of meters on hand during 1904		1,114
Number of meters set during 1904		969
Number of meters on hand Jan. 1, 1905		145
Number of meters repaired during 1904, for which bills were rendered		3,320
Number of meters removed to shop and reset during 1904		492

The net increase to the number of meters in service is 804, as compared with 223 for the year 1903. The number of meters repaired during the year was 3,320, as compared with 2,563 for the year 1903.

TABLE No. XIII.

NAMES AND SIZES OF WATER METERS IN USE DECEMBER 31, 1904.

MAKE.	SIZE.													TOTAL.
	½-inch.	⅝-inch.	¾-inch.	1-inch.	1¼-inch.	1½-inch.	2-inch.	3-inch.	4-inch.	6-inch.	8-inch.	10-inch.	12-inch.	
Worthington	5	219	390	1,108	6	963	967	473	41	9	.....	.....	.....	4,181
Pittsburg	.....	151	429	540	121	493	277	84	53	28	.....	.....	.....	2,176
Crown	.....	15	99	126	.....	107	123	49	89	26	.....	.....	.....	634
Hersey	.....	16	53	84	.....	99	125	72	58	39	.....	.....	.....	546
Nash	.....	23	37	61	.....	50	21	3	7	2	.....	.....	.....	204
Thomson	.....	1	9	11	.....	38	23	11	14	7	.....	.....	.....	114
Niagara	.....	24	44	15	.....	13	8	.....	.....	.....	.....	.....	.....	104
Gem	.....	.....	.....	.....	.....	.....	15	10	12	14	6	3	.....	60
Trident	.....	2	8	5	.....	9	13	3	1	.....	.....	.....	.....	41
Union	.....	9	4	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	15
Empire	.....	3	5	5	.....	2	1	.....	.....	.....	.....	.....	.....	16
Torrent	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	8	.....	.....	9
Westinghouse	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Venturi	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1
Total	5	463	1,078	1,958	127	1,774	1,573	705	275	126	14	3	1	8,102

TABLE No. XIV.

METER MECHANICAL DIVISION.

SHOWING WATER METERS IN USE AND HOW DISTRIBUTED.

Stores and flats	1,357
Business houses	1,161
Residences and apartment buildings	1,291
Railroads	579
Manufactories	1,664
Breweries	158
Liveries	381
Packing Houses	145
Laundries	185
Hotels	288
Office buildings	273
Theaters	32
Miscellaneous	507
Charitable institutions	81
Total	8,102

TABLE No. XV.

DETAILED STATEMENT OF ASSESSOR'S MISCELLANEOUS RECEIPTS FOR 1904.

MONTHS	Cement Walks	Leak and Waste	Sprinkling	Miscellaneous	Total
January	$208.96	.....	.....	$ 67.05	$ 276.01
February	55.86	.....	.....	59.58	115.44
March	63.05	$ 3.50	.....	27.52	94.07
April	384.89	2.25	$ 162.50	29.50	579.14
May	6.10	13.63	2,575.00	89.30	2,684.03
June	18.98	16.00	2,775.00	186.22	2,996.20
July	.70	39.87	3,075.00	101.75	3,217.32
August	.18	.....	3,100.00	531.95	3,632.13
September	9.10	24.50	2,775.00	129.37	2,937.97
October	2.02	8.00	2,187.50	3.19	2,200.71
November	.95	6.87	100.00	160.48	268.30
December	509.06	5.25	.....	561.77	1,076.08
Total	$1,259.85	$119.87	$16,750.00	$1,947.68	$20,077.40

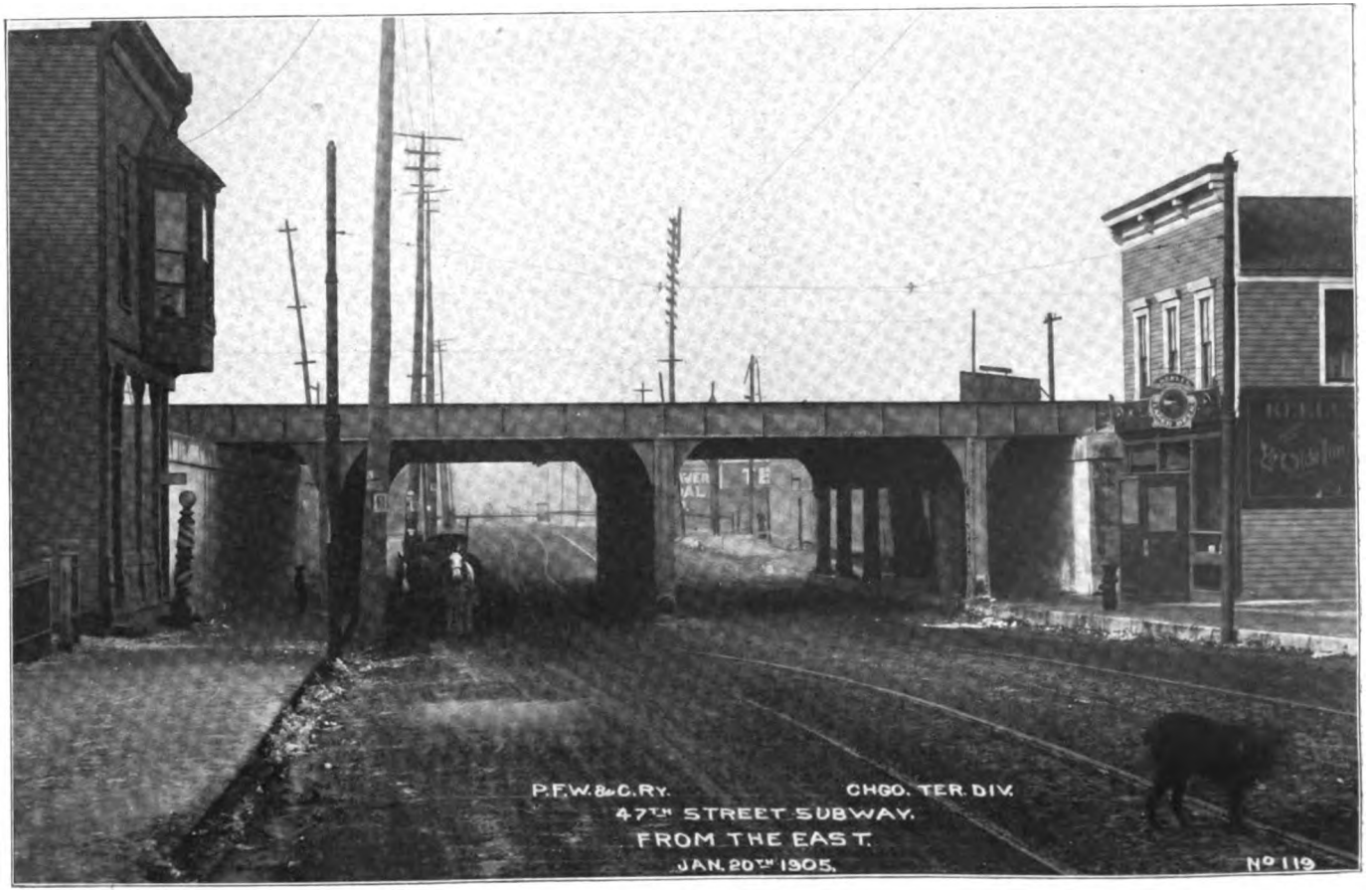


TABLE No. XVI.

WORK PERFORMED BY THE SHUT-OFF DIVISION.

1904.	Shut Off for Non-payment of Taxes.	Shut Off by Request of Owner.	Shut off for Leaks.	NOTICES SERVED.		Notices Mailed.	Water Turned on.
				For Non-payment.	For Leaks.		
January	311	181	.....	2,798	.....	3,100	153
February	158	66	.....	3,859	.....	6,225	118
March	341	93	.....	4,595	.....	4,390	300
April	409	76	.....	1,998	.....	.....	337
May	353	54	.....	1,964	.....	.....	238
June	219	302	.....	2,441	.....	4,500	127
July	381	87	.....	3,015	.....	5,850	237
August	597	170	.....	5,900	.....	6,900	379
September	380	69	.....	5,322	256	8,085	323
October	458	60	3	4,541	353	476	267
November	206	134	10	4,384	114	260	167
December	64	278	.....	3,618	7	186	88
Total	3,877	1,578	13	44,435	730	39,972	2,754

TABLE No. XVII.

SHOWING AMOUNT OF WATER TAX OF EIGHT-ROOM TWO-STORY DWELLING SUPPLIED WITH BATH, CLOSET, WASH BASIN, KITCHEN SINK, LAUNDRY TUB AND HOSE FOR SPRINKLING PURPOSES.

NAMES OF CITIES.	Water Tax for Average Eight-room Residence.
Detroit	$ 6.30
Boston	19.00
Cincinnati	18.65
Milwaukee	17.50
New York (Manhattan Borough)	10.00
Philadelphia	18.00
Pittsburg	20.50
San Francisco	16.80 (*b*)
St. Louis	19.50
Cleveland	9.50 (*a*)
New Orleans	30.00 (*a*) (*b*)
Buffalo	6.00 (*a*)
Chicago	10.50
Chicago	8.93 (*c*)

(*a*) Without hose.

(*b*) Private ownership.

(*c*) Chicago rate for prompt payment, being 15 per cent discount from gross amount.

TABLE No. XVIII.

DETAIL OF GENERAL ASSESSMENT FROM MAY, 1904, TO MAY, 1905.

WARD.	Frontage.	Water Closets.	Urinals.	Baths.	Wash Basins.	Extra Rooms and Persons.	Saloons.	Hose, Trough and Fountain.	Laundries.	Steam Heating and Engines.	Stables.	Miscellaneous.	Total Assessment.
1st....	$26,220.00	$11,640.50	$1,068.00	$1,776.50	$5,407.25	$6,135.75	$1,010.00	$ 948.00	$105.50	$1,310.25	$2,151.50	$1,889.75	$59,663.00
2d.....	38,899.00	11,918.00	378.50	4,512.50	3,546.50	4,910.00	442.00	2,876.00	199.50	448.50	2,672.00	886.00	71,888.50
3d.....	42,406.50	12,554.00	439.50	6,414.50	3,442.00	3,465.00	341.00	3,408.50	115.00	411.75	2,252.00	731.50	75,981.25
4th....	34,985.50	10,906.50	365.50	1,607.00	1,508.50	11,311.50	565.00	400.50	45.00	362.00	1,861.50	1,195.00	65,113.50
5th....	40,498.00	7,911.00	446.50	1,747.00	1,677.50	5,951.50	696.00	632.00	31.00	443.00	1,430.25	1,057.75	62,521.50
6th....	58,959.75	19,527.50	468.50	13,919.00	6,659.50	1,647.50	51.00	9,641.50	136.50	823.90	3,525.50	529.00	115,889.15
7th....	56,557.50	22,415.50	718.50	16,520.00	7,838.00	2,142.00	284.00	6,879.50	225.00	1,894.90	2,502.50	812.00	118,788.50
8th....	43,454.00	7,802.50	529.50	3,342.00	2,532.50	5,270.75	905.50	2,189.50	59.00	1,257.10	1,299.25	1,299.05	69,890.65
9th....	25,483.00	8,383.50	346.00	1,027.50	1,607.50	12,954.25	455.00	262.00	91.00	863.00	2,043.50	964.90	54,501.15
10th....	24,335.50	9,995.50	541.00	1,156.50	1,897.00	15,376.50	501.00	333.00	78.00	819.00	1,970.75	1,110.50	58,114.25
11th....	29,893.50	12,033.00	461.00	2,829.00	1,732.00	13,990.00	581.00	504.50	59.00	345.00	1,716.50	1,025.75	65,170.25
12th....	47,000.00	15,340.00	583.50	5,720.50	3,043.50	8,146.00	779.00	860.00	47.00	407.50	1,437.00	1,241.00	84,605.50
13th....	48,245.50	19,128.00	490.00	12,513.00	5,990.00	3,045.00	408.00	3,891.50	203.00	930.00	1,914.50	927.00	97,685.50
14th....	47,907.50	13,404.50	470.50	6,196.50	3,110.50	4,982.50	419.00	1,456.50	112.00	592.00	2,320.00	758.25	81,729.75
15th....	38,227.50	17,929.50	545.00	7,792.50	3,687.00	8,780.00	373.00	1,850.00	53.50	2,442.00	1,656.00	756.50	84,092.50
16th....	32,286.00	12,939.00	404.00	1,791.00	1,788.00	15,759.00	623.00	426.50	48.00	272.00	1,597.00	932.50	68,866.00
17th....	38,359.50	18,467.50	683.00	2,176.00	2,657.50	22,625.00	843.00	447.00	120.00	630.50	2,605.00	1,590.50	91,204.50
18th....	30,244.00	10,856.00	663.50	3,230.50	4,589.00	4,151.25	877.00	654.00	123.00	808.00	2,393.50	1,605.50	60,195.25
19th....	32,806.00	11,063.00	366.50	3,287.50	2,491.50	11,019.00	646.00	361.00	31.00	4,620.50	2,448.50	1,063.50	70,204.00
20th....	53,789.00	16,364.00	429.00	8,658.50	5,414.50	3,052.00	388.00	3,297.50	85.00	1,216.80	3,453.00	963.00	97,100.30
21st....	40,926.00	16,407.50	571.00	7,130.50	5,153.00	5,570.00	567.00	3,300.00	129.00	1,357.00	2,660.00	1,270.50	85,041.50
22d.....	33,965.00	17,437.50	551.50	3,118.00	3,060.00	16,388.75	841.00	460.00	155.50	2,314.50	2,662.00	1,602.50	82,556.25
23d.....	36,190.50	15,567.50	408.00	5,998.00	3,218.00	8,530.00	384.00	2,129.50	110.00	428.00	2,026.00	804.80	75,794.30
24th....	37,876.00	13,917.00	417.50	5,627.50	2,880.50	6,586.00	501.00	1,856.00	34.50	351.50	2,049.00	846.75	72,943.25
25th....	61,458.00	22,991.50	444.50	15,503.00	7,205.00	3,931.00	398 00	11,121.00	160.00	310.50	3,043.50	877.25	127,443.25
26th....	56,598.00	13,568.00	366.00	7,663.50	3,890.50	2,686.00	372.00	8,133.50	34.00	166.25	2,160.00	768.25	96,406.00
27th....	66,122.50	9,712.00	385.00	4,863.50	2,759.50	1,964.00	534.00	5,823.50	15 00	789.00	1,942.75	956.05	95,866.80
28th....	51,100.25	16,378.25	463.50	6,275.50	3,636.00	5,562.50	517.00	1,967.50	12.00	277.50	1,678.00	841.50	88,709.50
29th....	41,343.00	6,661.50	506.00	1,412.50	1,409.50	6,457.50	839.00	595.50	8.00	456.50	1,423.00	1,228.50	62,335.50
30th....	43,736.50	12,031.00	547.50	4,689.00	2,968.00	6,449.50	704.00	943.50	51.00	477.80	1,966.25	1,041.00	75,605.05
31st....	56,605.00	14,127.00	571.00	8,420.50	4,300.00	2,019.00	290.00	2,984.00	39.00	678.50	1,868.50	753.75	92,606.25
32d.....	60,632.50	12,117.50	469.50	7,169.00	4,474.50	2,023.00	294.00	9,147.00	221.00	755.75	2,318.75	999.10	100,616.60
33d.....	55,171.00	8,974.00	537.50	3,501.00	2,622.00	2,470.50	456.00	2,784.50	50.00	159.50	1,477.00	727.75	78,880.75
34th....	33,811.50	8,358.00	326.50	5,710.00	2,420.00	792.00	257.00	1,956.00	34.50	49.20	891.50	304.75	54,910.95
35th....	27,847.50	5,266.00	240.50	3,068.50	1,632.50	758.00	186.00	1,793.50	16.00	634.00	718.75	284.25	42,445.50
Total, 1904	$1,493,940.50	$464,093.75	$17,203.00	$190,367.50	$122,248.75	$236,902.25	$18,327.50	$96,164.00	$3,031.50	$30,102.30	$72,129.75	$34,655.65	$2,785,166.45
" 1903	1,471,423.00	448,594.50	16,377.00	188,071.00	115,508.50	235,709.25	17,574.00	89,706.50	2,820.00	30,050.05	74,613.00	34,085.85	2,724,532.65

TABLE No. XIX.

COMPARISON OF GENERAL ASSESSMENT FOR THE YEARS 1898, 1899, 1900, 1901, 1902, 1903 AND 1904.

	1898.	1899.	1900.	1901.	1902.	1903.	1904.
Frontage	$1,475,055.25	$1,358,846.50	$1,388,697.00	$1,406,027.50	$1,435,511.00	$1,471,423.00	$1,493,940.50
Water closets	372,827.00	365,894.00	372,265.00	398,982.00	428,363.00	448,594.50	464,093.75
Urinals	12,536.00	12,478.00	13,145.00	14,795.50	15,776.50	16,377.00	17,203.00
Baths	147,340.75	149,499.50	158,585.50	165,214.00	176,471.50	188,071.00	196,367.50
Wash basins	101,904.50	97,516.50	95,258.50	100,388.25	109,543.50	115,508.50	122,248.75
Extra rooms and persons	239,951.25	228,787.50	227,803.50	229,486.50	232,899.75	285,709.25	236,902.25
Saloons	18,048.50	16,928.50	16,934.00	16,852.50	17,383.00	17,574.00	18,327.50
Hose, troughs and fountain	82,704.00	80,646.50	87,782.00	92,368.00	91,686.50	89,706.50	96,164.00
Laundries	2,971.75	2,639.25	2,702.00	2,833.50	2,979.50	2,820.00	3,031.50
Steam heating and engines	27,679.40	24,929.55	24,366.30	29,073.95	31,504.00	30,050.05	30,102.30
Stables	70,864.50	68,204.75	71,023.00	72,795.50	75,248.00	74,613.00	72,129.75
Miscellaneous	33,249.60	30,823.50	31,332.90	31,829.40	34,321.85	34,085.85	34,655.55
Total	$2,585,135.50	$2,437,194.05	$2,489,844.70	$2,560,646.60	$2,651,688.10	$2,724,532.65	$2,785,166.45

TABLE No. XX.

DETAILED STATEMENT OF ASSESSOR'S INCREASE AND DECREASE CHECKS FOR THE YEAR 1904.

MONTHS.	INCREASE.				DECREASE.			
	Current Tax.	Back Tax.	Shut-off.	Total.	Current Tax.	Back Tax.	Drawback.	Total.
January	$4,912.37	$ 502.25	$ 120.75	$5,535.37	$4,238.95	$3,359.11	$1,578.96	$ 9,177.02
February	2,932.13	128.84	88.37	3,149.34	12,062.95	46,212.82	932.07	59,207.84
March	3,858.75	164.67	351.87	4,375.29	5,411.03	5,827.51	156.04	11,394.58
April	3,286.41	445.67	815.75	4,547.83	3,572.57	11,522.77	32.56	15,127.90
May	9,654.56	954.36	1,634.50	12,243.42	11,519.38	3,636.82	1,360.02	16,546.22
June	13,545.85	337.45	418.51	14,301.31	13,071.91	3,368.94	1,186.73	17,627.58
July	12,054.84	185.64	666.51	12,906.99	7,341.93	2,665.66	1,198.68	11,206.27
August	9,442.58	91.98	740.12	10,274.68	11,914.00	3,008.15	860.71	15,782.86
September	13,865.46	1,170.65	1,229.88	16,265.99	7,483.53	4,104.22	73.63	11,661.38
October	15,486.49	357.20	830.15	16,673.84	11,940.64	3,660.67	80.91	15,682.22
November	16,902.41	213.29	318.25	17,433.95	8,945.65	3,072.33	2,204.46	14,222.44
December	8,700.11	1,020.84	168.00	9,888.95	122,365.19	4,277.97	1,647.44	128,290.60
Total 1904	$114,641.46	$5,572.84	$7,377.66	$127,591.96	$219,897.73	$94,716.97	$11,312.21	$325,926.91
Total 1903	86,599.64	2,611.09	5,168.13	94,378.86	145,680.28	19,251.49	13,814.52	178,746.29

The excess of decreases for the year 1904, as compared with 1903, is explained by order of Council dated January 18, 1904, decreasing charges against premises where no water has been introduced. Of the total decrease of $325,926.91 from frontage rates for the year 1904, $119,725.25 is the result of the decreases to charitable, educational, municipal and religious institutions under section 24 of the ordinance.

TABLE No. XXI.

ANALYSIS OF LEDGER—ASSESSED RATES ACCOUNT.

WARD.	DEBIT.							CREDIT.					
	Balance Jan. 1, 1904.	General Assessment.	Increases.	Refunds.	Discounts.	Sundries	Total.	Decreases.	Discounts.	Collections.	Sundries.	Balance Dec. 31, 1904.	Total.
1.....	$ 10,809.25	$ 59,663.00	$ 4,184.47	$ 102.94	$ 13.46	$ 0.60	$ 74,773.72	$ 13,331.93	$ 6,635.48	$ 49,604.26	$ 17.50	$ 5,184.55	$ 74,773.72
2.....	6,910.05	71,688.50	1,441.31	102.87	9.63	.28	80,152.64	8,543.47	9,004.38	59,564.78	82.50	2,957.51	80,152.64
3.....	8,225.02	75,981.25	2,010.91	144.00	20.20	3.66	86,385.04	7,131.43	9,288.97	61,352.53	23.50	8,588.61	86,385.04
4.....	5,861.21	65,113.50	841.92	56.14	7.71	.15	71,880.63	6,367.12	8,602.15	52,947.54	42.00	3,981.82	71,880.63
5.....	7,051.87	62,521.50	1,816.68	162.61	21.13	.....	71,573.79	6,139.91	8,276.31	53,048.21	69.26	4,040.10	71,573.79
6.....	9,110.02	115,889.15	4,968.77	293.21	42.10	.01	130,303.26	10,642.08	15,152.13	100,328.97	17.83	4,162.25	130,303.26
7.....	15,930.34	118,788 50	7,670.56	353.73	52.90	3.00	142,799.03	14,131.42	15,158.18	101,538.00	144.45	11,826.98	142,799.03
8.....	11,089.25	69,890.65	2,510.23	165.04	26.28	5.51	83,686.96	12,395.17	9,145.87	58,635.41	92.00	3,418.51	83,686.96
9.....	18,814.82	54,501.15	1,059.47	58.39	8.06	.05	74,441.94	9,058.61	6,650 47	41,643.89	190.75	16,898.22	74,441.94
10.....	16,625.02	58,114.25	1,218.95	13.19	2.31	.....	75,973.72	5,516.03	7,503.30	45,794.90	152.49	17,007.00	75,973.72
11.....	15,619.15	65,170.25	815.41	49.13	7.72	5.79	81,667.45	4,695.90	8,556.82	51,566.34	138.75	16,709.64	81,667.45
12.....	23,304.69	84,605.50	4,835 35	106.63	14.12	.....	112,866.29	4,945.70	11,707.35	71,882.01	91.19	24,240 04	112,866.29
13.....	33,355.04	97,685 50	3,107.81	174.75	26.25	.13	134,349.48	7,122.90	12,289.87	79,114.84	530.75	35,291.12	134,349.48
14.....	34,080.25	81,729.75	6,245.35	408.95	59.01	.....	122,523.31	10,003.19	10,453.45	67,627.59	200.31	34,238.77	122,523.31
15.....	25,518.12	84,092.50	4,945.90	54.77	9.48	4.81	114,625.58	8,901.03	11,154.69	67,126.26	91.00	27 352.60	114,625.58
16.....	19,079.14	68,866.00	5,032.08	109.22	18.87	60.66	93,165.97	6,467.20	9,570.18	57,534.74	100.00	19,493.85	93,165.97
17.....	35,733 09	91 204.50	1,246.74	162.63	14.12	8.37	128,369.45	11,175.52	12,440 08	76,244.87	278.50	28,230.48	128,369.45
18.....	35,254.41	60,195.25	1,704.83	163.33	24.47	5.42	97,347.71	13,802.41	7,394.28	51,892.50	376.77	23,881.75	97,347.71
19.....	29,000.02	70,204.00	1,822.65	109.00	17.00	.....	101,152.67	12,015.17	8,648.08	56,330.89	296.04	23,862.49	101,152.67
20.....	41,768.58	97,100.30	1,518.92	186.29	28.71	5.33	140,608 13	11,072.35	12,528.35	81,362.06	168.50	35,476.87	140,608.13
21.....	39,925.25	85,041 50	2,281.94	275.70	34.09	9.21	127,567.69	8,666.61	11,420.35	73,886.50	279.25	33,314.98	127,567.69
22.....	42,050.93	82,556.25	1,631.16	87.47	13.03	.01	126,338.85	11,991.53	10,832.66	67,482.07	642.25	35,390.34	126,338.85
23.....	32,444.29	75,794.30	623.12	85.17	11.20	18.08	108,976.16	5,344.52	10,248.27	62,151.81	56.50	31,180.06	108,976.16
24.....	32,346.98	72,943.25	1,276.98	49.81	6.94	.....	106,623.96	5,585.76	9,901.76	60,458.57	.19	30,677.68	106,623.96
25.....	57,842.20	127,443.25	8,560.24	262.34	41.37	27.03	194,176.43	7,843.20	17,771.49	113,341.33	54.70	54,665.71	194,176.43
26.....	42,334.41	96,406.00	5,106.52	177.58	26.86	4.56	144,055.93	5,237.99	13,046.03	82,727.31	102.75	42,941.85	144,055.93
27.....	26,116.77	95,866.80	9,244.31	313.18	39.75	2.00	131,582.81	21,360.27	12,884.48	87,757.51	669.07	8,911.48	131,582.81
28.....	7,065.70	88,709.50	2,744.20	154.40	20.60	.....	98,694.40	5,623.73	12,221.74	76,400.27	273.50	4,175.16	98,694.40
29.....	9,176.13	62,335.50	4,108.67	202.90	31.19	.....	75,854.39	8,479.54	8,505.08	54,887.40	398.75	4,088.67	75,854.39
30.....	8,065.58	75,605.05	1,585.33	177.09	21.91	9.40	85,464.36	5,763.62	10,024.90	63,159.65	310.75	6,205.44	85,464.36
31.....	16,788.99	92,606.25	8,756.51	324.33	49.46	9.96	118,535.50	14,428.30	12,706.66	82,003.23	354.95	9,042.36	118,535.50
32.....	19,487.97	100,616.60	4,788.69	180.55	18 37	49.30	125,111.48	19,747.10	12,991.83	84,798.32	454.50	7,119.73	125,111.48
33.....	11,973.87	78,880.75	3,727.86	125.58	18.76	3.00	94,729.32	11,597.19	10,717.14	67,560.07	188.87	4,666.05	94,729.32
34.....	6,906.90	54,910.95	11,177.35	117.37	15.05	38.11	73,167 73	7,131.52	7,661 80	51,219.80	238.73	6,915.88	73,167.73
35.....	4,918.55	42,445.50	3,767.40	88.91	7.23	.42	51,228.01	4,493.62	5,526.16	37,087.16	271.25	3,899.82	51,228.01
Total	$760,585.86	$2,785,166.45	$128,348.09	$5,599.20	$779.34	$274.85	$3,680,753.79	$926,693 04	$966,615.69	$2,850,011.50	$7,395.10	$930,038.37	$3,680,753.79

TABLE No. XXII.

DETAILED STATEMENT OF PAY-ROLLS FOR THE YEAR ENDING DECEMBER 31, 1904.

MONTHS.	DIVISIONS.							
	Assessor's.	Collection.	Inspection.	Meter Rates.	Meter Mechanical.	Permit.	Shut-off.	Total.
January	$ 1,200.82	$ 3,274.28	$ 2,080.64	$ 2,353.48	$ 1,054.00	$ 3,400.56	$ 1,915.72	$ 15,279.50
February	1,131.88	3,261.98	2,109.05	2,320.50	1,044.25	3,276.47	1,947.75	15,091.88
March	2,263.75	6,629.92	4,212.44	3,398.51	1,492.61	5,005.29	2,451.47	25,453.99
April	1,496.65	4,623.19	2,910.88	2,676.21	1,535.00	3,788.88	2,076.50	19,107.21
May	1,509.15	4,741.64	2,971.23	2,783.78	1,603.24	3,866.50	2,328.58	19,804.12
June	1,454.15	4,861.85	2,963.33	2,756.10	1,693.37	3,907.76	2,541.00	20,177.56
July	1,458.50	4,867.46	3,041.39	2,827.96	1,741.69	3,845.01	2,601.00	20,378.01
August	1,509.15	4,824.85	2,901.06	2,884.33	1,987.62	3,969.26	2,612.17	20,688.44
September	1,509.15	4,663.16	2,823.33	2,844.21	1,843.50	3,868.76	2,497.00	20,049.11
October	1,466.41	4,804.33	2,736.55	2,876.71	1,872.37	3,858.26	2,498.19	20,112.82
November	1,509.15	4,785.58	2,675.83	2,770.93	1,939.50	3,907.76	2,535.00	20,123.75
December	1,509.15	4,887.14	2,828.49	2,843.82	2,010.12	3,901.76	2,553.44	20,533.92
Total, 1904	$18,012.91	$56,225.38	$34,254.17	$33,336.54	$19,817.27	$46,596.22	$28,557.82	$236,800.31
Total, 1903	$19,834.96	$52,262.34	$35,296.81	$31,075.29	$13,324.66	$47,236.42	$30,052.50	$229,082.98

TABLE No. XXIII.

DETAIL OF MISCELLANEOUS EXPENSES OF THE WATER OFFICE FOR THE YEAR 1904.

MONTHS.	Postage.	Railroad Tickets.	Street Car Tickets.	Stationery.	Sundries.	Total.
January	.....	.....	.....	.....	.....	.....
February	.....	.....	.....	$ 88.25	.....	$ 88.25
March	$1,505.00	$ 99.85	$227.90	433.27	$ 645.34	2,911.36
April	.....	63.50	.....	182.06	122.22	367.78
May	.....	.....	365.50	34.60	160.66	560.76
June	2,505.00	37.80	307.45	1,296.22	149.74	4,296.21
July	600.00	72.55	223.60	145.65	146.96	1,188.76
August	900.00	.....	.....	450.39	218.39	1,568.78
September	310.00	87.60	483.75	606.36	8.85	1,496.56
October	300.00	4.50	182.75	276.02	453.69	1,216.96
November	1,000.00	61.25	215.00	164.05	524.72	1,965.02
December	3,380.00	16.80	350.45	636.77	912.73	5,296.75
Total	$10,500.00	$443.85	$2,356.40	$4,263.64	$3,343.30	$20,907.19

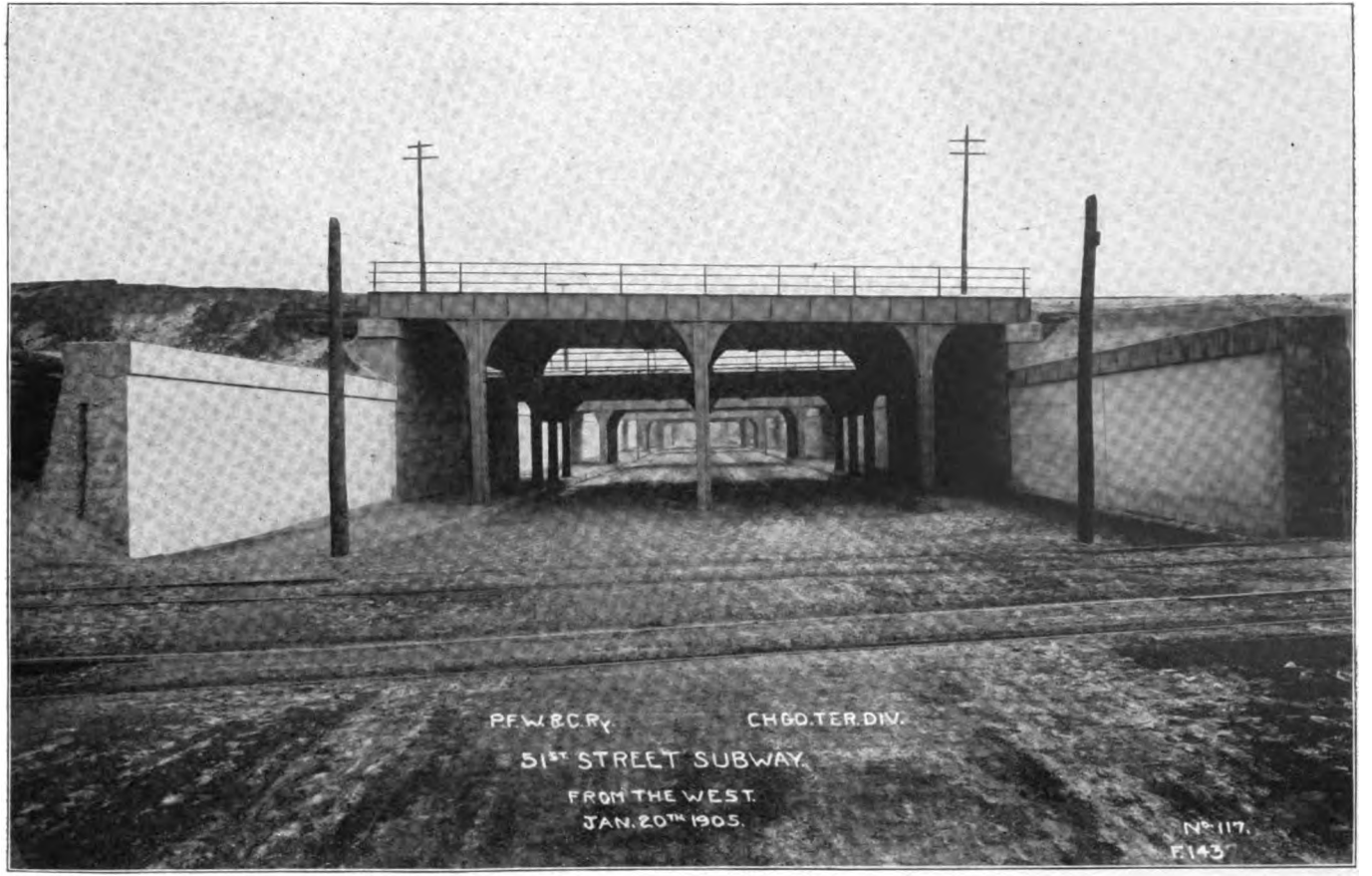


TABLE No. XXIV.

CASH COLLECTED BY CASHIER BUREAU OF WATER DURING THE YEAR OF 1904, AS COMPARED WITH 1903.

SOURCES.	1903.	1904.	Increase.	Decrease.	Net Increase
Assessed rates	$2,260,808.99	$2,350,011.69	$ 89,202.70	.....	.....
Meter rates	1,406,989.98	1,577,523.36	170,533.38	.....	.....
Permit division	17,156.95	17,554.90	397.95	.....	.....
Assessor's miscellaneous	18,703.25	20,077.40	1,374.15	.....	.....
Meter Mechanical divisi'n	12,997.94	24,427.24	11,429.30	.....	.....
Water Pipe Extension miscellaneous	11,486.37	9,867.84	.....	$1,618.53	.....
Suspense Account No. 1	13.00	145.75	132.75	.....	.....
Suspense Account No. 2	337.35	854.15	516.80	.....	.....
Total	$3,728,493.83	$4,000,462.33	.....	.....	$271,968.50
Special deposit fund	35,938.51	49,038.25	$13,099.74	.....	.....
Total	$3,764,432.34	$4,049,500.58	.....	.....	$285,068.24

TABLE No. XXV.

DETAILED STATEMENT OF CASH COLLECTED BY CASHIER OF BUREAU OF WATER AND CITY COLLECTOR FROM WARRANTS FOR COLLECTION ISSUED BY BUREAU OF WATER.

1904	Assessed Rates	Meter Rates	Permits	Assessor's Miscellaneous.	Meter Mechanical Division.	Water Pipe Extension.	Suspense Account No. 1.	Suspense Account No. 2.	Earnings of Meter Mechanical Division Large Meters, etc.	For use of water in construction of cement walks.	Miscellaneous Earnings Permit Division	TOTAL.
January...	$ 225,356.86	$ 60,364.13	$ 209.00	$ 276.01	$ 743.66	$ 486.00	.....	$ 5.25	$158.25	125.68	.....	$287,725.44
February .	214,400.75	134,066.12	153.00	115.44	1,103.95	.....	.....	736.37	.....	.....	.....	350,575.63
March.....	33,119.32	130,823.54	569.60	94.07	1,582.02	.....	.....	22.13	571.40	86.39	.....	166,868.47
April.....	11,791.59	132,798.53	1,392.20	579.14	2,107.17	544.00	.....	3.00	128.96	100.64	.....	149,445.23
May.....	220,705.28	131,896.89	1,641.70	2,684.03	2,158.60	1,086.00	.....	7.65	212.50	4.20	.....	360,396.85
June.....	387,209.80	126,468.42	1,751.10	2,996.20	1,812.99	.70	28.50	.....	760.57	1.42	.....	521,029.70
July.....	299,763.66	124,696.13	1,845.10	3,217.32	2,162.65	3,047.49	.....	43.80	295.75	5.33	.....	435,077.23
August....	254,189.99	156,132.74	1,765.15	3,632.13	3,154.50	2,063.75	12.50	.....	1.30	17.17	.....	420,969.23
September	33,528.83	140,642.02	1,626.15	2,937.97	2,009.42	1,228.90	.....	.....	253.10	17.08	.....	182,243.47
October. ..	17,173.73	143,329.25	1,547.70	2,200.71	1,813.08	562.50	29.75	.....	385.65	25.30	5,263.18	172,330.80
November.	256.629.67	132,981.52	3,061.00	268.30	2,000.69	644.50	.....	.....	409.45	527.61	.....	396,522.74
December.	396,142 21	163,324.07	1,992.60	1,076.08	3,778.51	204.00	75.00	35.95	338.95	2,438.94	1,958.25	571,364.56
Total 1904.	$2,250,011.69	$1,577,523.36	$17,554.90	$20,077.40	$24,427.24	$ 9,867.84	$145.75	$854.15	$3,515.88	$3,349.76	$7,221.38	$4,014,549.35
Total 1903.	$2,260,508.99	$1,406,989.98	$17,156.95	$18,706.25	$12,997.94	$11,486.37	$ 13.00	$387.35	$4,562.75	$2,158.60	$1,917.77	$3,737,152.95

TABLE No. XXVI.

DETAILED STATEMENT OF CASH COLLECTED FROM ALL SOURCES DURING 1904, AFTER DEDUCTING REFUNDS OCCASIONED BY DUPLICATE, WRONG PROPERTY, AND OVERPAYMENTS, ERRONEOUS ASSESSMENTS, COUNCIL ORDERS, ETC.

1904.	Assessed Rates.	Meter Rates.	Permits.	Assessor's Miscellaneous.	Meter Mechanical Division.	Water Pipe Extension.	Suspense Account No. 1.	Suspense Account No. 2.	Earnings of Meter Mech. Division. Large Meters. Etc.	For use of Water in Construction of Cement Walks.	Earnings of Permit Division.	Total.
January....	$ 225,025.17	$ 60,113.76	$ 209.60	$ 276.01	$ 740.11	$ 486.00	.....	$ 5.25	$158.25	$ 125.68	.....	$ 287,139.83
February..	213,436.30	134,033.07	153.00	115.44	1,098.55	.....	.....	736.37	.....	.....	.....	349,572.73
March.....	32,325.87	130,790.74	569.60	93.07	1,582.02	.....	.....	22.13	571.40	86.39	.....	166,041.22
April	10,568.54	132,517.65	1,392.20	579.14	2,084.55	544.00	.....	3.00	128.96	100.64	.....	147,918.68
May	220,447.09	131,757.54	1,641.70	2,684.03	2,158.60	1,086.00	.....	7.65	212.50	4.20	....	359,999.31
June	386,430.56	126,397.92	1,751.10	2,993.95	1,812.99	.70	$ 28.50	.....	760.57	1.42	.....	520,177.71
July	298,948.92	124,688.63	1,845.10	3,217.32	2,162.65	3,047.49	.....	43.80	295.75	5.38	.....	434,254.99
August	253,807.67	156,093.44	1,765.15	3,632.13	3,152.90	2,063.75	12.50	.....	1.30	17.17	.....	420,546.01
September	32,6[illegible]7.96	140,545.27	1,626.15	2,937.97	2,009.42	1,228.90	.....	.....	253.10	17.08	.....	181,285.85
October ...	16,653.72	142,511.87	1,547.70	2,200.71	1,801.88	562.50	29.75	.....	385.65	25.30	$5,263.13	170,982.21
November.	255,689.19	132,671.30	3,061.00	268.30	1,983.04	644.50	.....	.....	409 45	527.61	.....	395,254.39
December.	395,314.28	163,112.02	1,992.60	1,076.08	3,776.06	204.00	75.00	35.95	338.95	2,488.94	1,958.25	570,322.13
Total 1904.	$2,341,315.27	$1,575,233.21	$17,554.90	$20,074.15	$24,362.77	$9,867.84	$145.75	$854.15	*$3,515.88	*$8,349.76	*$7,221.38	$4,003,495.06
Total 1903.	$2,250,210.84	$1,405,440.45	$17,128.95	$18,703.25	$12,921.99	$11,486.37	$ 13.00	$337.35	*$4,582.75	*$2,158.60	*$1,917.77	$3,724,901.82
Increase ..	91,104.43	169,792.76	425.95	1,370.90	11,440.78	.....	132.75	516 80	.....	1,191.16	5,303.61	278,593.74
Decrease..	.....	.....	.....	.....	.....	1,618.53	.....	.....	1,066.87	.....	.....	.....

*Collections through warrants for collection.

TABLE No. XXVII.

SHOWING NET COLLECTIONS FROM ALL SOURCES FOR THE YEAR 1904, AS COMPARED WITH 1903.

SOURCES.	1903.	1904.	Increase.	Decrease.	Net Increase
Assessed rates	$2,250,210.84	$2,341,315.27	$ 91,104.43	.....	.....
Meter rates	1,405,440.45	1,575,233.21	169,792.76	.....	.....
Permit division	19,046.72	24,776.28	5,729.56	.....	.....
Assessor's miscellaneous	20,861.85	23,423.91	2,562.06	.....	.....
Meter Mechanical divisi'n	17,504.74	27,878.65	10,373.91	.....	.....
Water Pipe Ext'n—Misc.	11,486.37	9,867.84	.....	$1,618.53	.....
Suspense Account No. 1.	13.00	145.75	132.75	.....	.....
Suspense Account No. 2.	337.35	854.15	516.80	.....	.....
Total	$3,724,901.32	$4,003,495.06	$280,212.27	$1,618.53	$278,593.74

TABLE No. XXVIII.

SHOWING NET RECEIPTS AND EXPENSES, AND PER CENT OF EXPENSES TO COLLECTIONS, FOR THE YEARS 1891 TO 1904, INCLUSIVE.

YEAR.	Receipts.	Expenses.	Per Cent.
1891	$2,331,286.20	$303,879.86	13
1892	2,592,111.67	336,956.79	13
1893	2,837,827.35	294,968.60	$10\frac{5}{10}$
1894	3,010,259.92	287,306.92	$9\frac{5}{10}$
1895	3,215,137.10	309,273.30	$9\frac{5}{10}$
1896	3,003,692.61	288,497.34	$9\frac{6}{10}$
1897	3,177,706.83	281,378.72	$8\frac{8}{10}$
1898	3,489,390.87	298,982.07	$8\frac{8}{10}$
1899	3,203,569.71	285,887.71	$8\frac{9}{10}$
1900	3,248,411.36	264,648.64	$8\frac{1}{10}$
1901	3,397,928.87	253,182.64	$7\frac{5}{10}$
1902	3,223,867.55	252,810.28	$7\frac{8}{10}$
1903	3,728,493.83	252,583.26	$6\frac{8}{10}$
1904	4,000,462.33	262,818.92	$6\frac{5}{10}$

TABLE No. XXIX.

ACCOUNTING DIVISION.

INCOME ACCOUNT.

REVENUE.

General assessment, May 1, 1904		$2,785,166.45	
Increase to back tax		5,798.31	
Increase to current tax		114,641.46	
Increase to shut-off		7,367.66	
			$2,912,973.88
Less—			
Discounts allowed		$365,836.45	
Erroneous assessments refunded		3,097.22	
Decreases on account of municipal buildings, in accordance with Section 24 of the City ordinance:			
Public schools	$ 56,421.20		
Police stations	1,861.50		
Fire engine houses	2,991.25		
Miscellaneous city buildings	11,877.75		
		73,151.70	
Decreased on account of charitable, educational and religious institutions, in accordance with Section 24 of the City ordinance:			
Churches and religious institutions	$ 22,851.96		
Parochial and miscellaneous schools and colleges	13,898.00		
Hospitals	3,243.50		
Miscellaneous charitable institutions	6,580.09		
		46,573.55	
Decreased on account of overpayments, as per affidavits and special examinations, buildings removed and destroyed, no water, changes to meter control, and other causes,		194,925.89	
Allowance on current bills to cover drawbacks on amounts previously paid on vacant property, in accordance with City ordinance		11,312.21	
			694,897.02
Net revenue from assessed rates			$2,218,076.86

Brought forward			$2,218,076.86
Charges as per meter readings and increase		$1,639,586.11	
Less—			
Decrease on account of charitable, educational and religious institutions, in accordance with Section 24 of the City ordinance:			
Municipal institutions	$1,484.25		
Religious institutions	5,931.10		
Schools and colleges	4,593.75		
Asylums, homes, etc	2,858.40		
Hospitals	2,712.15		
State property	2,439.90		
Miscellaneous	214.35		
	$ 20,263.90		
Decreased on account of erroneous readings	2,857.77		
		23,121.67	
Net revenue from meter rates			1,616,464.44
Assessor's miscellaneous charges for sprinkling wagons, construction of cement walks, etc.			23,424.11
Revenue of Water Pipe Extension Division			9,867.84
			$3,867,833.25
Less			
Decrease Suspense Account No. 1		$ 461.00	
Decrease Suspense Account No. 2		167.10	
Net loss of operation, Division of Permits (see Table No. X)		28,721.72	
Net loss of operation, Meter Mechanical Division (see Table No. XI)		872.52	
			30,222.34
			$3,837,610.91

EXPENSES.

Less—		
Postage	$ 10,500.00	
Railroad tickets	443.85	
Street car tickets	2,356.40	
Printing and stationery	4,263.64	
Sundries	3,343.30	
Rent	11,845.00	
Reimbursing Bureau of Streets	9.00	
Court costs, witness fees, etc	831.35	
Attorney's salary	1,905.53	
Miscellaneous appropriation items	25.00	
Meter testing plant	565.30	
Leak and waste investigators' salaries	2,088.75	
Pay-rolls (Meter Mechanical and Permit Divisions omitted)	170,386.82	
		208,513.94
Net income, Bureau of Water		$3,629,096.97

P. C. C. & St. L. Ry., Chicago Track Elevation.—Thirty-sixth Street Subway, Looking East.—October 25, 1904.

TABLE No. XXX.

BALANCE SHEET.

DEBIT.

Balance uncollected December 31, 1903.....		$ 935,695.84	
Inventory, Meter Mechanical Division, December 31, 1903.....		9,624.67	
Inventory, Permit Division, December 31, 1903		1,440.09	
Disbursements during 1904 for:			
Meter Merchandise.....	$ 11,891.56		
Permit Merchandise	4,996.25		
Salaries.....	236,800.31		
Postage.....	10,500.00		
Sundry Expenses.....	9,061.42		
Street Car Tickets.....	3,686.30		
Rent.....	11,845.00		
Reimbursing Bureau of Streets.....	9.00		
Attorney's Salary.....	1,905.53		
Court Costs, etc.....	831.35		
Meter Testing Plant	565.80		
Miscellaneous Appropriation Items.....	2,063.75		
		294,155.77	
Net income 1904 as per income account (See table No. XXIX).....		3,629,096.97	
			$4,870,013.34

CREDIT.

Debit balance against Comptroller, December 31, 1904, as follows:

Net collections made by Bureau of Water ..	$3,989,408.04		
Amount collected by City Collector for Bureau of Water on warrants for collection for setting of large meters, etc.....	3,515.88		
Amount collected by City Collector on warrants for collection for water used in construction of cement walks.....	3,349.76		
Amount collected by City Collector on warrants for collection for earnings of Permit Division	7,221.38		
		$4,003,495.06	
Inventory, Meter Mechanical Division, December 31, 1904.....		12,802.17	
Inventory, Permit Division December 31, 1904		1,254.65	
Balance uncollected December 31, 1904:			
Assessed Rates.....	$630,038.37		
Meter Rates.....	165,046.88		
Meter Mechanical Division	3,236.85		
Suspense Account No. 1.....	34,994.86		
Suspense Account No. 2.....	19,144.50		
		852,461.46	
			$4,870,013.34

TABLE No. XXXI.

During the year the United States Express Company, under the contract with the Department of Public Works, made the following collections:

	Number of Bills.	Amount.
From January 1st to March 1st, 1904	24,148	$125,699.61
From March 1st to August 31st, 1904	48,692	239,082.17
From September 1st to January 7th, 1905	38,966	163,979.13
Total for 1904	111,806	$528,760.91
Total for 1903	92,478	$449,542 80

In closing permit me to express to his Honor the Mayor and to yourself the thanks of the employees of this bureau for the appreciation and consideration extended to them and the undersigned in their efforts to accomplish good results in the conduct of the bureau.

Respectfully submitted,

H. O. NOURSE,

Superintendent of Water.

P. C. C. & St. L. Ry., Chicago Track Elevation. Thirty-fifth Street Subway, Looking East. October 25, 1904.

P. C. C. & St. L. Ry., Chicago Track Elevation.—Thirty-fourth Street Subway, Looking East.—October 25, 1904.

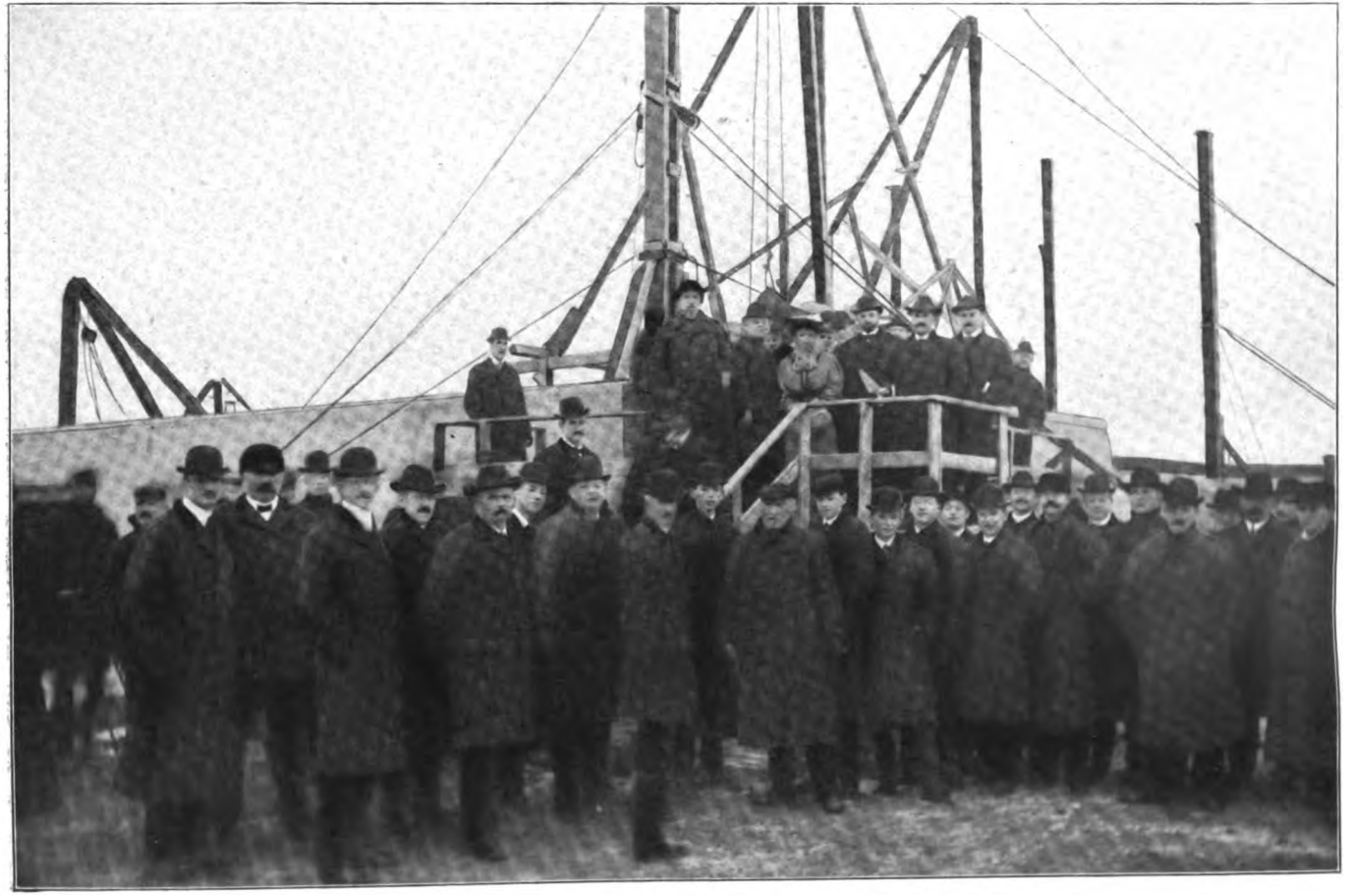
ANNUAL REPORT

Bureau of Sewers

CITY OF CHICAGO

1904

WM. E. QUINN
Superintendent



MAYOR HARRISON LAYING CORNER STONE OF THIRTY-NINTH STREET PUMPING STATION. INTERCEPTING SEWERS.

BUREAU OF SEWERS.

HON. F. W. BLOCKI,

Commissioner of Public Works.

DEAR SIR: I have the honor to submit herewith the annual report of the Bureau of Sewers for the year ending December 31, 1904, being the twenty-ninth annual report of the bureau under the Department of Public Works, and the forty-ninth annual statement of work done in connection with the sewers of the City, as follows:

EXPENDITURES.

Total expenditures, except intercepting sewers	$325,008.90

Distributed as follows:

GENERAL FUND.

House drains	$ 33,326.18
Sixty-ninth street pumping station	4,749.32
Woodlawn pumping station (including reserve on coal and oil)	16,581.76
Seventieth street pumping station (including reserve on coal and oil)	7,309.09
Seventy-third street pumping station (including reserve on coal and oil),	6,467.41
Kensington pumping station (including reserve on coal and oil)	6,814.31
Pullman pumping station (including reserve on coal and oil)	10 522.16
Rogers Park system	3,376.86
Repairing sewers, catch-basins, etc	50,472.97
Repairing covers	22,485.08
Cleaning sewers and catch-basins	120,883.90
Building new catch-basins	4,994.77
Unpaid bills	194.60
Bench monuments	3,040.20
Restoration of streets	2,203.62
Miscellaneous work	1,302.00
Dredging Slip "A"	3,445.70
Office salaries and expenses	8,626.78
	$306,796.16

WATER FUND.

Fullerton avenue pumping station	$18,212.74

SEWERS AND CATCH-BASINS CLEANED (BY DISTRICTS) IN THE CITY OF CHICAGO DURING THE YEAR 1904.

METHOD.	District No. 1.		District No. 2.		District No. 3.		District No. 4.		Total.		Average Cost per 100 Feet.
	Feet Cleaned.	Cost.	Feet Cleaned.	Cost.	Feet Cleaned.	Cost.	Feet Cleaned.	Cost.	Feet Cleaned.	Cost.	
Flushing	585,100	$5,632.75	879,500	$10,133.25	59,000	$ 705 37	147,300	$ 666.50	1,670,900	$17,137.87	$1.03
Iron scraper	16,400	3,702.75	14,750	485.25	112,800	6,829.38	113,200	5,431.56	257,150	16,448.94	6.40
Wood scraper	82,900	1,358.50	.....	.....	.....	.....	.....	.....	82,900	1,358.50	1.64
Total	684,400	$10,694.00	894,250	$10,618.50	171,800	$7,534.75	260,500	$6,098.06	2,010,950	$34,945.31	.....
Opening inlets to catch-basins, attending complaints, etc.										$35,091.87	
Total										$70,037.18	

	No.	Cost.	No.	Cost.	No.	Cost.	No.	Cost.	Total No.	Cost.	Average Cost per Basin.
Catch-basins cleaned	7,367	$25,001.63	3,568	$10,498.75	2,557	$6,402.55	2,287	$7,474.17	15,779	$49,377.10	$3.13

Cost of cleaning sewers and catch-basins	$119,414.28
Miscellaneous bills, tools, supplies, etc.	1,469.62
Amount paid Rogers Park Water Company for water used in flushing sewers	3,376.36
Total	$124,260.26

AMOUNTS EXPENDED FOR REPAIRS OF SEWERS, MANHOLES AND CATCH-BASINS, DURING THE YEAR 1904.

No.	DESCRIPTION OF WORK DONE.	Cement	Brick	Wood Covers	Iron Covers	Wood Lids	Iron Lids	Straight Pipe 6-in.	Straight Pipe 9-in.	Straight Pipe 12-in.	Straight Pipe 15-in.	Straight Pipe 18-in.	Straight Pipe 24-in.	Curved Pipe 6-in.	Curved Pipe 9-in.	Curved Pipe 12-in.	Curved Pipe 15-in.	Curved Pipe 24-in.	Traps	Bottoms	Junctions	Slants	Labor and Teaming	Material	Total Cost
12	New manholes built																								
17	New catch-basins built																								
830	Manholes repaired																								
1187	Catch-basins repaired																								
163	Feet of 6-inch drains repaired																								
4365	Feet of 9-inch drains repaired																								
437	Feet of 12-inch drains repaired																								
411	Feet of 15-inch drains repaired																								
26	Feet of 18-inch drains repaired																								
1668	Feet of 2-foot sewers repaired	1,578	382,700	102	621	33	7	114	2,919	393	325	15	42	11	61	4	10	1	38	12	27	2	$48,762.93	$6,704.81	$55.467.74
632	Feet of 2½-foot sewers repaired																								
6	Feet of 3-foot sewers repaired																								
4	Feet of 3½-foot sewers repaired																								
49	Feet of 4-foot sewers repaired																								
96	Feet of 4½-foot sewers repaired																								
8	Feet of 5-foot sewers repaired																								
90	Feet of 9-foot sewers repaired																								
60	Feet of new 12-inch sewer built																								
232	Feet of new 15-inch sewer built																								

	Wood Covers		Iron Covers		Wood Lids		Iron Lids		Grates	Labor and Teaming	Material	Total Cost
	Manhole.	Catch-Basin	Manhole.	Catch-Basin	Manhole.	Catch-Basin	Manhole.	Catch-Basin				
Manhole and catch-basin covers rep'red	148	251	34	4	2,587	2,263	138	28	47	$16,299.86	$6,185.17	$22,485.03
Total												$77,952 77

10,103 Complaints were attended to by this Bureau during the year.

THE FOLLOWING STATEMENT SHOWS THE AMOUNT EXPENDED PER MILE PER YEAR FOR THE PAST EIGHTEEN YEARS, IN CLEANING SEWERS AND CATCH-BASINS.

YEAR.	Miles of Sewer to Maintain.	Cost of Cleaning Sewers and Catch-Basins.	Cost per Mile of Cleaning Sewers and Catch-Basins per Year.
1887	474	$ 50,264.65	$106.04
1888	492	52,423.41	106 55
1889	712	61,503.01	86.38
1890	785	107,873.84	137.42
1891	888	123,620.44	139.21
1892	992	142,720.52	143.87
1893	1,145	132,633 51	115.84
1894	1,211	154,225.45	127.35
1895	1,248	134,424.44	107.71
1896	1,306	96,901.65	74.20
1897	1,345	91,414.89	67.96
1898	1,388	92,961.88	66.98
1899	1,424	72,439 07	50.92
1900	1,453	80,985.64	55.73
1901	1,475	94,369.87	63.98
1902	1,501	99,372.58	66.20
1903	1,529	118,303.41	77.37
1904	1,563	124,260.26	79.50

HOUSE DRAIN DIVISION.

EDWARD J. HAYES, Chief Inspector.

During the year there were 9,146 notifications of work which required inspection, most of the jobs requiring three or more visits, which kept the twenty-four inspectors very busy, and we have not been able to give as much attention to each job as should be necessary. A fine degree of inspection has been given, however, and the work platted and indexed in our atlases.

A total collection of $21,738 for license, permit and inspection fees has been made during the year, making the division practically self-sustaining.

The system of recording notifications has been improved during the year, and a complete system of checking the inspectors' work has been adopted, showing the date of the starting of the work, the date of the inspector's final report and the platting of his work in his field book, also the date of indexing the work in the atlases.

Detailed report follows:

CORNER STONE THIRTY-NINTH STREET PUMPING STATION. INTERCEPTING SEWERS.

GRANITE SETTING, THIRTY-NINTH STREET PUMPING STATION. INTERCEPTING SEWERS.

RECEIPTS OF HOUSE DRAIN DIVISION FOR THE YEAR 1904.

DIVISION.	Extension Permits.	Fee Permits.	Credits by Cancellation.	Receipts.	Junctions 6-inch.	Receipts.	Junctions 9-inch.	Receipts.	Junctions 12-inch.	Receipts.	Junctions 15-inch	Receipts.	Council Order Drains.	Special Inspection Receipts.	Total Receipts.
North.....	818	547	$ 25.00	$ 2,710.00	53	$132.50	34	$170.00	3	$22.50	1	$10.00	134	$40.00	$ 3,085.00
South.....	1,511	1,351	60.00	6,695.00	160	400.00	68	340.00	11	82.50	6	60.00	1	10.00	7,587.50
West.....	2,530	1,757	65.00	8,720.00	70	175.00	42	210.00	1	7.50	1	10.00	46	23.00	9,145.50
Totals.....	4,859	3,655	$150.00	$18,125.00	283	$707.50	144	$720.00	15	$112.50	8	$80.00	181	$73.00	$19,818.00

Total receipts for regular house drain permits	$18,125.00
Total receipts for extra junctions	1,620.00
Total receipts for miscellaneous engineering and inspections	73.00
Total receipts for drain layers' licenses	1,920.00
Grand total receipts	$21,738.00

Total number of house drain extensions and repairs	4,859
Total number of house drains by permit	3,655
Total number of house drains by Council order	181
Total number of house drains by special assessment	4,357
Grand total new house drains	13,052

INSPECTIONS.

Total number of house drain inspections, extensions and repairs	4,859
Total number of house drain inspections, new permit connections	3,655
Total number of house drain inspections, new junctions set	451
Total number of house drain inspections, Council orders	181
Grand total number of house drain inspections	9,146

SEWAGE PUMPING STATIONS, 1904.

WILLIAM DOLAN, Chief Mechanical Engineer.

SIXTY-NINTH STREET MOTOR PUMPS.

Sewage pumped during the year, 1,135,000,000 gallons. Operating expenses, $4,749.32.

Owing to the location of motor pump it is impossible to prevent the motor room from flooding during heavy rainstorms if the motor should stop suddenly with water in the receiving well higher than the motor room floor and the outlet or discharge sewer filled with water. Last August during a heavy rain the motor was working to its full capacity; in the receiving well the water was 3 feet above the floor of the motor room; the suction valve was regulated to admit the water as fast as the pump could discharge it; the discharge sewer was taxed to its full capacity; suddenly the motor stopped, and the suction valve was closed to prevent the water from coming into the motor room, but it appeared that the water backed up through the discharge pipe and pump into the motor room, partly submerging the motor. After the water subsided the pit was pumped out. Armature and field coils were sent to shop and thoroughly baked. In testing it was found that the insulation was covered with verdigris. The armature and coils were rewound, new brushes furnished and machine put in good condition. The work raising the pump shaft to line with motor was started in December, but owing to the condition of weather it was impossible to complete the work during the year. At the pumping station the engine and boiler are kept in condition to start at any time the motor is out of service.

SEVENTY-THIRD STREET STATION.

J. R. BRUNNICK, Engineer in Charge.

Sewage pumped during the year, 1,860,000,000 gallons. Operating expenses, including coal reserve, $6,467.41.

Repairs made during the year: Engine No. 1—New bonnet and brass valve stem made for high-pressure engine, set of steel blocks for grab hook of valve gear, rings adjusted on intermediate piston, air pump valves, piston, and piston-rod overhauled. Engine No. 2—Air pump valves reseated, new brass sleeve put on piston rod. The old breeching between boiler room wall and chimney was badly corroded and in such condition that it had to be removed and a new breeching put in its place. Both engines in the station needed a general overhauling.

SEVENTIETH STREET STATION.

JAMES AGNEW, Engineer in Charge.

Sewage pumped during the year, 2,907,000,000 gallons. Operating expenses, including coal reserve, $7,309.09.

Repairs made during the year: Engine No. 1—New bronze brasses for wrist pins high and low-pressure engine, also rebabbitting crank pin brasses on low-pressure engine. Engine No. 2—Cross heads and wrist pins turned up, brasses rebabbitted. Brasses and pins on connecting arms of air pump refitted, new rings made for low-pressure piston, air pump piston rod turned up, glands bushed, new valves put in.

During the year a few minor repairs will be needed incidental to its operation, otherwise the plant is in good condition.

KENSINGTON STATION.

P. E. HOULIHAN, Engineer in Charge.

Sewage pumped during the year, 674,000,000 gallons. Operating expenses, including coal reserve, $6,814.31.

Repairs made during the year: Boiler No. 1—New set of flues, cast iron liners put in doorway, brickwork in fire box repaired, old 2-inch cast iron flange and 2-inch blow-off pipe replaced with a 4-inch steel flange, 4-inch extra heavy wrought iron pipe and malleable iron elbow. Boiler No. 2—Cast iron liners put on doorway, brickwork repaired under boiler, old 2-inch cast iron flange and 2-inch blow-off pipe replaced with a 4-inch steel flange, 4-inch extra heavy wrought iron pipe and malleable iron elbow.

Repairs necessary during the coming year: Brick pier to be built under each boiler to protect blow-off pipe, air pump and boiler feed pumps need overhauling, also the interior of engine and boiler room needs painting and calcimining, otherwise the plant is in good condition.

PULLMAN STATION.

D. S. WILLIAMS, Engineer in Charge.

Sewage pumped during the year, 716,000,000 gallons. Operating expenses, including coal reserve, $10,522.16.

Repairs made during the year: Engine No. 1—Rocker arm shaft rebabbitted, new cross-arm made for air pump, valves faced and reseated, water end of pump overhauled, valve repaired and plunger lined up. Engine No. 2—Rocker arm shaft rebabbitted, valve and rubber hoods repaired. Boilers Nos. 1 and 2—Arches under boilers repaired and put in good shape. Live steam heater disconnected and inter brass tube

rolled. The main steam header leaked badly, due to contraction, expansion and strain caused by the settling of boilers. To prevent further trouble the header was taken down and reconstructed. To prevent this plant from shutting down while the work was in progress, a temporary auxiliary header was erected to supply steam to the engine.

During the ensuing year it will be necessary to overhaul both air pumps, reset and face valves on steam end of pump No. 2, discharge from condensers provided with a hot-well so that the warm water can be returned to boilers, also have the returns from traps discharge into hot-well.

I would recommend that a ceiling be erected in the engine and boiler rooms to protect the tile roof from the wind when the windows and doors are open.

WOODLAWN STATION.

F. W. SADLER, Engineer in Charge.

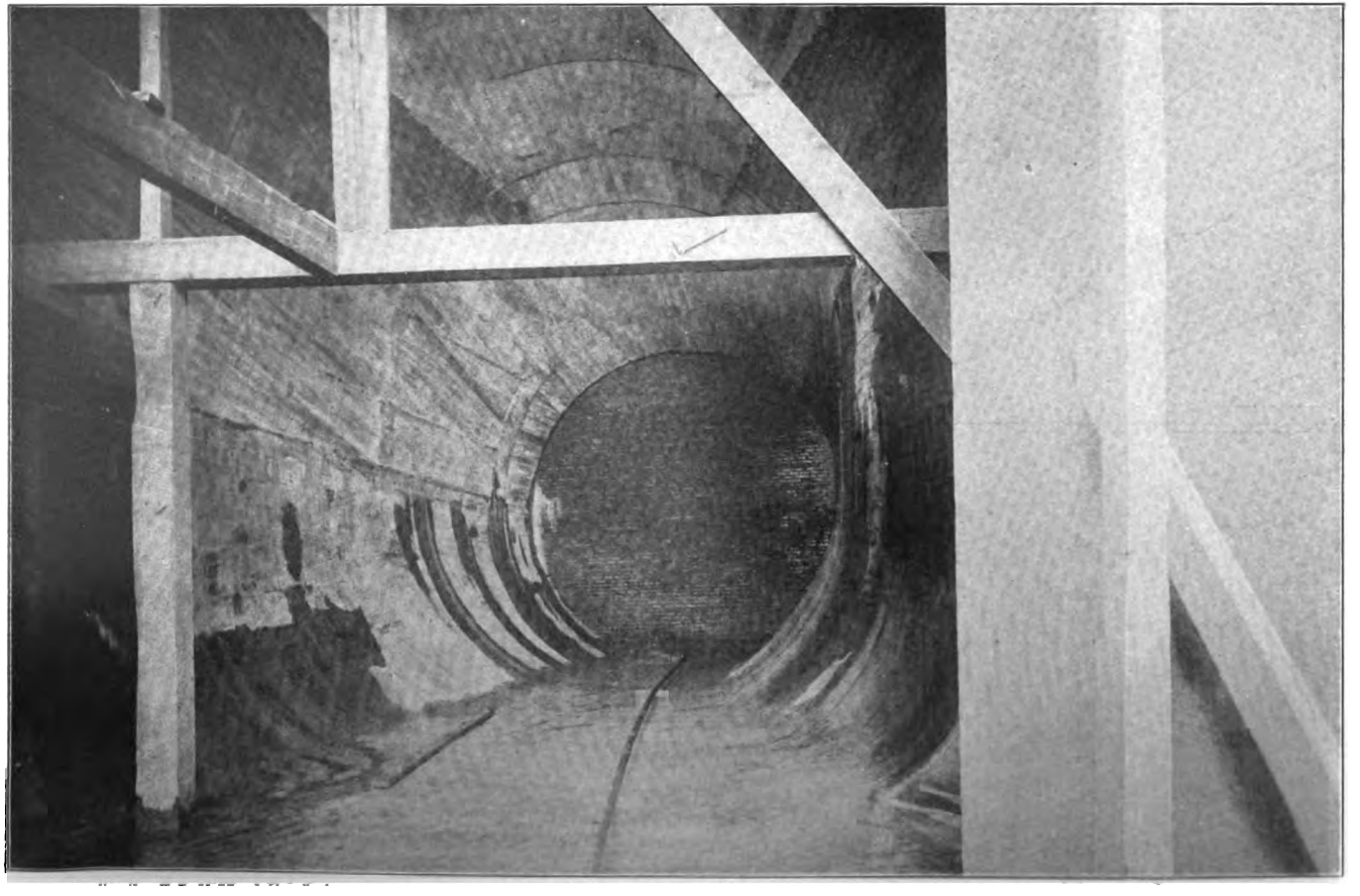
Sewage pumped during the year, 2,546,000,000 gallons. Operating expenses, including coal reserve, $16,581.76.

The following is a report of the principal repairs at this station during the year: Engine No. 1—Rocker arms, pins and valve connections renewed, water end of pump overhauled, valves and hoods repaired, four new rubber hoods used. Engine No. 2—Steam end of pump overhauled, valves faced and reseated, pistons lined up and rings set out, new pins made for link motion blocks, rocker arms rebabbitted, jam nuts fitted to valve stem to hold cross head in place, water end of pump, suction and discharge valves repaired, old rubber hoods repaired, and five new rubber hoods used. Engine No. 3—Old brass sleeves removed and hard cast iron sleeves substituted, plungers turned to fit same, new piston rods furnished and glands brushed, suction and discharge valves repaired, four old rubber hoods taken out and replaced with new ones. Condensers Nos. 1 and 2 were thoroughly overhauled and put in good shape. Boilers Nos. 2 and 3—New breeching connected to chimney, grates repaired and new asbestos corks put on blow-off pipes. During the year the water ends of all three pumps were incased with 3-inch pine flooring to deaden the sound due to the opening and closing of the valves.

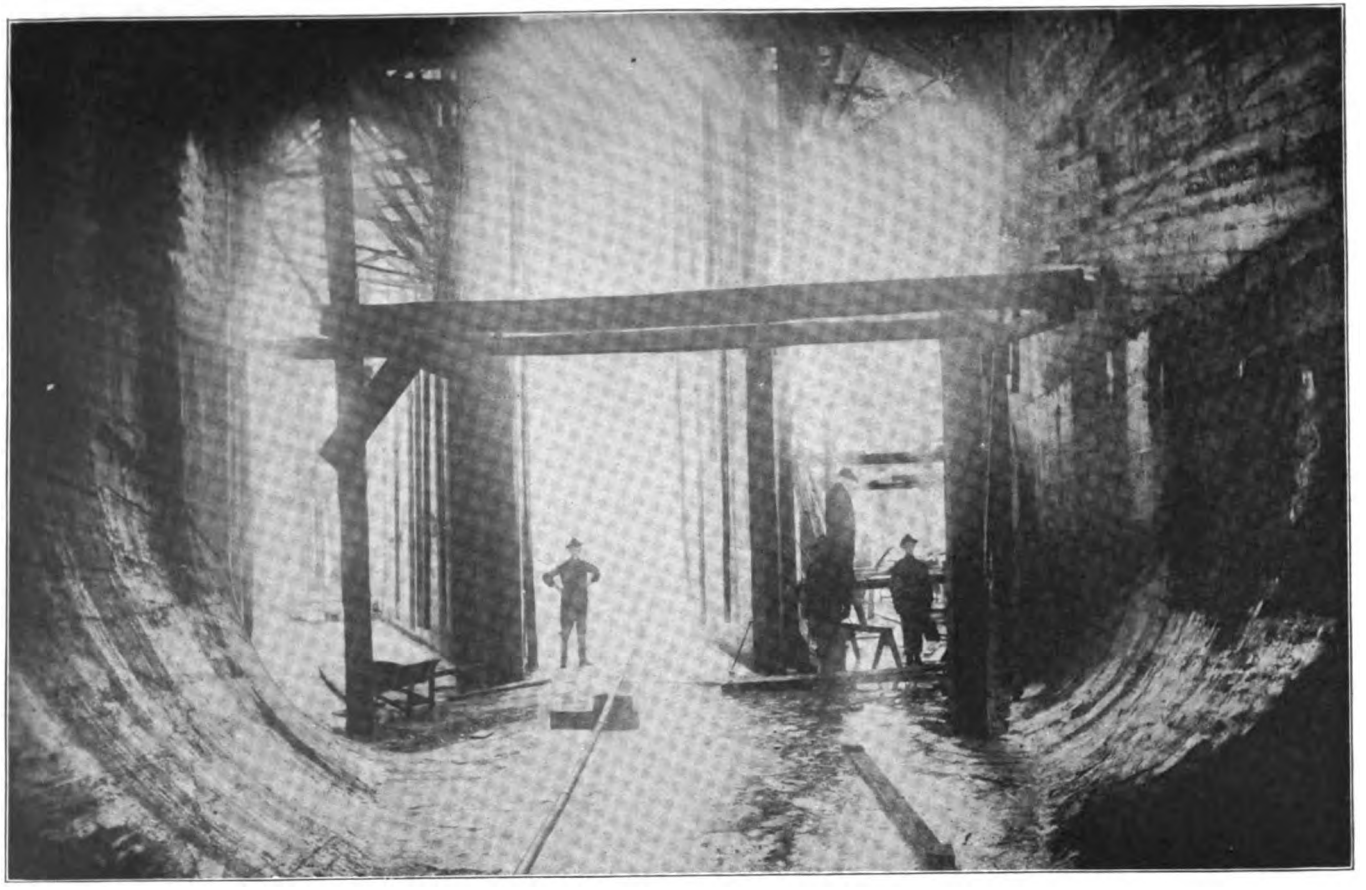
FULLERTON AVENUE STATION.

P. E. MCDONNELL, Chief Engineer.

Water pumped into the river during the year, 4,413,000,000 cubic feet. Operating expenses, including coal reserve and installing motors, $18,212.74.



LOOKING INTO THIRTY-NINTH STREET CONDUIT AT JUNOTION OF THREE WATER CHANNELS.—THIRTY-NINTH STREET PUMPING STATION.
INTERCEPTING SEWERS.



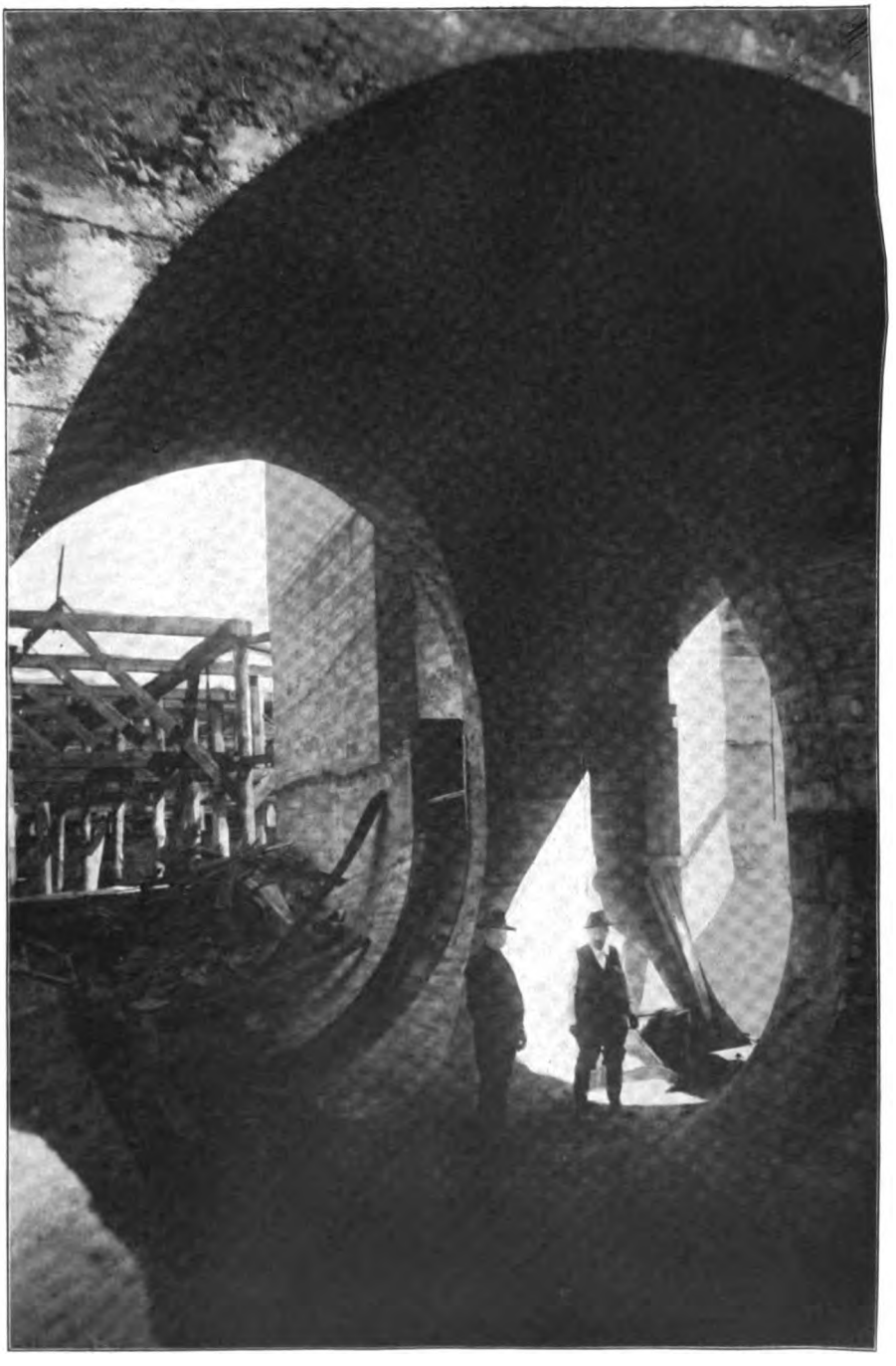
LOOKING INTO THREE WATER CHANNELS AT JUNCTION WITH THIRTY-NINTH STREET CONDUIT.
THIRTY-NINTH STREET PUMPING STATION. INTERCEPTING SEWERS.

In sending in my report for this station during the year I respectfully submit the following: This station was shut down eighteen days in May and June repairing engines, making new pistons, packing rings and boring out the cylinders, making and putting on a new coupling on the east end of main shaft. This coupling was put on by the shrinking process and was a complete success. This work completed, the engines were in excellent condition, pumping 24,000,000 cubic feet per day up to the 1st of September, at which time the City Boiler Inspector condemned all three boilers. The station was shut down, bids for new boilers advertised, and when opened a suggestion of City Electrician E. B. Ellicott was followed, that of putting in two 125-horse-power electric motors to run the main shaft until the new electric plant, now being erected on the site adjoining the pumping station, could furnish steam for the engine. When this plant is completed the Electrical Department has agreed to furnish steam to operate the engines. These motors have been put in and we started pumping again on December 28th. They, however, run our main shaft but an average of 72 revolutions per minute, as against 80 when steam was used, and the pumpage is reduced to about 18,000,000 cubic feet per twenty-four hours. So far, however, we are unable to make full time, and 15,000,000 cubic feet per day is our maximum pumpage. This will be remedied in the near future, as the boilers are now being installed in the new electric plant.

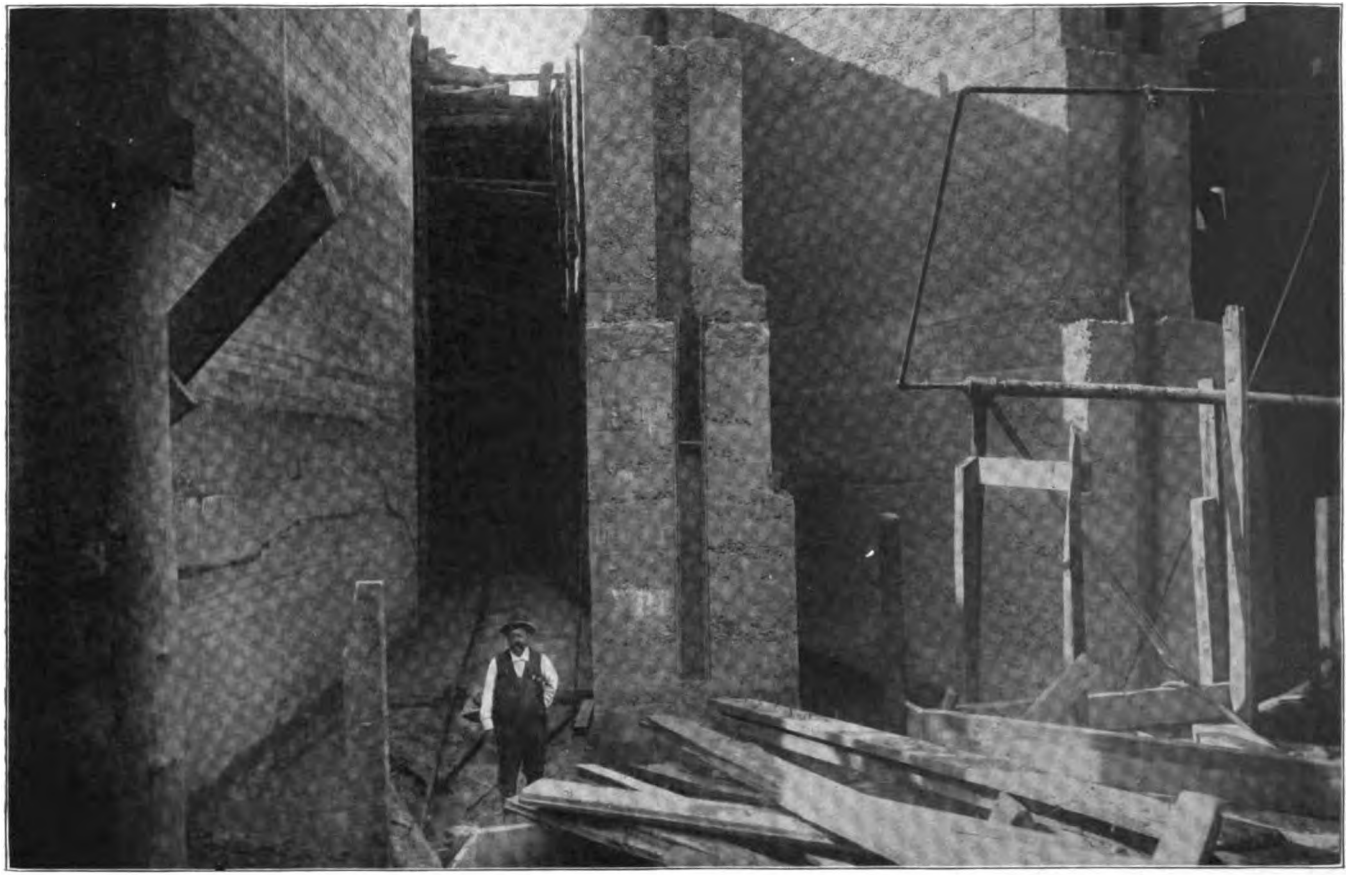
NEW SEWERS AND CATCH-BASINS BUILT DURING THE YEAR 1904 AND THE COST OF SAME.

Length.	DIAMETER, IN FEET.	Cost.
* 680	¾	$ 768.40
*87,707	1	143,714.05
*49,107	1¼	86,971.63
* 238	1½	666.40
* 9,717	2	28,664.84
* 3,810	2 (Double invert)	14,837.36
* 2,000	2½ (Double invert)	5,420.00
* 1,181	2½ (Double invert)	6,523.71
* 990	2¾	3,465.00
* 2,338	3	13,504.16
* 2,726	3½	12,039.84
* 1 802	4	11,262.50
* 1,884	5½	16,956.00
* 2,670	6	29,370.00
* 2,000	11	54,200.00
† 994	¾	1,290.50
†16,859	1	24,920.37
†10,165	1¼	16,251.98
† 509	2	1,476.10
† 663	2½	2,585.70
† 1,331	3	6,388.80
† 1,333	3½	7,064.90
† 826	4	4,956.00
‡ 1,145	1	1,425.15
‡ 2,523	6½	33,899.00
‡ 1,552	12½	62,080.00
§ 292	1¼	700.00
206,542		$591,402 39

* Special Assessment.
† Private Contract.
‡ Intercepting Sewers.
§ Repair Gang.



LOOKING OUT THROUGH INTAKE CHANNEL FROM LOCATION OF ONE SCREW PUMP CROSS CONNECTION AT RIGHT.—THIRTY-NINTH STREET PUMPING STATION. INTERCEPTING SEWERS.



WATER CHANNELS, RIGHT AND LEFT OF SITE OF ENGINE PIT, SCREW PUMPS.—THIRTY-NINTH STREET PUMPING STATION. INTERCEPTING SEWERS.

DRAINS CONSTRUCTED BY SPECIAL ASSESSMENT DURING THE YEAR 1904.

STREET	FROM	TO	No. of drains	Length.	Price per Foot.	COST.
W. Addison	N. Springfield avenue	N. Hamlin avenue	10	350	$0.30	$ 105.00
N. Avers avenue	W. Addison	Avondale avenue	57	863	.30	258.90
Avondale avenue	Alley W. of Harding avenue	N. Avers avenue	5	90	.30	27.00
Belden avenue	Hancock	Kimball avenue	10	250	.27	67.50
Belden avenue	N. Central Park avenue	Hancock	15	375	.40	150.00
Belden avenue	13 cubic yards rock	$3.00 cubic yard				39.00
N. Clark	Irving Park boulevard	Addison	42	1,120	.44	492.80
Columbia avenue	Southport avenue	770 ft. E. of Evanston ave	42	1,050	.17½	183.75
Cornell avenue	Sixty-ninth	Seventy-first	38	1,242	.22¾	282.56
Cortland	Kimball avenue	N. Central Park avenue	29	725	.24	174.00
Dickens avenue	N. Hamlin avenue	Ballou	63	1,461	.26	379.86
Dickens avenue	359 cubic yards rock	$3.00 cubic yard				1,077.00
East End avenue	Sixty-ninth	Seventy-first	29	928	.21½	199.52
Edgewater avenue	N. Clark	Southport avenue	38	950	.18	171.00
S. Elizabeth	W. Fifty-seventh	W. Sixtieth	86	2,150	.15 9/10	341 85
Emerald avenue	W. Ninety-ninth	W. 103d	168	4,200	.26	1,092.00
N. Fifty-first avenue	W. Kinzie	W. Chicago avenue	87	2,175	.20½	445.88
N. Forty-first court	Bloomingdale avenue	Wabansia	11	275	.33	90.75
S. Forty-second avenue	W. Thirtieth	W. Thirty-first	11	275	.33	90.75
S. Forty-second court	W. Harrison	Harvard	33	825	.24	198.00
S. Forty-third court	W. Twenty-second	C. B. & Q. R. R.	66	1,650	.24¾	408 38
S. Forty-fifth avenue	W. Lake	Colorado avenue	55	1,375	.26	357.50
S. Forty-fifth court	W. Jackson	Colorado avenue	91	2,275	.21⅞	497.66
S. Forty-eighth avenue	W. Randolph	Park avenue	16	432	.53¾	231.20
Franklin avenue	South boulevard	Madison	2	50	.28	11.50
Franklin boulevard	W Cornelia	N. Monticello avenue	249	9,500	.20⅝	1,959.38
Greenwood avenue	Fifty-first	Fifty-fifth	43	1,075	.24 9/10	267.68
S. Halsted	W. Seventy-ninth	W. Eighty-fifth	166	5,478	.52¾	2,889.64
N. Harding avenue	W. Addison	Avondale avenue	95	1,425	.30	427 50
S. Harding avenue	W. Sixteenth	W. Nineteenth	74	1,850	.22½	416.25
Hawley avenue	W. Twenty-second	C. B. & Q. R. R.	55	1,389	.23⅜	324.67
S. Hermitage avenue	W. Fifty-second	W. Fifty-fourth	73	1,825	.17 9/10	326.68
S. Hermitage avenue	W. Sixty-first	W. Sixty-fifth	122	3,050	.26¾	815.88

DRAINS CONSTRUCTED BY SPECIAL ASSESSMENT DURING THE YEAR 1904 — CONTINUED.

STREET	FROM	TO	No. of drains	Length.	Price per Foot.	COST.
S. Homan avenue	W. Twenty-sixth	W. Thirty-first	77	1,925	$0.20½	$ 394.63
Honore	W. Fifty-first	Garfield boulevard	184	3,350	.18⅜	615.57
Honore	W. Fifty-ninth	W. Sixty-third	146	3,650	.22⅞	834.93
N. Hoyne avenue	Clay avenue	Lawrence avenue	26	650	.20½	133.25
Justine	Garfield boulevard	W. Sixty-third	179	4,475	.17½	783.13
Laflin	W. Sixty-first	W. Sixty-third	38	950	.15 9/10	151.05
S. Lincoln	W. Fifty-ninth	W. Sixty-third	146	3,650	.26¾	976.38
Luther	S. Washtenaw avenue	S. Rockwell	13	260	.25	65.00
Magnolia avenue	Lawrence avenue	Argyle	43	1,075	.14½	155.88
N. Maplewood avenue	W. Diversey avenue	Elston avenue	11	275	.24½	67.38
S. Marshfield avenue	Garfield boulevard	W. Fifty-eighth	47	1,175	.20½	240.88
Millard avenue	W. Twenty-eighth	W. Thirtieth	19	475	.22	104.50
Milwaukee avenue	Lawrence avenue	C. & N.-W. R. R.	18	450	.49½	222.75
N. Oakley avenue	Roscoe	Melrose	40	1,000	.25¾	257.50
O'Brien avenue	Grand avenue	Wabansia avenue	19	475	.26	123.50
S. Paulina	W. Sixty-first	W. Sixty-fifth	109	2,725	.26¾	728.94
Perry	Diversey avenue	Fullerton avenue	27	675	.27½	185.63
Prairie avenue	Chicago avenue	Augusta	25	512	.39	199.68
E. Ravenswood Park	Foster avenue	Ainslie	8	208	.42	87.36
Ridge avenue	N. Clark	C. & N.-W. R. R.	59	1,475	.18	265.50
N. Robey	Montrose avenue	Irving Park boulevard	69	1,725	.25	431.25
S. Sacramento avenue	W. Twenty-second	W. Twenty-sixth	20	500	.21	105.00
Sixty-first	Indiana avenue	South Park avenue	7	175	.29	50.75
W. Sixty-first	S Ashland avenue	S. Wood	28	700	.26¾	187.25
W. Sixty-first	S. Ashland avenue	S. Center avenue	101	2,525	.17½	441.88
S. Spaulding avenue	W. Twenty-sixth	W. Thirtieth	60	1,500	.26¼	393.75
N. Springfield avenue	W. Addison	Avondale avenue	71	2,485	.30	745.50
S. St. Louis avenue	W. Twenty-eighth	W. Thirtieth	12	300	.23½	70.50
N. Talman avenue	W. Wellington	W. Diversey	13	325	.19	61.75
S. Talman avenue	W. Twelfth	Ogden boulevard	13	330	.20	66.00
W. Taylor	S. Central Park avenue	S. Lawndale avenue	12	300	.33¾	101.25
W. Taylor	S. Fortieth avenue	S. Forty-second avenue	29	725	.23½	170.38
W. Thirty-first	S. Fortieth avenue	S. Forty-second avenue	68	1,700	.31½	535.50

S. Troy	W. Twenty-sixth	W. Twenty-eighth	28	700	0.20½	143.50
W. Twenty-third	S. Homan avenue	S. Kedzie avenue	14	350	.22½	78.75
W. Twenty-third place	S. Rockwell	S. California avenue	17	425	.23½	99.88
W. Twenty-fourth place	S. Rockwell	Marshall boulevard	33	670	.27	180.90
Turner avenue	W. Twenty-sixth	W. Thirtieth	9	225	.23	51.75
Union avenue	W. Ninety-ninth	W. 103d	161	4,025	.26¾	1,076.69
N. Washtenaw avenue	Wellington	W. Diversey avenue	9	225	.22⅞	51.46
N. Western avenue	Montrose avenue	Irving Park boulevard	94	2,350	.21¾	511.13
S. Wipple	W. Twenty-third	W. Twenty-sixth	18	450	.20	90.00
S. Winchester avenue	W. Thirty-eighth	W. Thirty-ninth	38	950	.24½	232.75
S. Winchester avenue	W. Forty-sixth	Garfield boulevard	215	5,375	.21½	1,155.63
Winona	N. Clark	E. Ravenswood Park	36	900	.35½	319.50
S. Wood	W. Sixty-first	W. Sixty-fifth	117	2,925	.26¾	782.43

Total number of Drains, 4,357; total length, 112,968 feet; total cost, $29,530.61.

SEWERS CONSTRUCTED BY PRIVATE CONTRACT DURING THE YEAR 1904.

STREET	FROM	TO	Diam. in feet.	Length.	NAME OF CONTRACTOR.
Avondale avenue	Evergreen	Ceylon avenue	1	759	Chas. Krueger.
Berwyn avenue	N. Oakley avenue	Bowmanville avenue	1	526	Wm. F. Healy.
Castello avenue	N. Forty-seventh avenue	C. & N.-W. R. R.	1	563	Wm. F. Healy.
N. Central Park avenue	Irving Park boulevard	Belle Plaine avenue	1¼	656	Wm. F. Healy.
N. Central Park avenue	Montrose avenue	Cullom avenue	1¼	656	Wm. F. Healy.
E. S. N. Central Park avenue	Belle Plaine avenue	Berteau avenue	¾	674	Wm. F. Healy.
E. Clark	Irving Park boulevard	560 ft. north	1¼	619	Wm. F. Healy.
E. Clark	560 ft. N. of Irving Park boulevard	Warner avenue	1	573	Wm. F. Healy.
E. Clark	Granville avenue	231½ ft. south	1¼	267	Wm. F. Healy.
W. Cornelia avenue	220 ft. W. of N. 41st avenue	132 ft. E. of N. 41st avenue	1	421	Wm. F. Healy.
Drake avenue	Irving Park boulevard	Elston avenue	1¼	697	Wm. F. Healy.
Drake avenue	Elston avenue	Grace	1	632	Wm. F. Healy.
N. S. Elston avenue	Fortieth avenue	Cullom avenue	1	281	Wm. F. Healy.
N. S. Elston avenue	Springfield avenue	Berteau avenue	1	320	Wm. F. Healy.
S. S. Elston avenue	Fortieth avenue	Berteau avenue	1	1,086	Wm. F. Healy.
Evergreen	Norwood place	Avondale avenue	1¼	778	Chas. Krueger.
Fairfield avenue	Wellington	300 ft. South	⅝	320	P. J. McNulty.
Farragut avenue	N. Oakley avenue	N. Western avenue	1	683	Wm. F. Healy.
Fiftieth place	Vincennes avenue	Washington Park court	1	298	Nash Bros.
W. Fifty-second	Center avenue	190 ft. W. of Throop	1	884	South Park Commissioners.
Forestville avenue	Forty-seventh	Forty-eighth	1	712	Wm. F. Healy.
N. Forty-first avenue	Milwaukee avenue	Cornelia avenue	1¼	865	Wm. F. Healy.
S. Forty-first court	Colorado avenue	300 ft. north	1	310	McNichols & Co.
W. Forty-fourth	Ashland avenue	Hermitage avenue	1¼	955	South Park Commissioners.
N. Forty fifth avenue	Byron	350 ft. south	1	402	Wm. F. Healy.
Glenlake avenue	Southport avenue	Perry	1¼	658	Wm. F. Healy.
Glenlake avenue	Perry	Clark	1	591	Wm. F. Healy.
Hermitage avenue	W. Forty-fourth	W. Forty-fifth	1	668	South Park Commissioners.
Kinzie	130 E. of Paulina	Wood	4	826	Wm. F. Healy.
Kinzie	Wood	Robey	3½	1,383	Wm. F. Healy.
Kinzie	Robey	Leavitt	3	1,331	Wm. F. Healy.
Kinzie	Leavitt	Oakley avenue	2½	663	Wm. F. Healy.
Kinzie	Oakley avenue	Western avenue	2	509	Wm. F. Healy.
Marshfield avenue	W. Forty-fourth	W. Forty-fifth	1	668	South Park Commissioners.

McLean avenue	Forty-third avenue	Forty-fourth avenue	1	154	J. H. McCarthy.
E. Meridian	W. 103d	W. 105th	1¼	1,350	Wm. F. Healy.
E. Meridian	W. 105th	W. 107th	1	1,330	Wm. F. Healy.
Newport avenue	220 ft. W. of N. 41st avenue	132 ft. E. of N. 41st avenue	1	413	Wm. F. Healy.
Polk	Central Park avenue	St. Louis avenue	1¼	665	P. J. McNulty.
Polk	St. Louis avenue	Homan avenue	1	682	P. J. McNulty.
W. Roscoe	220 ft. W. of N. 41st avenue	132 ft. E. of N. 41st avenue.	1	421	Wm. F. Healy.
N. Springfield avenue	Elston avenue	100 ft. north	1	153	Wm. F. Healy.
Thome avenue	E. Ravenswood Park	Alley E. of Hermitage ave.	1	558	Wm. F. Healy.
N. S. W. Twenty-second	S. Forty-fifth avenue	S. Forty-fourth avenue	1¼	668	M. P. Byrne Construction Co.
N. S. W. Twenty-second	S. Forty-fourth avenue	Hawley avenue	1	373	M. P. Byrne Construction Co.
Wellington	Washtenaw avenue	California avenue	1	474	P. J. McNulty.
Western avenue	Foster avenue	Berwyn avenue	1	640	Wm. F. Healy.
Whipple	Irving Park boulevard	Belle Plaine avenue	1¼	665	P. J. McNulty.
Whipple	Belle Plaine avenue	Cullom avenue	1	1,334	P. J. McNulty.
Whipple	Cullom avenue	Montrose avenue	1¼	666	P. J. McNulty.

SEWERS CONSTRUCTED BY SPECIAL ASSESSMENT DURING THE YEAR 1904.

STREET	FROM	TO	Diam. in feet.	Length.	Name of Contractor.
Aberdeen	W. Eighty-fifth	W. Eighty-seventh	1	1,312	McNichols & Co.
Ainslie	N. Ashland avenue	50 ft. E. of alley east	1	273	Nash Bros.
Arch	Lyman	200 ft. South	1	212	McNichols & Co.
Aubert avenue	N. Robey	125 ft. E. of Lincoln avenue	1	675	M. J. Joyce.
Augusta	N. Forty-eighth avenue	N. Forty-ninth avenue	1¼	662	Nash Bros.
Augusta	N. Forty-ninth avenue	N. Fiftieth avenue	1	670	Nash Bros.
W. S. N. Avers avenue	W. Addison	Avondale avenue	1	921	McNichols & Co.
E. S. N. Avers avenue	W. Addison	Avondale avenue	1	780	McNichols & Co.
Barry avenue	N. Robey	225 ft W. of W. Ravenswood Park	1¼	861	McNichols & Co.
W. Belle Plaine avenue	N. Kimball avenue	N. Kedzie avenue	1	1,810	J. H. McCarthy.
Belmont avenue	Lake View Ave., boulevard	Evanston avenue	3	1,344	Nash Bros.
W. Berteau avenue	N. Kimball avenue	Alley W. of N. Kedzie avenue	1	1,181	J. H. McCarthy.
N. S. Bloomingdale avenue	Campbell avenue	120 ft. W. of Western avenue	1	502	Thos. Burke.
Castello avenue	N. Forty-eighth avenue	N. Forty-seventh avenue	1¼	660	Thos. Burke.
Cheney avenue	Crescent avenue	Hobart avenue	1	1,089	McNichols & Cogan.
Choctaw avenue	N. Forty-first court	N. Forty-second avenue	1¼	468	John Green.
Choctaw avenue	N. Forty-second avenue	Maple avenue	1	978	John Green.
Christiana avenue	W. Irving Park boulevard	W. Byron	1¼	662	P. J. McNulty.
Christiana avenue	W. Byron	W. Grace	1	666	P. J. McNulty.
Clarendon	Crescent avenue	Hobart avenue	1¼	1,039	McNichols & Cogan.
18 ft. E. of W. line N. Clark	Montrose avenue	Sunnyside avenue	1¼	676	James Healy.
18 ft. E. of W. line N. Clark	Sunnyside avenue	Leland avenue	1	1,353	James Healy.
18 ft. E. of W. line N. Clark	Leland avenue	Lawrence avenue	1¼	665	James Healy.
18 ft. E. of W. line N. Clark	Lawrence avenue	600 ft. north	1¼	639	James Healy.
18 ft. E. of W. line N. Clark	600 ft. N. of Lawrence ave.	Argyle avenue	1	713	James Healy.
18 ft. E. of W. line N. Clark	Foster avenue	25 ft. S. of Winona avenue	1¼	398	Wm. F. Healy.
18 ft. E. of W. line N. Clark	25 ft. S. of Winona avenue	Winnemac avenue	1	644	Wm. F. Healy.
20 ft. E. of W. line N. Clark	Rogers avenue	Birchwood avenue	1¼	626	Andrew Maloney.
20 ft. E. of W. line N. Clark	Birchwood avenue	Howard avenue	1	613	Andrew Maloney.
20 ft. W. of E. line N. Clark	Bryn Mawr avenue	Catalpa avenue	1¼	666	M. J. Joyce.
20 ft. W. of E. line N. Clark	Catalpa avenue	Balmoral avenue	1	671	M. J. Joyce.
Cortez	N. Forty-eighth avenue	N. Forty-ninth avenue	1¼	664	Wm. F. Healy.
Cortez	N. Forty-ninth avenue	N. Fiftieth avenue	1	670	Wm. F. Healy.
Crescent avenue	Evergreen	Cheney avenue	1¼	667	McNichols & Cogan.

Crescent avenue	Cheney avenue	Alley west	1	280	McNichols & Cogan.
W. Cullom avenue	N. Kimball avenue	N. Spaulding avenue	1	667	J. H. McCarthy.
W. Cuyler avenue	N. Kimball avenue	N. Spaulding avenue	1	673	J. H. McCarthy.
Dickens avenue	N. Fortieth avenue	C. M. & St. P. R. R. (Milw. Div.)	1	418	Nash Bros.
Dickens avenue	N. Forty-eighth avenue	N. Forty-seventh avenue	1¼	661	Thos. Burke.
W. Division	N. Central Park avenue	C. M. & St. P. R. R.	1	471	Nash Bros.
Dunning	High	Perry	1	324	M. J. Joyce.
Eggleston avenue	W. 111th	W. 112th	1	670	McNichols & Cogan.
W. Eighty-fifth	S. Carpenter	Aberdeen	1¼	345	McNichols & Co.
W. Eighty-fifth	Aberdeen	S. May	1¼	340	P. J. McNulty.
Evanston avenue	Belmont avenue	Barry avenue west	D. I. 2½	785	Nash Bros.
Evanston avenue	Barry avenue west	Oakdale avenue	D. I. 2	846	Nash Bros.
Evanston avenue	Oakdale avenue	E. line N. Clark	1¼	985	Nash Bros.
Evanston avenue	Belmont avenue	Melrose	D. I. 2½	396	Nash Bros.
Evanston avenue	Melrose	Buckingham place	D. I. 2	606	Nash Bros.
Evanston avenue	Wing sewers		1¼	260	Nash Bros.
Evergreen	Norwood place	Crescent avenue	1¼	632	McNichols & Cogan.
W. Fifteenth	S. Honore	S. Lincoln	1¼	855	J. H. McCarthy.
N. Fiftieth avenue	Armitage avenue	232 ft. S. of Humboldt avenue	1¼	1,061	M. J. Benson.
N. Fiftieth avenue	232 ft. S. of Humboldt ave	W. Belden avenue	1	943	M. J. Benson.
N. Fifty-fourth avenue	Grand avenue	W. Belden avenue	1¼	1,600	Wm. F. Healy.
N. Fifty-fourth avenue	W. Belden avenue	Alley S. of Fullerton avenue	1	500	Wm. F. Healy.
N. Fifty-fourth avenue	W. Lawrence avenue	W. Leland avenue	1¼	760	Nash Bros.
N. Fifty-fourth court	W. Lawrence avenue	Roberts avenue	1	468	Nash Bros.
N. Fifty-fifth avenue	W. Lawrence avenue	W. Leland avenue	1¼	827	Nash Bros.
N. Fifty-sixth avenue	W. Lawrence avenue	W. Leland avenue	1¼	834	Nash Bros.
N. Fifty-sixth avenue	Grand avenue	Humboldt avenue	1¼	575	P. J. McNulty.
N. Fifty-seventh avenue	Grand avenue	Dickens avenue	1¼	435	Nash Bros.
N. Fifty-seventh avenue	Dickens avenue	Armitage avenue	1	426	Nash Bros.
N. Fifty-seventh court	Grand avenue	W. Belden avenue	1¼	969	J. H. McCarthy
N. Fifty-seventh court	W. Belden avenue	1st Alley S. of W. Fullerton ave	1	508	J. H. McCarthy
Fifty-seventh	Jackson Park avenue	Woodlawn avenue	6	2,670	Burke & Donohue.
Fifty-seventh	Woodlawn avenue	Drexel avenue	5½	1,884	Burke & Donohue.
N. Fifty-eighth avenue	Grand avenue	W. Belden avenue	1¼	885	P. J. McNulty.
N. Fifty-eighth avenue	W. Belden avenue	1st Alley S. of Fullerton ave	1	501	P. J. McNulty.
Fletcher	N. Robey	225 ft. W. of W. Ravenswood Park	1¼	864	McNichols & Co.

SEWERS CONSTRUCTED BY SPECIAL ASSESSMENT DURING THE YEAR 1904—CONTINUED.

STREET	FROM	TO	Diam. in feet.	Length.	Name of Contractor.
Flournoy	S. Fifty-second avenue	S. Fifty-third avenue	1¼	687	Nash Bros.
Flournoy	S. Fifty-third avenue	108 ft. W. of Walnut avenue	1	1,274	Nash Bros.
Flournoy	108 ft. W. of Walnut avenue	Central avenue	1¼	659	Nash Bros.
N. Forty-first avenue	Choctaw avenue	Sunnyside avenue	1¼	299	John W. Farley.
N. Forty first avenue	Sunnyside avenue	150 ft. N. of Miller avenue	1	749	John W. Farley.
N. Forty-second avenue	Choctaw avenue	400 ft. North	1	464	John Green.
N. Forty-second avenue	Milwaukee avenue	W. Roscoe	1	541	Nash Bros.
S. Forty second court	W. Sixteenth	W. Fifteenth	1	665	M. J. Joyce.
S. Forty-third avenue	W. Sixteenth	W. Fifteenth	1	665	M. J. Joyce.
S. Forty-fourth court	W. Fourteenth	N. line W. Fifteenth	1	644	Nash Bros.
Forty-fifth avenue	W. Randolph	Alley S. of Park avenue	1	238	Nash Bros.
N. Forty sixth court	Humboldt avenue	Belden avenue	1¼	662	Thos. Burke.
N. Forty-sixth court	Belden avenue	1st Alley S. of Fullerton ave	1	490	Thos. Burke.
N. Forty-seventh avenue	Humboldt avenue	Belden avenue	1	661	Thos. Burke.
N. Forty-seventh avenue	Belden avenue	1st Alley S. of Fullerton ave	1	492	Thos. Burke.
N. Forty-seventh avenue	Humboldt avenue	110 ft. S. of S. line McLain ave	1	1,161	Thos. Burke.
N. Forty-eighth avenue	W. Addison	Warwick avenue	2	983	P. J. McNulty.
N. Forty-ninth avenue	Grand avenue	Homer	1	251	McNichols & Co.
N. Forty-ninth avenue	W. Montrose avenue	W. Sunnyside avenue	1¼	669	Nash Bros.
N. Forty-ninth avenue	W. Sunnyside avenue	C. &. N.-W. R. R.	1	432	Nash Bros.
Foster avenue	1080 ft. E. of center line of N. Kedzie ave.	N. & S. ¼ Sec. 12–40–13	1¼	1,576	P. J. McNulty.
Foster avenue	N. & S. ¼ Sec. 12–40–13	540 ft. W. of W. line Lincoln ave	1	1,211	P. J. McNulty.
W. Foster avenue	1070 ft. E. of center line of N. Kedzie ave.	N. Kedzie avenue	3½	1,070	John Green.
W. Foster avenue	N. Kedzie avenue	Phinney avenue	3	994	John Green.
W. Foster avenue	Phinney avenue	N. St. Louis avenue	2¾	990	John Green.
W. Foster avenue	N. St. Louis avenue	N. Central Park avenue	1¼	637	John Green.
W. Fourteenth	S. Forty-fifth avenue	S. Forty-fourth court	1¼	350	Nash Bros.
S. Harding avenue	W. Eighteenth	125 ft. S. of S. line W. Sixteenth	1	510	Wm. F. Healy.
E. S. N. Harding avenue	W. Addison	Avondale avenue	1	1,288	McNichols & Co.
W. S. N. Harding avenue	W. Addison	Avondale avenue	1	1,432	McNichols & Co.
Hawley avenue	Ogden avenue	C. B. & Q. R. R.	1	430	Nash Bros.
Haynes court	W. Thirty-first	185 ft. S. of Lyman	1	352	McNichols & Co.
S. Hermitage avenue	W. Seventieth	W. Seventy-second	1	1,334	Cornelius Hogan.
Hirsch	Grand avenue	N. Forty-third avenue	1	1,982	Nash Bros.

Hirsch	N. Forty-third avenue	N. Forty-fourth avenue	¾	680	Nash Bros.
Hirsch	Wing sewers		1	59	Nash Bros.
Hobart avenue	Clarendon	E. Circle avenue	1	1,892	McNichols & Cogan.
Homer	N. Forty-ninth avenue	N. Forty-eighth court	1	550	NMcichols & Cogan.
Honore	W. Sixty-ninth	W. Seventieth	1	670	Burke & Donohue.
Humboldt avenue	N. Forty-eighth avenue	N. Forty-seventh avenue	2	662	Thos. Burke.
Humboldt avenue	N. Forty-seventh avenue	N. Forty-sixth court	1¼	323	Thos. Burke.
Humboldt avenue	N. Forty sixth court	C. & N.-W. R. R.	1	245	Thos. Burke.
Hutchinson	N. Kimball avenue	N. Spaulding avenue	1	664	J. H. McCarthy.
Iowa	N. Homan avenue	235 ft. east	1	273	J. H. McCarthy.
Jackson Park avenue	Seventy-third	Seventy-sixth	11	2,000	M. P. Byrne Construction Co.
W. Jackson	S. Fifty-second avenue	S. Fifty-third avenue	1¼	690	Nash Bros.
W. Jackson	S. Fifty-third avenue	Walnut avenue	1	1,135	Nash Bros.
W. Jackson	Walnut avenue	Central avenue	1¼	815	Nash Bros.
James	S. Lincoln	280 ft. east	1	312	McNichols & Co.
Jefferson avenue	Sixty-first	125 ft. north	1	170	Nash Bros.
Kamerling avenue	N. Fortieth avenue	N. Forty-second avenue	1	1,387	McNichols & Co.
Kamerling avenue	N. Forty-second avenue	N. Forty third avenue	1¼	669	McNichols & Co.
Kamerling avenue	N. Forty-third avenue	N. Forty-fourth avenue	1	672	McNichols & Co.
N. Kedzie avenue	W. Addison	W. Waveland avenue	1¼	686	McNichols & Co.
N. Kedzie avenue	W. Waveland avenue	W. Grace	1	674	McNichols & Co.
N. Kedzie avenue	W. Irving Park boulevard	W. Byron	1¼	660	McNichols & Co.
N. Kedzie avenue	W. Byron	W. Grace	1	674	McNichols & Co.
Kimball avenue	W. Irving Park boulevard	W. Byron	1¼	666	Nash Bros.
Kimball avenue	W. Byron	W. Grace	1	666	Nash Bros.
La Fayette avenue	W. 106th place	420 ft. north	1	432	M. H. McNamara.
N. Leavitt	Clay	Ainslie	1	673	Wm. F. Healy.
W. Leland avenue	Milwaukee avenue	N. Fifty-fourth avenue	1	982	Nash Bros.
W. Leland avenue	N. Fifty-fourth avenue	N. Fifty-sixth avenue	1	1,340	Nash Bros.
S. Lincoln	W. Fourteenth	W. Fifteenth	1	662	J. H. McCarthy.
S. Lincoln	W. Thirty-first	W. Thirty-second	1¼	670	McNichols & Co.
Logan avenue	W. Ninety-fifth	W. Ninety-sixth	1¼	812	McNichols & Co.
Logan avenue	W. Ninety-sixth	W. Ninety-eighth	1	1,308	McNichols & Co.
Logan avenue	W. Ninety-eighth	W. Ninety-ninth	1¼	663	McNichols & Co.
30 ft. E. of W. line Marshall bvd	W. Twenty-second	W. Twenty-first	-	608	M. J. Benson.
30 ft. N. of E. line Marshall bvd.	W. Nineteenth	220 ft south	1	270	J. H. McCarthy.
30 ft. N. of S. line Marshall bvd.	S. California avenue	S. Francisco avenue	1¼	675	John Green.
30 ft. N. of S. line Marshall bvd.	S. Francisco avenue	15 ft. E. of Boulevard way	1	400	John Green.
30 ft. S of N. line Marshall bvd.	S. California avenue	140 ft. E. of Marshall bvd.	1	730	John Green.
S. Marshfield avenue	W. Seventieth	W. Seventy-second	1	1,335	Cornelius Hogan.
S. May	W. Seventy-third	479 ft. S. of W. Seventy-fourth	1	1,175	Jas. H. Roche.

SEWERS CONSTRUCTED BY SPECIAL ASSESSMENT DURING THE YEAR 1904—CONTINUED.

STREET	FROM	TO	Diam. in feet.	Length.	Name of Contractor.
S. May	W. Eighty-fifth	W. Eighty-seventh	1	1,340	P. J. McNulty.
Milton place	N. Forty-eighth avenue	N. Forty-seventh avenue	1¼	693	P. J. McNulty.
Milwaukee avenue	W. Lawrence avenue	W. Leland avenue	D. I. 2	953	Nash Bros.
Milwaukee avenue	W. Leland avenue	W. Montrose avenue	1¼	2,200	Nash Bros.
Monticello avenue	W. Belden avenue	Humboldt avenue	1	662	Wm. F. Healy.
Monticello avenue	W. Addison	W. Waveland avenue	1¼	653	M. Donohue.
Monticello avenue	W. Waveland avenue	W. Grace	1	648	M. Donohue.
S. Morgan	W. 119th	W. 117th	2	1,340	J. H. McCarthy.
Newgart avenue	Albion avenue	North Shore avenue	1	664	Nash Bros.
N. Oakley avenue	Lawrence avenue	Ainslie	1	646	Burke & Donohue.
O'Brien avenue	Humboldt avenue	Belden avenue	1¼	663	Thos. Burke.
O'Brien avenue	Belden avenue	1st Alley S. of Fullerton ave.	1	489	Thos. Burke.
W. 105th	Vincennes road	Throop	1	720	P. J. McNulty.
W. 106th	Vincennes road	Throop	D. I. 2	905	P. J. McNulty.
106th	Calumet River	Avenue N	4	1,802	McNichols & Cogan.
106th	Avenue N	Avenue H	3½	1,656	McNichols & Cogan.
W. 111th	Easterly line C. & W. I. R. R.	Eggleston avenue	2	420	McNichols & Cogan.
Park avenue	Ohio	Chicago avenue	1	2,025	M. Donohue.
N. Paulina	Cemetery drive	Thorndale avenue	1	573	P. J. McNulty.
S. Paulina	W. Sixty-seventh	W. Seventieth	1	2,000	Wm. F. Healy.
S. Paulina	W. Seventieth	W. Seventy-second	1	1,335	Cornelius Hogan.
W. Pensacola avenue	Kimball avenue	N. Spaulding avenue	1	666	J. H. McCarthy.
Portland avenue	W. Forty-sixth	W. Forty-sixth place	1	250	John Green.
Potomac avenue	N. Forty-fourth avenue	N. Forty-third avenue	1	675	John Green.
Potomac avenue	N. Forty-third avenue	N. Forty-second avenue	1¼	668	John Green.
W. Ravenswood Park	Winnemac avenue	Winona avenue	1¼	518	M. J. Benson.
W. Ravenswood Park	Winona avenue	80 ft. S. of Foster avenue	1	431	M. J. Benson.
Roberts avenue	W. Lawrence avenue	N. Fifty-fourth avenue	1	789	Nash Bros.
Roberts avenue	N. Fifty-fourth avenue	N. Fifty-fifth avenue	1	670	Nash Bros.
N. Robey	Belmont avenue	Barry avenue	2	678	McNichols & Co.
S. Sacramento avenue	W. fork S. branch Chicago River	W. Twenty-eighth	2	930	M. Donohue.
S. Sacramento avenue	W. Twenty-eighth	W. Twenty seventh	1¼	660	M. Donohue.
S. Sacramento avenue	W. Twenty-seventh	160 ft. S. of W. Twenty-sixth	1	495	M. Donohue.

N. St. Louis avenue	W. Foster avenue	W. Berwyn avenue	2	680	John Green.
N. St. Louis avenue	Wing sewers		1½	238	John Green.
N. St. Louis avenue	Wing sewers		1	238	John Green.
Seventieth	Prairie avenue	1st Alley E. of Indiana avenue	1	275	John Green.
W. Seventy-first	S. Ashland avenue	S. Wood	2	1,370	Cornelius Hogan.
W. Seventy-second place	S. Center avenue	24 ft. E. of Ada	1	830	P. J. McNulty.
W. Sixteenth	S. Forty-second avenue	S. Forty-third avenue	2	670	M. J. Joyce.
Sixty-first	Jackson Park avenue	I. C. R. R.	1	690	Nash Bros.
N. Sixty-ninth avenue	W. Fullerton avenue	W. Wrightwood avenue	1¼	1,326	Thos. Burke.
N. Spaulding avenue	W. Irving Park boulevard.	W. Warner avenue	2	990	J. H. McCarthy.
N. Spaulding avenue	W. Warner avenue	W. Montrose avenue	1¼	1,663	J. H. McCarthy.
N. Springfield avenue	W. Addison	Avondale avenue	1	1,158	McNichols & Co.
N. Springfield avenue	W. Cornelia avenue	W. Roscoe	1	668	J. H. McCarthy.
N. Springfield avenue	W. Diversey avenue	Schubert avenue	1¼	653	P. J. McNulty.
N. Springfield avenue	Schubert avenue	W. Wrightwood avenue	1	674	P. J. McNulty.
N. Springfield avenue	W. Diversey avenue	W. George	1¼	690	Nash Bros.
W. Thirtieth	S. Kedzie avenue	S. Troy	2	324	Jas. Healy.
W. Thirty-first	S. Ashland avenue	S. Lincoln	2½	2,000	McNichols & Co.
W. Thirty-first	S. Lincoln	S. Robey	2	670	McNichols & Co.
W. Thirty-second	S. Lincoln	280 ft. east	1	310	McNichols & Co.
Thorndale avenue	N. Hermitage avenue	N. Paulina	1¼	431	P. J. McNulty.
Thorndale avenue	N. Paulina	125 ft. W. of N. Clark	1	307	P. J. McNulty.
Throop	W. 105th	W. 107th	1	1,330	P. J. McNulty.
S. Troy	W. Thirty-first	N. to S. line of R. R.	1	1,278	Jas. Healy.
W. Twenty-eighth	S Sacrameto avenue	S. Whipple	1¼	340	M. Donohue.
S. Turner avenue	W. Thirtieth	C. S. F. & C. R. R.	1	553	J. H. McCarthy.
W. Warner avenue	N. Kimball avenue	Alley W. of N. Kedzie avenue.	1	1,177	J. H. McCarthy.
Warwick avenue	N. Forty-eighth avenue	N. Forty-seventh avenue	1¼	696	P. J. McNulty.
Warwick avenue	N. Forty-seventh avenue	N. Forty-sixth avenue	1	522	P. J. McNulty.
Washington avenue	Seventy-third	Seventy-fourth	1¼	665	J. H. McCarthy.
Washington avenue	Seventy-fourth	Seventy-fifth	1	626	J. H. McCarthy.
W. Waveland avenue	N. Forty-eighth avenue	N. Forty-seventh avenue	1¼	691	P. J. McNulty.
W. Waveland avenue	N. Forty-seventh avenue	N. Forty-sixth avenue	1	528	P. J. McNulty.
N. Whipple	W. Addison	W. Cornelia	1¼	682	P. J. McNulty.
S. Whipple	W. Twenty-eighth	190 ft. N. of W. Twenty-seventh	1	880	M. Donohue.
S. Winchester avenue	W. Thirty-first	W. Thirty-second	1	670	McNichols & Co.
Wolfram	N. Ashland avenue	N. Paulina	1	670	Burke & Donohue.
S. Wood	W. Seventy-first	W. Seventy-second	1	700	Cornelius Hogan.

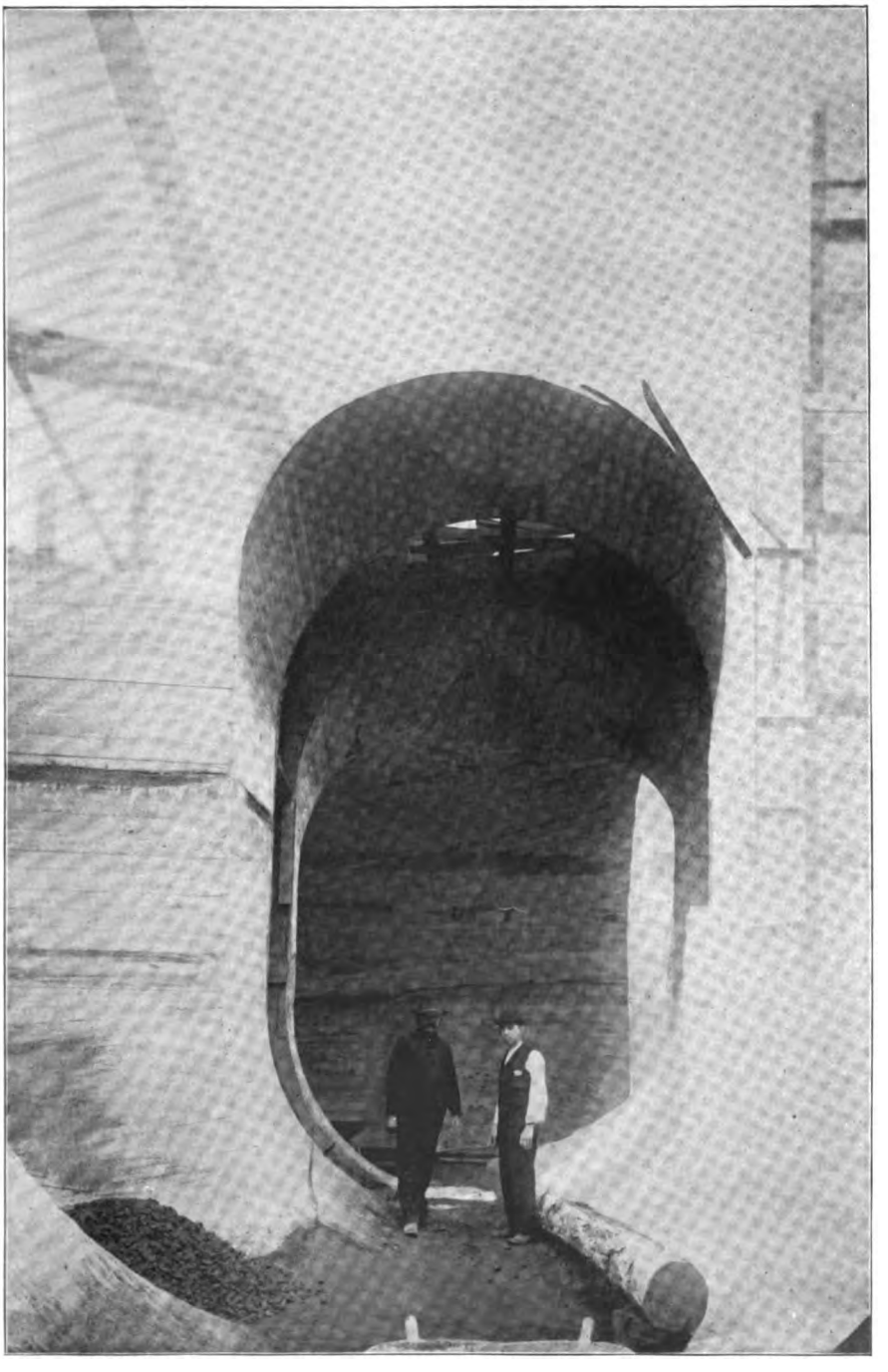
TOTAL COST OF THE CONSTRUCTION OF SEWERS AND CATCH-BASINS AND MAINTAINING SAME, SINCE THE ESTABLISHMENT OF THE SEWERAGE SYSTEM IN 1855 TO JANUARY 1, 1905.

Year.	Lineal feet of Sewers Built.	No. of Catch-Basins Built.	No. of Man-holes Built.	No. of House Drains Put in.	Cost of Cleaning Sewers and Catch-Basins.	Street Intersections and Repairs of Sewers.	Cost of Construction.
Previous to 1861	283,586	1,174	2,102	2,194	$ 5,619.48	No. amts. found on reports.	$665,188.46
1861	2,826	18	33	243	1,715.60	$ 2,951.76	3,617.31
1862	15,676	72	66	365	4,897.24	3,024.07	57,036.42
1863	39,605	192	204	536	5,065.40	2,058.11	169,527.38
1864	25,021	189	183	512	9,417.81	4,597.63	87,221.48
1865	29,948	223	168	1,288	13,818.07	7,493.56	137,643.02
1866	48,127	327	271	3,732	28,445.16	773.65	225,564.53
1867	89,681	418	555	3,703	26,540.81	9,581.42	416,730.51
1868	47,841	480	293	3,261	26,954.06	11,287.08	197,152.92
1869	139,705	771	928	3,979	26,015.68	7,527.16	654,141.26
1870	78,166	626	468	5,187	21,464.30	10,954.74	258,664.70
1871	50,716	277	357	3,093	17,415.46	42,557.72	153,295.36
1872	47,342	245	341	1,435	21,484.16	16,975.40	173,255.76
1873	146,702	897	1,015	4,691	31,229.27	29,781.97	450,222.90
1874	222,322	1,054	1,474	6,292	36,884.57	21,996.72	587,507.38
1875	120,971	958	789	3,365	32,098.23	28,107.40	342,932.89
1876	15,248	155	75	1,172	29,545.41	19,803.29	79,545.28
1877	64,666	363	431	1,822	35,763.33	16,959.44	291,829.63
1878	88,031	492	603	1,514	25,704.37	19,259.49	37,264.97
1879	145,381	820	1,043	2,953	29,286.67	10,649.69	130,840.50
1880	79,128	271	554	4,196	25,561.48	25,068.11	92,544.08
1881	132,076	548	917	4,810	34,512.15	30,967.89	452,310.06
1882	98,515	792	725	5,677	33,969.35	26,618.05	224,450.16
1883	75,364	835	497	5,963	34,749.74	25,140.81	231,084.33
1884	101,547	751	654	5,957	43,678.03	37,893.29	258,020.91
1885	118,647	796	854	6,325	46,532.18	45,333.02	203,188.03
1886	103,193	734	723	7,441	51,110.46	50,707.64	177,647.24
1887	90,584	756	605	8,100	50,264.65	43,789.60	186,496.98
1888	104,903	816	674	8,152	52,422.41	53,782.07	228,567.57
1889	171,023	1,351	1,190	4,303	61,503.01	63,459.25	350,234.54
Annexed Districts previous to 1890	993,573	6,102	8,620	Estimated cost of maintenance not known.		Estimated cost of construction, not known.	2,614,224.75
1890	379,203	2,986	2,604	9,279	107,873.34	83,383.08	826,718.67
1891	546,918	3,979	3,736	11,312	123,620.44	95,906.75	1,532,990.44
1892	549,258	3,866	3,714	12,562	142,720.52	70,747.83	1,290,017.98
Norwood and Rogers Park annexed previous to 1893	96,697	326	231	No. of house drains and cost of construction not known.			172,846.30
1893	708,176	4,811	4,825	14,198	132,633.51	114,702.78	1,606,720.09
1894	350,944	2,597	2,259	8,928	154,225.45	130,749.03	1,014,489.86
1895	196,349	1,515	1,409	1,621	134,424.44	93,713.66	356,950.01
1896	303,172	2,201	1,990	6,161	96,901.65	91,339.54	721,869.88
1897	206,450	1,842	1,550	8,241	91,414.89	90,651.29	446,249.53
1898	256,618	1,812	1,916	2,635	92,961.88	100,986.06	682,229.10
1899	191,790	1,466	1,384	2,647	72,439.07	84,004.37	793,623.28
Part of town of Cicero annexed previous to 1900	154,895	995	1,075	No. of house drains, cost of construction and cost of maintenance not known.			
1900	155,866	1,591	1,176	4,750	80,985.64	102,677.89	475,733.36
1901	117,546	899	906	5,598	94,369.87	Sewer Repairs. 55,965.24	454,273.53
1902	138,311	1,326	927	8,482	99,372.58	57,492.79	1,398,329.60
1903	188,793	1,795	1,351	6,107	118,303.41	68,522.45	989,502.50
1904	206,542	1,913	1,498	3,986	124,260.26	77,952.77	591,402.39
Totals	*8,517,642	†59423	‡59963	218858	$2,529,975.49	$1,994,901.46	$23,492,897.84

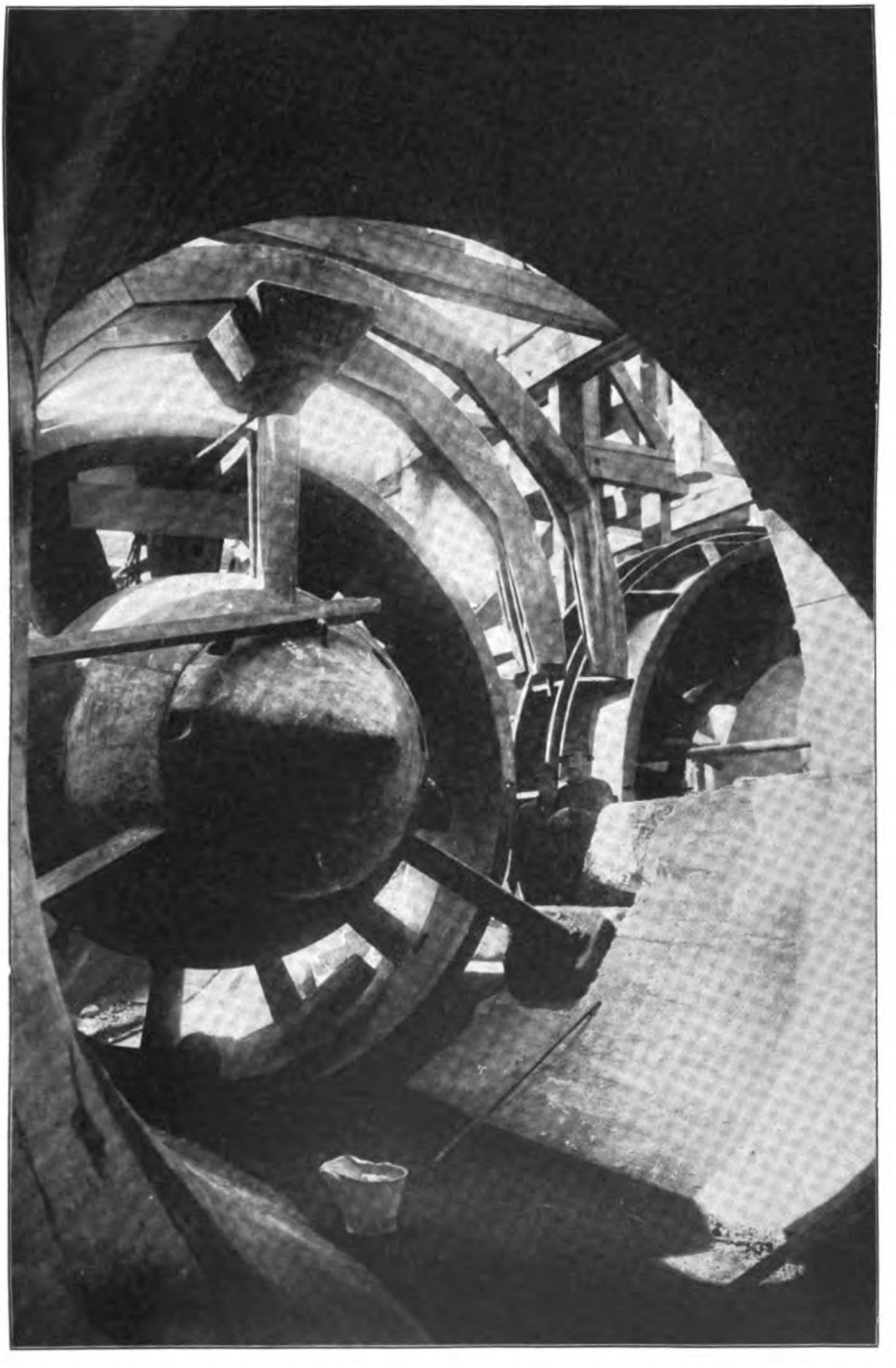
* Of this amount 60,685 feet have been taken up and replaced by sewers of larger size, leaving in place January 1, 1905, 8,456,957 lineal feet, or 1,601 miles. Of this amount 574.9 miles are of brick construction and 1,026.1 miles are of vitrified tile pipe.

† Of this number 67 catch-basins have been abandoned, leaving in place, January 1, 1905, 59,356.

‡ Of this number 434 manholes have been abandoned, leaving in place, January 1, 1905, 59,529.



LOOKING THROUGH CROSS-CONNECTING CHANNEL AT SCREW PUMP CHANNELS.
THIRTY-NINTH STREET PUMPING STATION. INTERCEPTING SEWERS.



DEFLECTOR RING AND HUB OF SCREW PUMP, ERECTED.—THIRTY-NINTH STREET PUMPING STATION. INTERCEPTING SEWERS.

DIVISION OF STANDARD BENCH MONUMENTS, BENCH MARKS AND STREET GRADES.

W. H. HEDGES, Bench and Street Grade Engineer.

STANDARD BENCH MONUMENTS.

In the appropriation ordinance for the year 1904, the sum of $1,200 was set apart for building forty-two new concrete bench monuments, in the south and southwest parts of the City, where they are much needed, but at no time during the year was it possible to obtain the money for that purpose, and no new concrete bench monuments were built in the year 1904.

In the years 1897-98, eighty-two of these monuments were built in the north and northwest parts of the City and in a small portion of Hyde Park, and the exact levels thereon were completed in the year 1901, establishing the elevation of the bench point in each monument. The term "exact levels" is used in connection with this work, because the levels were run with great exactness, using a Y level instead of adopting the precise level system. This method was adopted in the interests of economy, it being found that equally good results could be obtained by careful work with a Y level, as compared with the precise level system. Since the year 1901 no more monuments have been built, and therefore the exact levels could not be extended. The North and West sides of the City are mostly included in the territory having the advantage of these monuments and exact levels, while the Towns of Lake, Calumet, and a larger part of Hyde Park are without them.

Each year the effort has failed to obtain the money necessary to build more bench monuments, and give the Bench Engineer an Assistant Engineer to attend to the street grade portion of the work, while the Bench Engineer devotes his time to the extension of the bench monument levels. For this reason no advance in the bench monument work has been made in the last three years, and over one-half the City is still unprovided for.

These bench monuments are about one mile apart north and south and east and west, and are mostly placed in the grass plot between the street curb and the lot or building line, and are so planned that the top of the iron cover comes just level with the surface of the ground, or flush with the surface of the cement sidewalk if the walk extends out to the curb. The monuments are of the best concrete formation, 42 inches square at the base, 16 inches square at the top, and 6 feet from

bottom to top of the concrete. In the center of the top of the concrete, is set a hardened copper rod, ½ inch in diameter, and 2 feet long. The end of the rod showing in the top of the concrete is the bench point on which the elevation of the monument is established.

An iron cover having a lid locked by a self-acting weight lock is set on top of the concrete. The exact location and elevation of each bench monument is carefully noted and recorded. A special ordinance provides for the preservation of these monuments, with a penalty of from $50 to $200 for "destroying, covering up, or in any way injuring" one of them. The name "standard bench monuments" was adopted in order to avoid confusion with other points established by the City Council in 1888, as "standard benches," that were soon found to be of little value. It is hoped that in the year 1905 the money will actually be provided for building more monuments, and adding the necessary Assistant Engineer and Rodman to the Bureau of Sewers, so that the Towns of Lake, Calumet, and Hyde Park shall enjoy the same advantage already given to the other portions of the City.

BENCH MARKS.

As the establishing of the ordinary exact level bench marks, located on the water tables of brick buildings, stone steps, stone curbs, nails in roots of trees, and tops of hydrants, is done in connection with and along the lines of the exact levels, run to establish the elevation of the concrete bench monuments, it follows that no new exact level bench marks were established during the year 1904. As stated in the annual report for 1903, nine hundred and thirty-five (935) of these exact level benches are recorded in the books of this bureau, and are a great convenience and saving of time, not only for the City Engineers, but also for all the surveyors and engineers in the City.

The failure to extend the regular system of exact levels makes it necessary for the Bench Engineer to spend considerable time during the year in running levels for temporary use at points not reached by the exact levels. This expenditure of time is not desirable, but will continue to be necessary until the exact levels are properly extended. This consideration is one of many reasons for the effort to have more concrete bench monuments built and an Assistant Engineer provided for street grade work.

STREET GRADES.

During the year 1904 the time of the Bench and Street Grade Engineer has been almost entirely given to work connected with the proper

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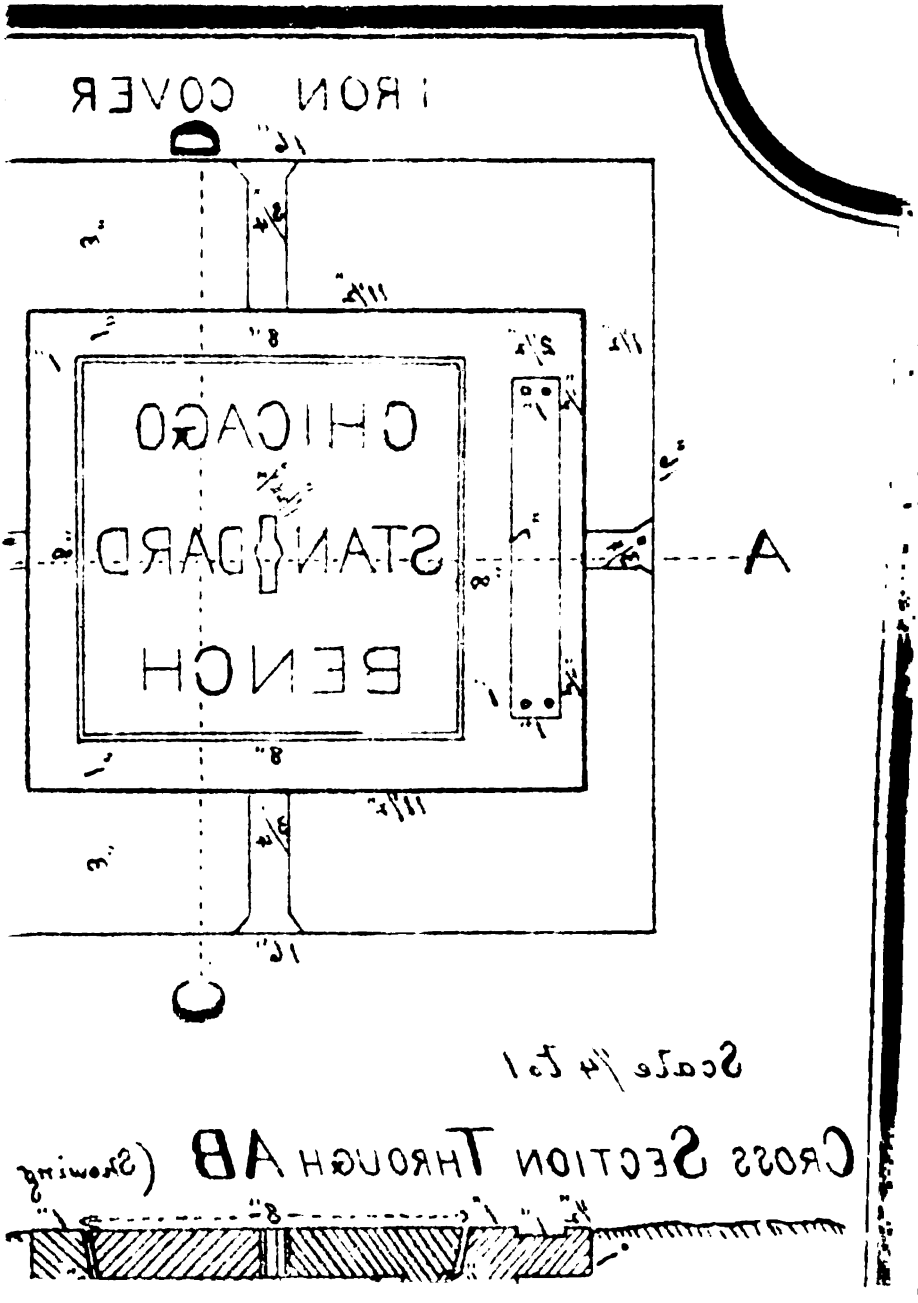
IRON COVER
CHICAGO
STANDARD
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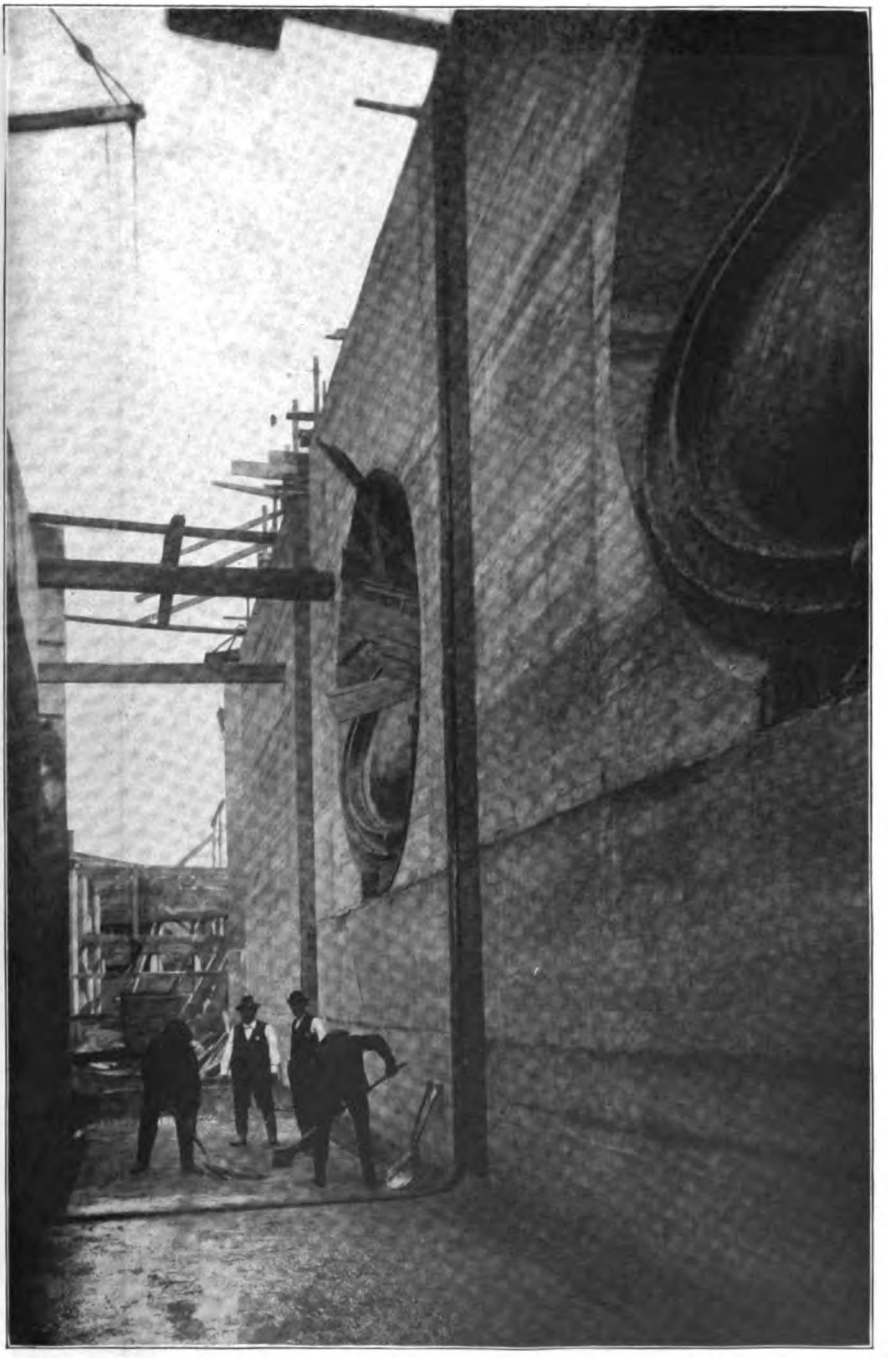
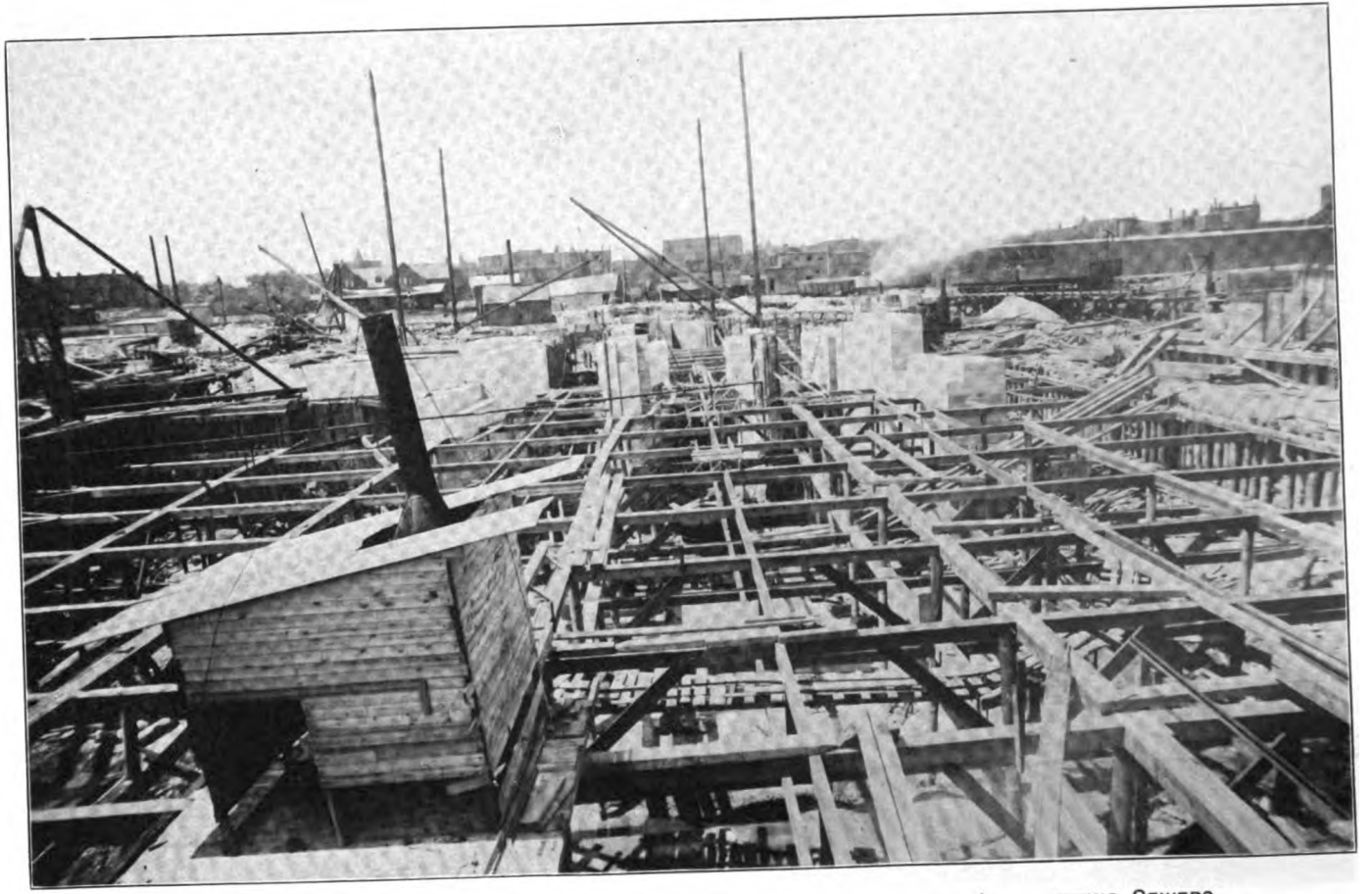


CHECK VALVES, CENTRIFUGAL PUMPS, IN GRAVITY CHANNEL.—THIRTY-NINTH STREET PUMPING STATION. INTERCEPTING SEWERS.



INTAKE CHANNELS TO PUMPS.—THIRTY-NINTH STREET PUMPING STATION. INTERCEPTING SEWERS.

establishing and recording of street grades, and this important part of the City records is now in a most satisfactory condition. Instead of the state of chaos and confusion in the matter of street grades that prevailed a few years ago, we are now, through the system recently adopted, able to turn at once to the ordinance or ordinances relative to street grades at any corner or point in the City, giving date and page of Council proceedings at which a street grade was there first established, and any and all subsequent changes of grade at that point, dating back to the year 1871 (the time of the great fire), with all details as to cause and reason for such a change. It is now necessary to maintain a constant supervision of all new street grades established, and of the constant changes made in grades, in order that the good conditions we now have shall not be destroyed.

To this end paragraph 752 in the revised code of 1897 provides "that all ordinances fixing the grades of streets in the City of Chicago shall be referred to the Superintendent of Sewers, and shall be passed only upon the recommendation of said Superintendent." This makes it necessary that all estimates, plans or sidewalk plats, involving street grades, shall be examined and grades approved by this bureau before they pass into the Special Assessment Department. During the year ending December 31, 1904, the City Council has by ordinance established seventeen hundred and fifty-three (1,753) street grades. The making up of these grade lists to be submitted for Council action, the keeping a careful and correct record of all these grades in the grade books when passed by the Council, and the placing of the grades on the grade maps, includes a great amount of office work; in addition to which there is frequently a large amount of field work, in running the levels necessary in fixing grades that are specially called for in difficult places.

All this work in the past year has taken all the time of the Bench and Street Grade Engineer, and if at any time it is decided to have the Bench Engineer carry on and complete the bench monuments and exact levels, it will be necessary to provide an Assistant Engineer to take care of the street grade work, so that it shall not fall into a state of confusion and error.

DIVISION OF INTERCEPTING SEWERS.

WM. S. MACHARG, Consulting Engineer.

The work of this division during the year has progressed well in the South division of the City, and the main sewers on the lake shore between Thirty-fifth street and Fifty-first street are in partial operation, discharging the daily flow of sewage into the Thirty-ninth street conduit.

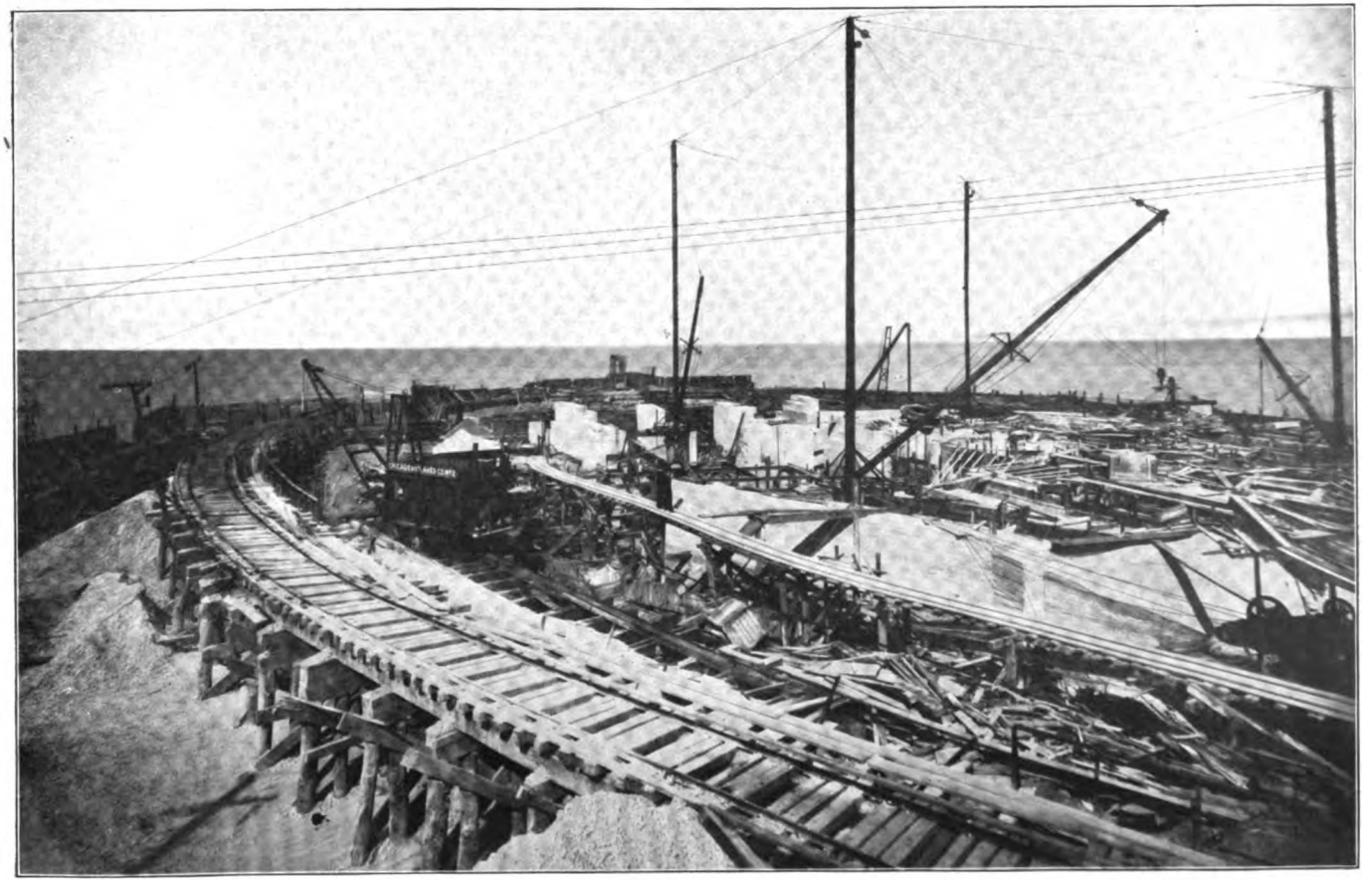
To accomplish this a temporary pumping station was erected in the spring on the lake shore and pumps of a capacity of 15,000 gallons a minute were installed, which were set in operation early in October. These pumps are discharging about 8,000,000 gallons of sewage a day into the conduit, thus relieving the water supply of this amount of polluting matter.

The main intercepting sewer, from Thirty-ninth street to Seventy-third street, was completed in June, and subsequently the sewer in the Illinois Central right-of-way from Thirty-ninth street to Thirty-fifth street was built. The first named sewer is 4½ miles long, 16 feet inside diameter at Thirty-ninth street and 12½ feet at Seventy-third street, and has been described in previous reports. The second is 6½ feet inside diameter and about ½ mile in length and carries the discharge of the Thirty-fifth street sewer to the pumping station at Thirty-ninth street. All of this work was successfully built by day labor.

The heavy work in concrete for the substructure of the Thirty-ninth street pumping station was brought to completion late in the summer, so that work on the building was commenced in the early fall.

The station will be externally of granite and brown brick with a roof of red Spanish tile. The engine-room in which will be set the engines to pump about 1,400,000,000 gallons of lake water and sewage in twenty-four hours is 129 feet by 138 feet on the ground, with a boiler-room and fuel receiving room adjoining on the north, 50 feet by 146 feet. The engine-room will be finished inside in white enameled brick, with Welsh tile floor and with the ceiling of yellow pine.

The pumping engines for sewage and storm water are triple expansion, horizontal condensing engines, direct-connected to vertical centrifugal pumps, which are set in pits below the floor. There are four of these engines, two for sewage pumping and two for storm water. The two pumps for sewage will each discharge 33,750 gallons per minute with a lift of 23 feet; the two storm water pumps will each discharge 112,500 gallons per minute with a lift of 13 feet.



WATER CHANNEL WALLS, THIRTY-NINTH STREET PUMPING STATION. INTERCEPTING SEWERS.

The pumping engines for lake water are triple expansion vertical condensing engines, direct-connected to horizontal screws. The engines are two in number, set in a cast iron pit in the floor of the engine-room; the pit is oval in plan, 35.5 feet by 43.5 feet and 27 feet deep. The shafts of the engines pass through stuffing boxes in the side of the pit, and each is fitted with a screw, 14 feet outside diameter and wholly submerged. The delivery of each pump is 300,000 gallons a minute, with a lift of 7 feet.

All these engines are built and ready for installation as soon as the roof is on the engine-room.

A 15-ton electric crane of 100-foot span traverses the length of the engine-room, covering in its travel the spaces occupied by the engines.

It is intended to operate the storm water pumps, except when needed for their specific purpose, in pumping lake water against the head of 7 feet, under which circumstances the delivery will be increased so that the total ordinary delivery of lake water and sewage will be 900,000 gallons or 120,000 cubic feet per minute.

This discharge will be through the main conduit, 20 feet inside diameter and 12,123 feet in length, in Thirty-ninth street into the stock yards slip at Halsted street and through the South fork of the South branch of the river to the drainage canal.

With the completion of the pumping station in the spring all sewage from the South division north of Eighty-seventh street will be so discharged.

The remaining work for the completion of the system in the South division is the building of the deep sewer in Sixty-third street and the reversal of the sewers between Jackson Park avenue and Lake Michigan, which now form the outfall sewers for this district.

The refusal of the Supreme Court in October to allow a rehearing in the case of the City of Chicago vs. Joseph Hanreddy settled finally the question of building any part of the Lawrence avenue conduit by day labor, unless action is taken by the Legislature enabling the City to do such work directly.

The city purchased a lot on Lawrence avenue at the crossing of the Chicago, Milwaukee & St. Paul Railway for a site for the pumping station.

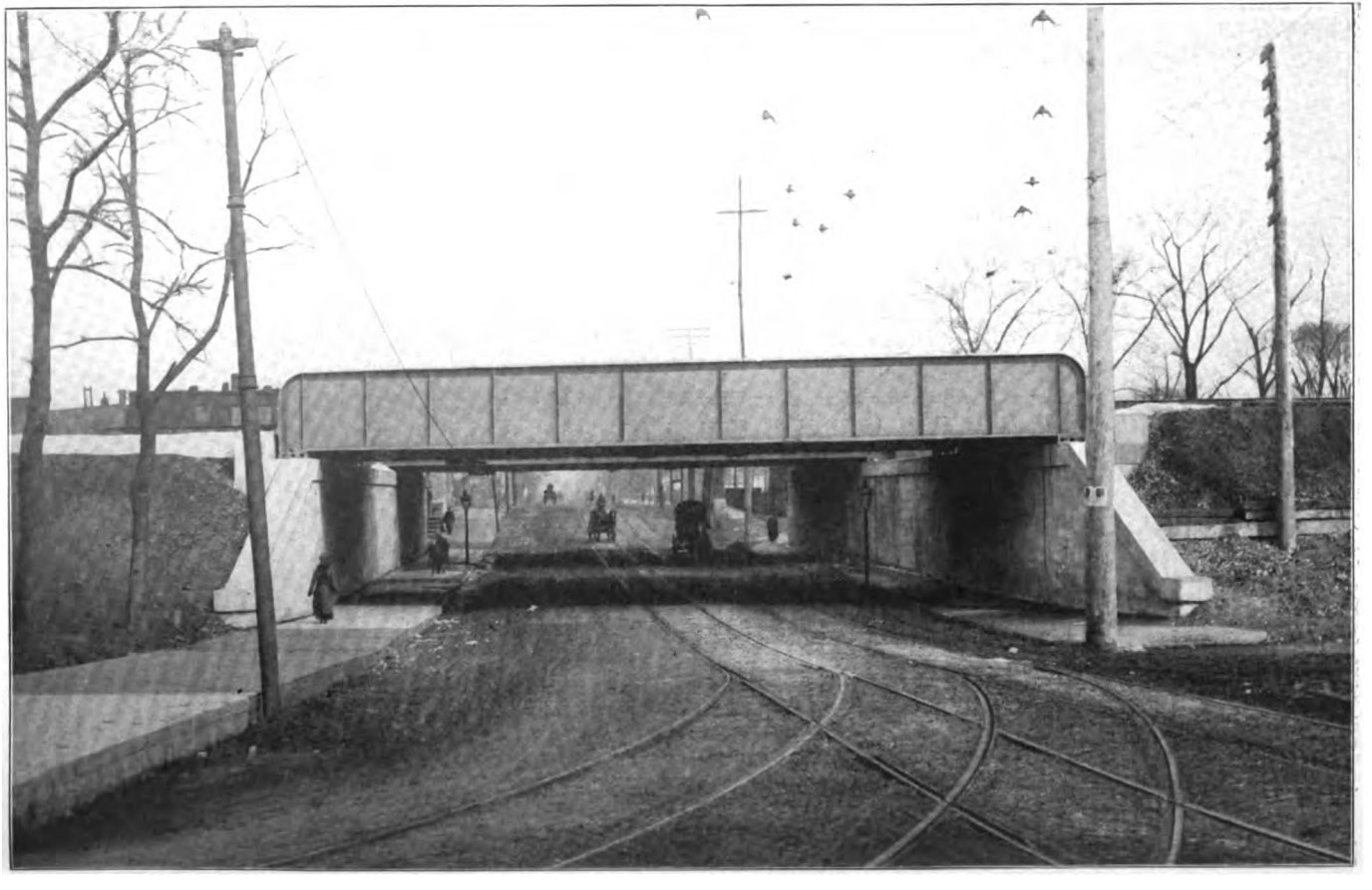
The plans for the pumping station are being perfected and the machinery for the new location is determined upon.

The location of the station at this point will result in much better drainage on the north shore than could have been secured under the original plan which was as outlined by the Pure Water Commission.

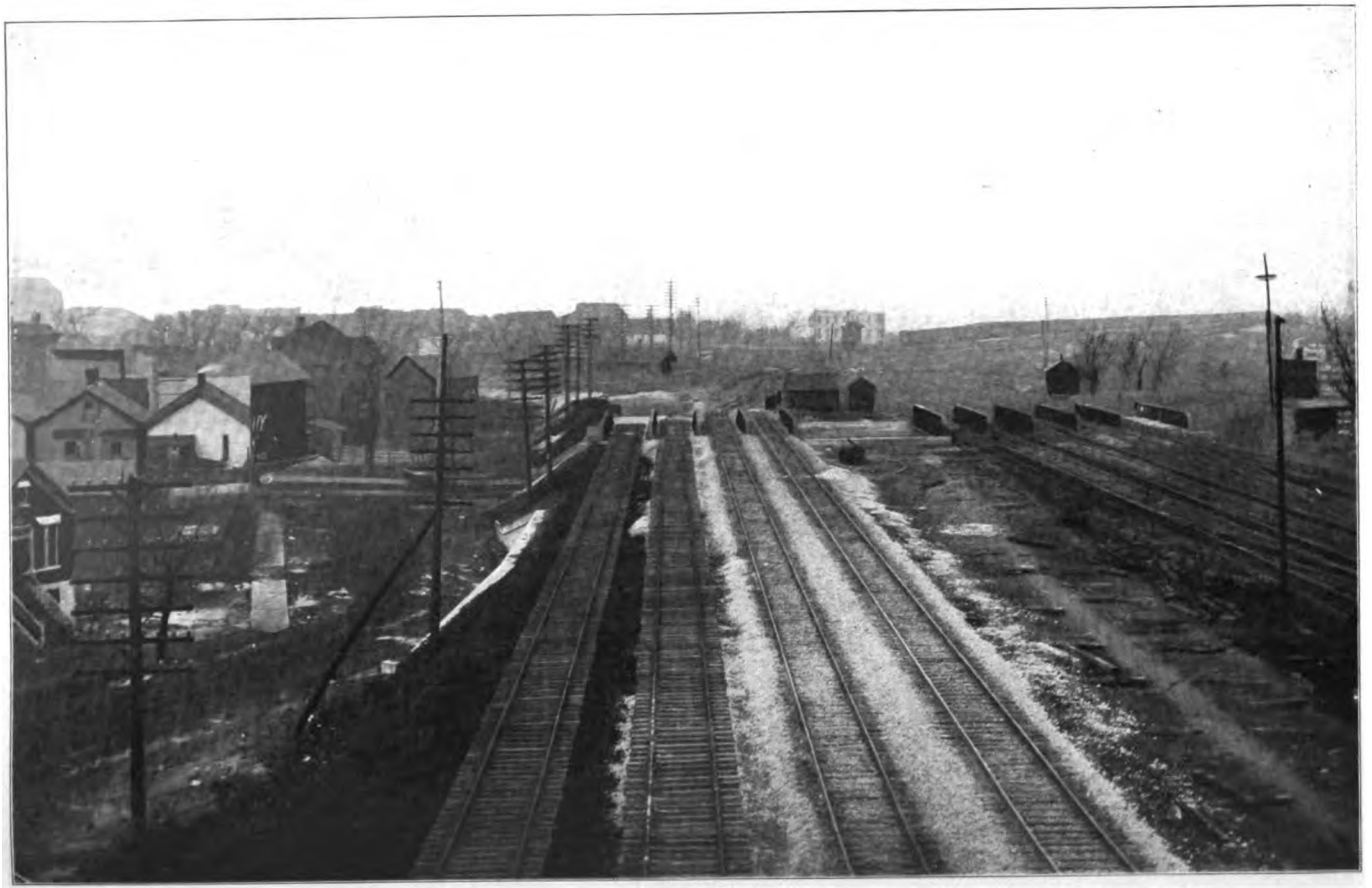
The north and south arms of the intercepting sewer on the lake shore had been brought together at Lawrence avenue and Sheridan Road in order that if possible this change might be made. These sewers will now be run to a pump well at the station and will be kept pumped out, making them sewers of free delivery instead of submerged sewers as in the original plan. Under the original plan the pumping station was located at the river, and the sewers north and south of Lawrence avenue would always have been full of water to the lake level, resulting in a very low velocity with the ordinary flow of sewage.

Respectfully submitted,

WM. E. QUINN,
Superintendent Bureau of Sewers.



ARCHER AVENUE SUBWAY.--LOOKING EAST.



ARCHER AVENUE SUBWAY.—TRACK VIEW LOOKING NORTH.

ANNUAL REPORT

Bureau of Streets

CITY OF CHICAGO

1904

M. J. DOHERTY
Superintendent

BUREAU OF STREETS

HON. F. W. BLOCKI,

Commissioner of Public Works.

DEAR SIR:—I have the honor to submit herewith the Twenty-ninth Annual Report of the Bureau of Streets for the year ending December 31 1904.

FINANCIAL STATEMENT

APPROPRIATION FOR 1904.

For removal of garbage, street and alley cleaning, repairing improved and unimproved streets and alleys, repairing sidewalks, miscellaneous	$995.695.00	
Special appropriation	40,575.00	
Removing snow, First ward	60,000.00	
Special appropriation for snow removal	14,285.00	
Restoration of streets	40,000.00	
Maintenance of dumps	41,485.00	
Rental ward yards	8,000.00	
Corporation inspectors' salaries	40,000.00	
Maintenance of City parks	22,250.00	
Office salaries	20,220.00	
Obstruction inspectors' salaries	9,000.00	
Office expenses	1,500.00	
Engineer steam roller, etc	1,630.00	
Repairing snow dump	3,000.00	
Ward superintendents' salaries	49,800.00	
Unpaid bills	1,491.96	
Ten extra teams for each ward	45,000.00	

SPECIAL APPROPRIATIONS.

Repairing asphalt streets out of reserve	50,000.00	
Repairing right of way of traction companies	60,000.00	
Cleaning right of way of traction companies	200,000.00	
Widening roadway, West Lake street from Rockwell street to Hoyne avenue	40,000.00	
Special ward appropriations	23,360.00	
		$1,767,291.96

DISBURSEMENTS.

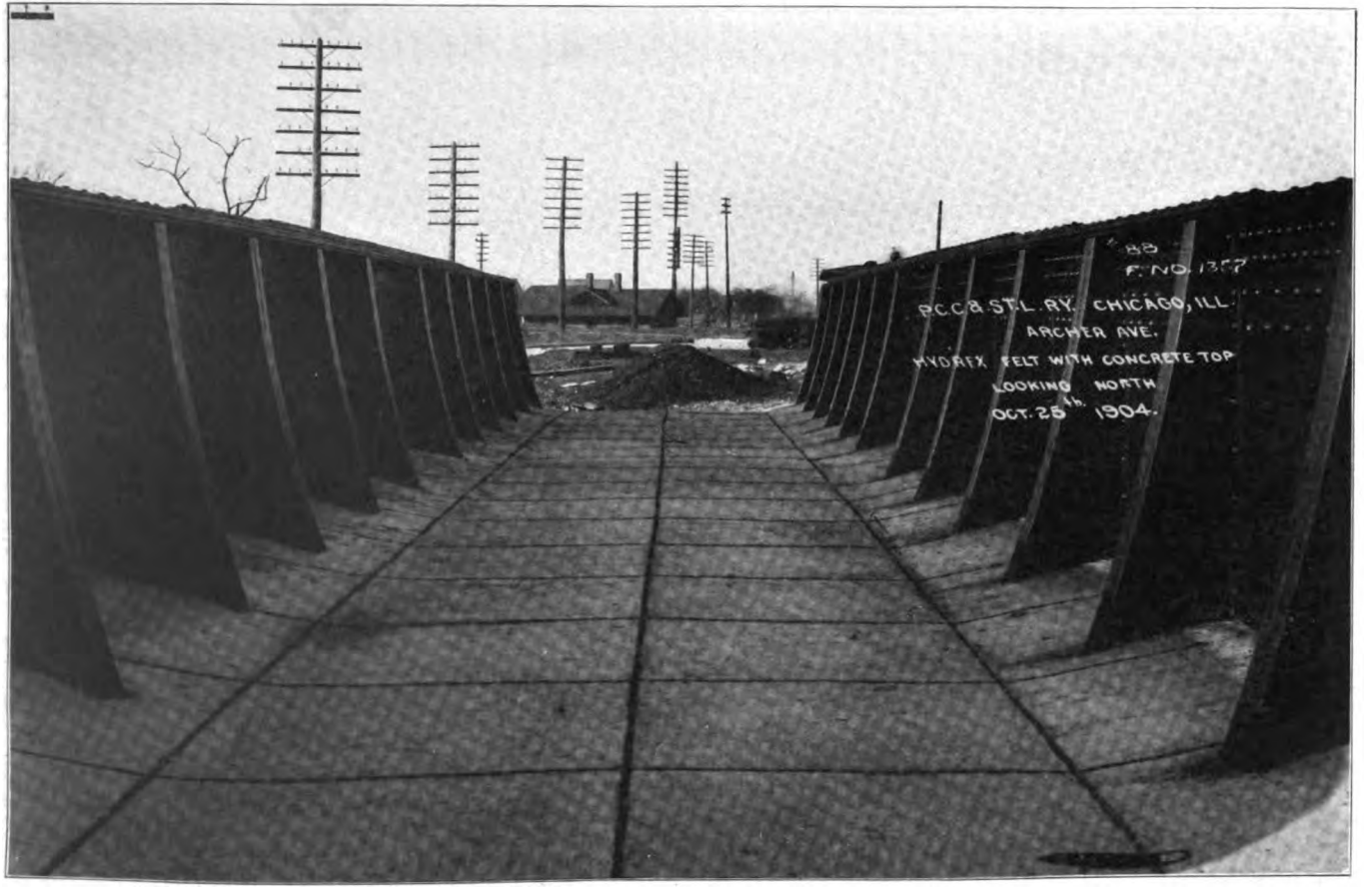
For removal of garbage	$640,602.50	
For street and alley cleaning	274,531.70	
Repairing improved streets	31,993.31	
Repairing unimproved streets	33,802.56	
Repairing sidewalks	32,269.86	
Miscellaneous	8,317.00	
Removing snow, First Ward	74,284.27	
Restoration of streets	27,634.25	
Maintenance of City dumps	40,997.48	
Rental of ward yards	5,830.79	
Corporation inspectors' salaries	29,586.00	
Maintenance of City parks	15,541.34	
Office salaries	20,220.00	
Obstruction inspectors' salaries	6,797.95	
Office expenses	1,430 99	
Engineer steam roller, etc	1,629.50	
Repairing snow dump	2,181.14	
Ward superintendents' salaries	49,487.93	
Ten extra teams for each ward	45,000.00	
Unpaid bills	1,241.96	
Repairing asphalt streets out of reserve	50,000.00	
Cleaning right of way of traction companies	48,030.61	
Special ward appropriations	20,636.42	
Unexpended balance	306,480.90	
		$1,767,291.96

GARBAGE.

During the year 1904 there were removed 1,456,395 cubic yards of garbage, or 289,695 loads, at a cost of $640,602.50. There were 902 garbage complaints in comparison with 919 during 1903.

The question of the City owning and operating its own garbage plants has been discussed at various times during the year and there is no doubt but that during the coming year steps will be taken towards the construction of suitable plants and the acquiring of the necessary equipment in the way of wagons, horses, etc., as specifications have been prepared and it is the intention of the department to advertise for bids immediately after the first of the year.

In connection with the removal of garbage, ashes and combustible material, I would favor the amendment of the Clean Street Ordinance, making it obligatory upon the householder to dispose of all combustible material. There is no reason why this could not be done, as in the Second, Third, Sixth and Seventh wards, where gas has heretofore been used for heating purposes, the majority of these plants have been removed and hot water and steam heating plants have been installed instead



and it would be a very easy matter to burn all the combustible material. Where it could not be done in this way woven iron baskets could be used for the reception of this combustible material and same could be taken out on vacant lots and alleys regularly and reduced to ashes.

STREET AND ALLEY CLEANING.

During the year there were cleaned 17,554 miles of streets and alleys, necessitating the removal of 128,537 loads of street dirt; 1,323,385 lineal feet of weeds were cut; 354,125 inlets to catch basins were opened and cleaned. The total cost of street and alley cleaning, opening of inlets and cutting of weeds was $274,531.70. Of this amount $48,030.61 was charged to street car companies for cleaning their various rights of way. The cost of removing street dirt becomes greater each year on account of the long hauls, but the policy of the department has been to utilize all available space between sidewalks and curbs and to fill in streets below grade. The policy of filling in sidewalk space has been of great service in the cause of permanent walks, as citizens are glad to avail themselves of this opportunity for putting in a foundation for a cement or stone walk.

Forty-five thousand six hundred and seventy-six loads of snow were removed at a total cost of $74,284.27. The appropriation for the removal of snow was $60,000.00, with an additional appropriation of $14,284.27.

In connection with street cleaning and snow removal in the down-town section of the City, I would state that inside of another year there will be practically no place for the dumping of snow, dirt or refuse. I have advised with a number of engineers and have made the following suggestions to them and they agree with me that the same are practicable and could be carried into effect. I would ask that these suggestions receive attention at once:

Suspended sewers of, at least, 24 inches in diameter could be suspended to the curb walls on the east and west and north and south streets running into the river, with manholes, at least, every 25 feet apart. The snow and also the dirt could be shoveled into these openings, and as the fall would be 11 feet in every 4,700 feet, viz: From the river to Michigan avenue on the east and west streets and about the same fall on the north and south streets, in connection with the high water pressure system this snow and dirt could be easily flushed into the river and would not confine itself to one place as the current of the river would have a tendency to scatter it. Even if it were confined to one place, the cost per yard for dredging would amount to about twenty-four

cents, and one of the engineers familiar with this question states it would only cost the City about $10,000 a year for dredging purposes. Of course, the law is against dumping of any dirt or refuse into the river, but in view of the position the City is in, I would suggest that Congress be appealed to to have the law changed so these ideas could be carried out. It would also be a great saving to the City, as the work could be carried on with about the same force of laborers as is required at the present time and the expense for teaming would be entirely done away with. I estimate that the work could be done for 40 per cent less than it now costs.

In the early part of June the Citizens Street Cleaning Bureau organized for the purpose of taking care of a section of the down-town district and cleaning the streets and alleys in that portion of the City between Madison and Van Buren streets, from La Salle street to Michigan avenue. State street they have taken care of from Van Buren street to the river. For this work, from June to December 31st, the City allowed them $12,500, or an average of $14 per mile. However, a representative of the Citizens Street Cleaning Bureau made the statement that the average cost per mile for the work done was over three times the amount allowed by the City.

The department welcomed an innovation of this kind for the reason that it has given those who are directly interested in the work an opportunity to see how the work is done and the cost thereof. However, I am opposed in the congested parts of the City to having receptacles placed on the sidewalks for the deposit of refuse and dirt where they are left for any length of time. The remedy I would suggest is this: To have a cart go around regularly and as soon as piles are put together have them shoveled into the cart and hauled away. These receptacles are not only unsightly but are dangerous as well, and this department was the recipient of a number of complaints regarding the receptacles on State street, as well as other streets, and during the holidays the Mayor directed their removal, recognizing the justice of the complaints.

During the year the department spent $50,000 on asphalt repairs and this outlay met with the approval of citizens and taxpayers as a number of the streets repaired, i. e., Cottage Grove avenue on the south side, Madison street on the west, and Wells and Clark streets on the north side are main arteries leading to and from the City. I would suggest that an appropriation of, at least, $75,000 be made for asphalt repairs in 1905 as the reserve on many of the asphalt streets will soon expire and they will need repairs.

In December I submitted to the City Council a report, by wards,

giving the number of square yards of repairs needed on the different kinds of pavements, on streets out of reserve, together with a list of streets in need of new pavements, and have asked that ten per cent of the estimated amount be appropriated for repairs this year, which I hope the City Council will take cognizance of and allow the department.

In all the large cities of the United States I visited this year, both in the East and West, I find the question of street cleaning and garbage removal being agitated to a great extent and the relative merits of the various kinds of material for street paving purposes, the cost of same and the manner of cleaning. Relative to street cleaning, as far as my experience goes the only proper way to do street cleaning is by hand. The cost of cleaning by hand, however, is much greater than by machine, but the work is done in a more satisfactory manner. As yet I have recommended no kind of material for street pavements with the exception of dressed granite block, which, in my opinion, is the only wearing material fit to be put down in any portion of a City where there is heavy traffic.

I wish to call attention to the system of reports in vogue and which I consider responsible for the efficient work of the department to a great extent.

The ward superintendents are required to turn in daily reports showing the amount of work done and the number of men and teams at work. These daily reports are compiled at the end of the week and submitted to the aldermen of the various wards at the weekly meetings of the council. In connection with this subject of reports I desire to call attention to same in relation to sidewalk accidents, and would state that over eighty per cent of the suits tried in recent years have been won by the City because of the records prepared and testimony given by the ward superintendents in suits for damages, as they were able to show that barricades had been put up and maintained as soon as notice was given either on citizens' complaints or police reports.

The danger from sidewalk accidents has been done away with to a great extent and the consequent suits for damages owing to the fact that a year ago last fall I noticed after a snowstorm the great danger pedestrians were exposed to in stepping on and off of sidewalks to the street on account of the edges being worn smooth and also the danger they were exposed to where iron coalhole covers were worn smooth. I had notices prepared and served on owners to at once put in corrugated covers and caused the edges of walks to be bush-hammered, and where angle-irons were put in to protect the curb at a number of the crossings in the downtown section of the City, the top has been removed and

an iron laid over, which has a rough surface which makes it safe to step on.

In my report of 1903 I mentioned the conditions that arise in the southwest portion of the City on account of floods which inundate that territory each season and urged the necessity for immediate relief. I notice that during the year contract for sewer has been let, starting from Jackson Park avenue and Seventy-third street, and there is no doubt but the work will be finished by next year and the long desired relief given.

The following number of dead animals were removed during the year at no expense to the city:

Horses	4,210
Cows	68
Dogs	14,267
Calves	92
Goats	85
Sheep	94
Colts	71
Total dead animals removed	18,887

REPAIRING IMPROVED STREETS AND ALLEYS.

During the year the following repair work was done:

15,617¼ square yards of new cedar blocks were laid.
10,023 square yards of old cedar blocks were relaid.
5,479½ square yards of granite blocks were relaid.
1,382 square yards of macadam laid.
1,412½ square yards of brick laid.
435 square yards of asphalt.

In connection with which the following material was used:

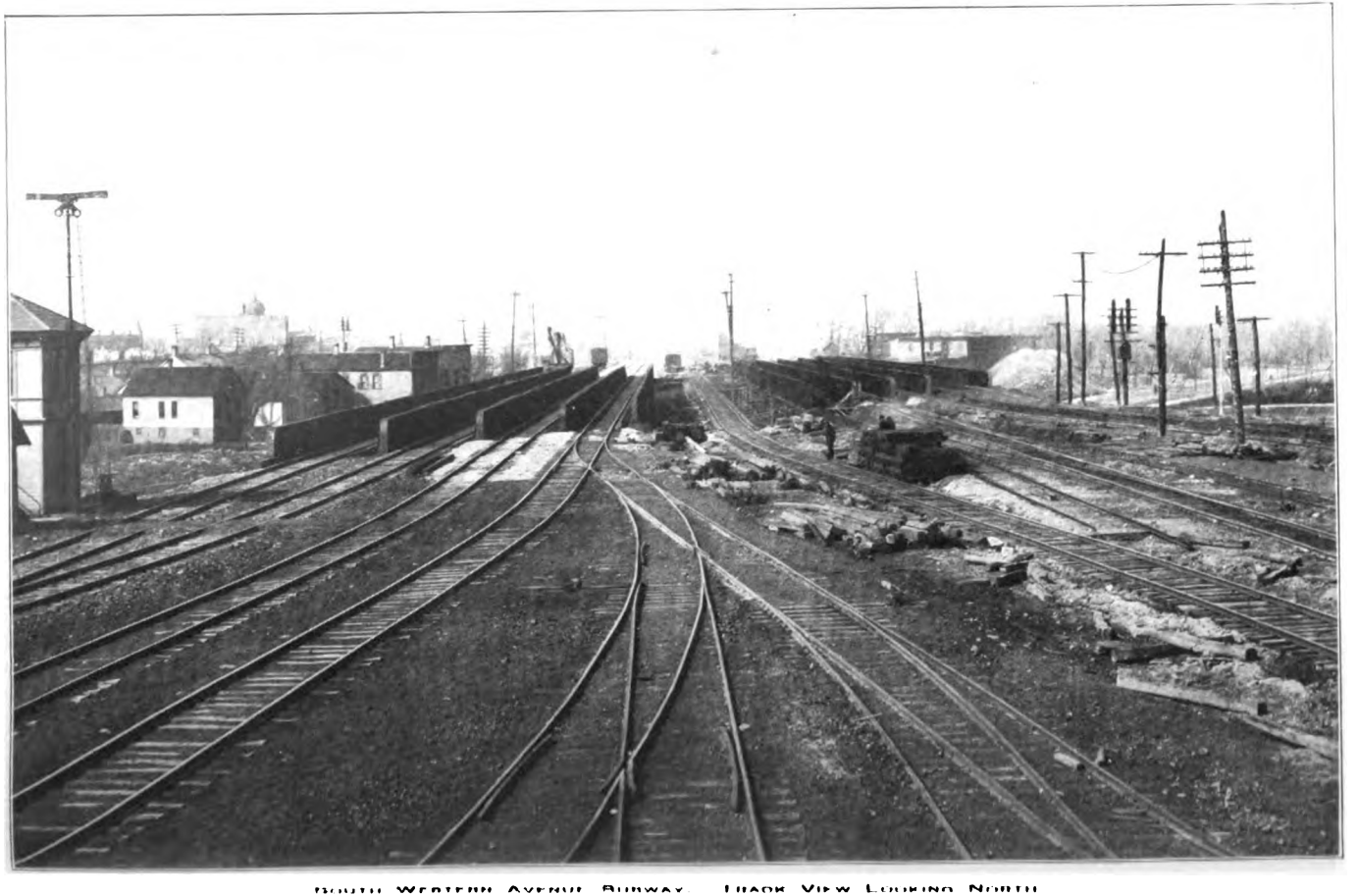
577¾ cubic yards of gravel.
1,876 cubic yards of crushed stone.
28,416 cubic yards of cinders and spawls.
50,333 lineal feet of new lumber.
37,376 lineal feet of old lumber.

At a total cost of $31,993.31.

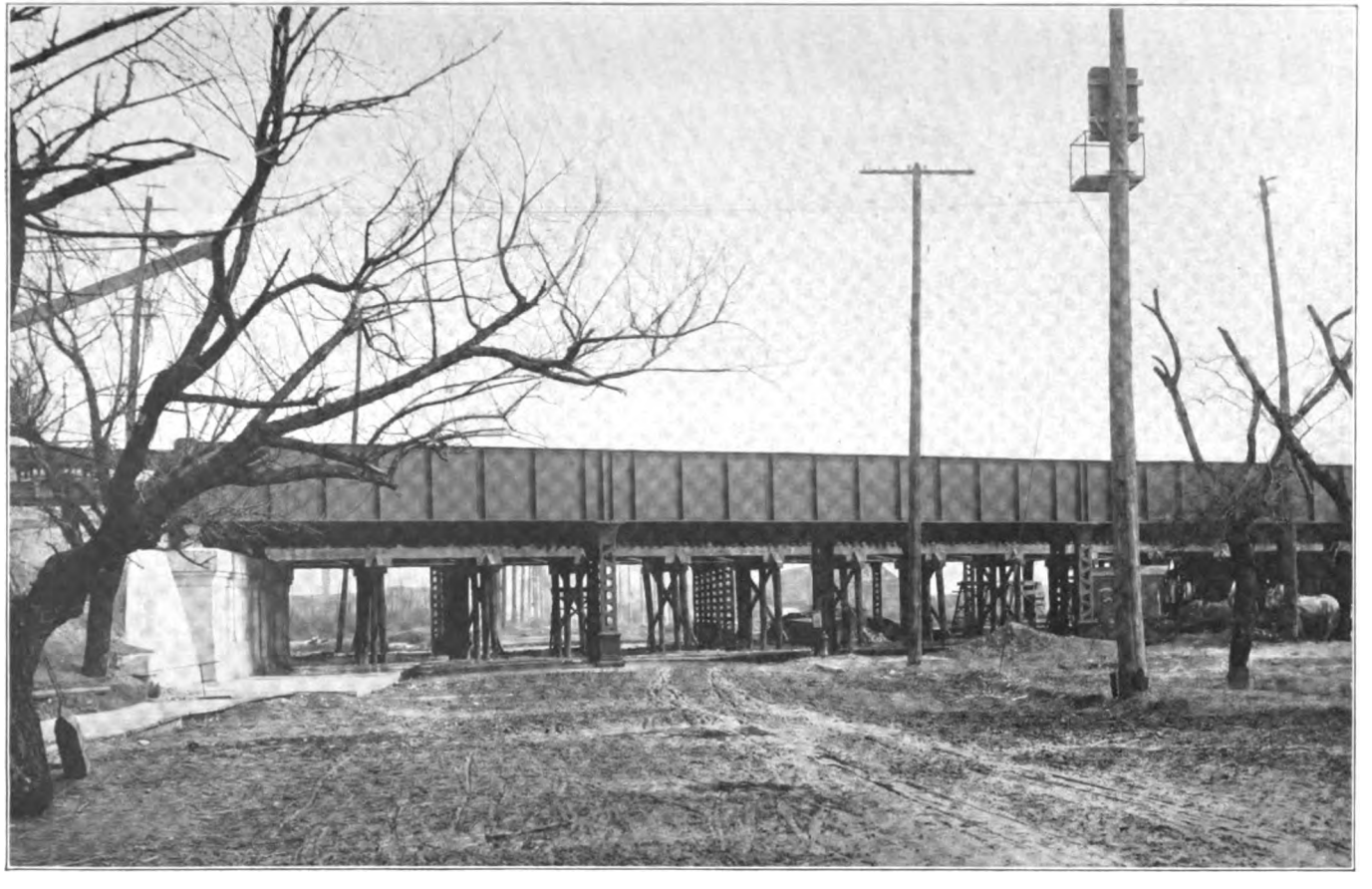
REPAIRING UNIMPROVED STREETS AND ALLEYS.

During the year the following work was done on unimproved streets and alleys:

660,186 lineal feet of grading.
590,597 lineal feet of ditches were opened and cleaned.
490 new and repaired aprons.
1,092 new and repaired crossings.
1,470 new and repaired culverts.
48 new and repaired box drains.
498 general repairs.



SOUTH WESTERN AVENUE SUBWAY. TRACK VIEW LOOKING NORTH



SOUTH WESTERN AVENUE BOULEVARD.—LOOKING EAST ALONG THIRTY-NINTH STREET.

In connection with which the following material was used:

270,869 lineal feet of new lumber.
164,195 lineal feet of old lumber.
110 kegs of nails.
14,305 loads of cinders and spawls.

At a total cost of $33,802.56.

SIDEWALK REPAIRS.

During the year the following work was done on sidewalks:

2,094 new and repaired intersections.
16 563 general repairs were made.

In connection with which the following material was used:

295,429 lineal feet of new lumber.
987,839 lineal feet of old lumber.
389 kegs of nails.
2,102 loads of cinders.

At a total cost of $32,269.86.

SPECIAL APPROPRIATIONS.

Ward.	APPROPRIATION.	Amount.	Expended.
5th	For ditching	$ 975.00	$ 881.55
8th	For ditching on Seventy-ninth street	747.50	675.12
8th	For ditching on Commercial and Anthony aves.	585.00	585.00
8th	For ditching on 103d and 108th streets	390.00	376.50
12th	For repairing Western avenue	500.00	305.25
22d	For repairing sundry streets	500.00	463.00
26th	For ditching	812.50	812.50
26th	For hauling slag	1,625.00	1,624.90
27th	For grading Lincoln avenue	812.50	800.16
27th	For repairing Peterson avenue	500.00	499.88
27th	For repairing Milwaukee avenue	1,625.00	1,625.00
27th	For repairing Grand avenue	650.00	465.42
27th	For ditching in Norwood Park	650.00	650.00
29th	For ditching	1,300.00	1,300.00
31st	For ditching	1,300.00	1,261.00
31st	For improving Western avenue	3,000.00	2,978.09
32d	For repairing culvert on Seventy-seventh street between Vincennes Road and Stewart avenue.	350.00	350.00
32d	For ditching	487.50	487.50
32d	For repairing Vincennes road	812.50	812.50
33d	For ditching	650.00	645.61
33d	For repairing Michigan avenue	1,625.00	1,617.50
34th	For repairing Forty-fifth avenue	487.50	487.50
35th	For repairing Fifty-second avenue	975.00	932.47

The appropriation for the maintenance of the thirty-two parks under the jurisdiction of this department for the year 1904 was $22,250.00, of which sum $15,541.34 was expended. All parks improved prior to 1904 were maintained and kept in good condition and the citizens of Chicago by their increased attendance of these breathing spots testify their appreciation of the benefits to be derived by the keeping up of these parks.

PERMITS.

During the year permits were issued to open improved and unimproved streets as follows:

People's Gas Light and Coke Company	10,790
Chicago Edison Company	621
Commonwealth Electric Company	21
Chicago Telephone Company	138
Ogden Gas Company	142
Various corporations	190
Plumbers and sewer builders	1,796
City Departments	1,692
Unimproved street opening permits	3,845
Use of streets	611
Inspection permits	34
Manure vault permits	15
Space permits	323
Miscellaneous	2,601
	22,729

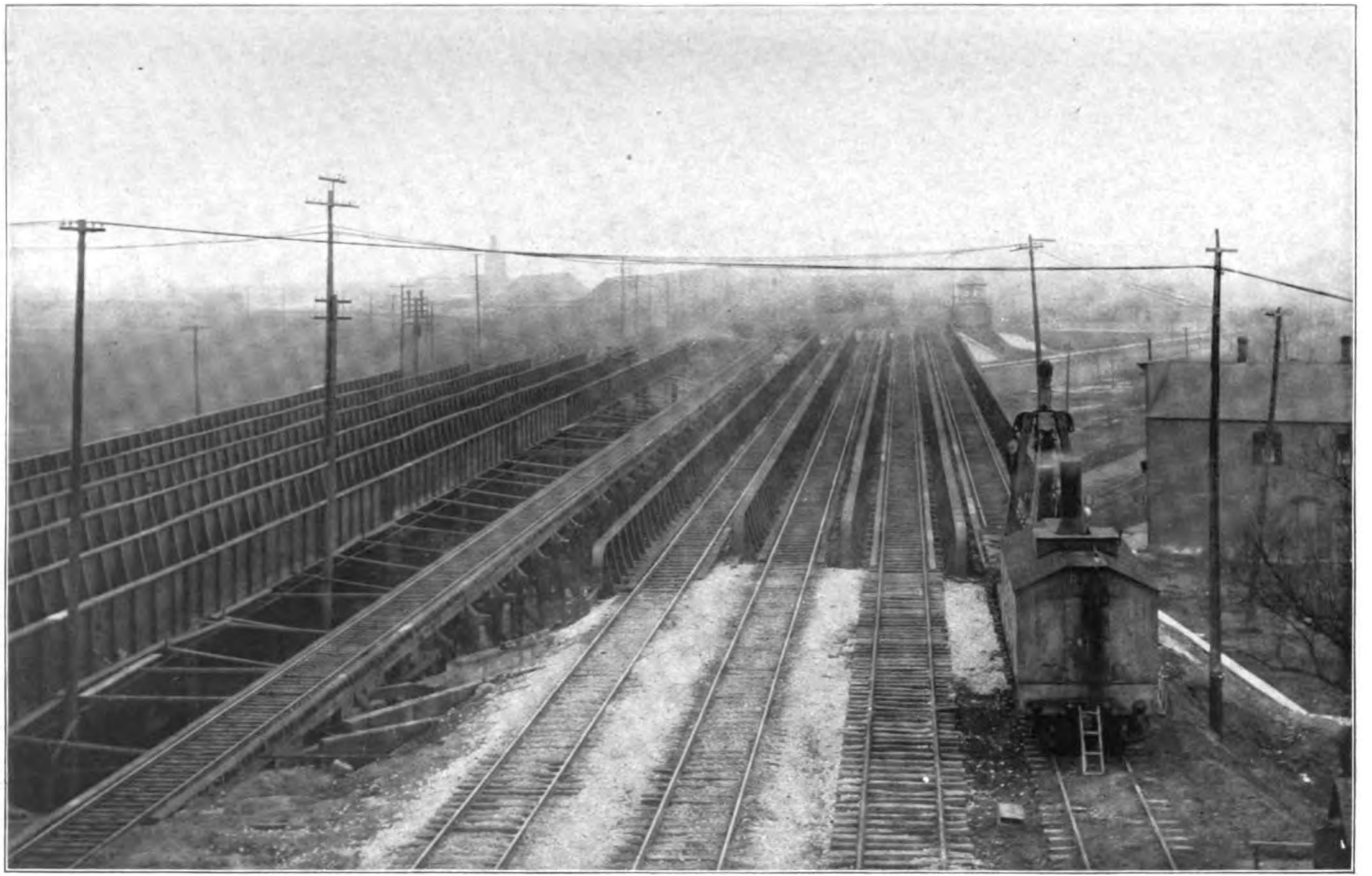
PAVEMENTS REPAIRED BY THE PEOPLE'S GAS LIGHT & COKE COMPANY ON STREET OPENING PERMITS.

Square Yards, Cedar.	Square Yards, Macadam.	Square Yards, Granite.	Square Yards, Brick.	Square Yards, Asphalt.
68,531.0	28,855.3	5,750.1	2,520.7	1,773 3

PAVEMENTS REPAIRED BY THE CHICAGO EDISON COMPANY ON STREET OPENING PERMITS.

Square Yards, Cedar.	Square Yards, Macadam.	Square Yards, Granite.	Square Yards, Brick.	Square Yards, Asphalt.
2,962	670	8,275	2,080	1,128

SOUTH WESTERN AVENUE SUBWAY.— LOOKING SOUTH.



SOUTH WESTERN AVENUE SUBWAY.—TRACK VIEW LOOKING SOUTH.

PAVEMENTS REPAIRED BY THE COMMONWEALTH ELECTRIC COMPANY ON STREET OPENING PERMITS.

Square Yards, Cedar.	Square Yards, Macadam.	Square Yards, Granite.	Square Yards, Brick.	Square Yards, Asphalt.
4,627	2,741	...	537	61

PAVEMENTS REPAIRED BY THE CHICAGO TELEPHONE COMPANY ON STREET OPENING PERMITS.

Square Yards, Cedar.	Square Yards, Macadam.	Square Yards, Granite.	Square Yards, Brick.	Square Yards, Asphalt.
5,519	656	195	1,197	798

PAVEMENTS REPAIRED BY THE OGDEN GAS COMPANY ON STREET OPENING PERMITS.

Square Yards, Cedar.	Square Yards, Macadam.	Square Yards, Granite.	Square Yards, Brick.	Square Yards, Asphalt.
1,128	218	...	115	11

ANNUAL REPORT OF HOUSE MOVING, 1904.

MONTHS.	No. Permits.	DIMENSIONS. Stories High. One.	Two.	Three.	Front Width Lineal Feet.	Kind Frame.	Brick.	DIVISION. North.	South.	West.	PERMIT FEES. One Doll.	Five Doll.	Misc.	AMOUNT.	REMARKS.
January	17	7	5	..	225	12	..	3	9	5	3	14	....	$ 73.00	J1142 Sample Copy. Three cables moved. One vault moved. One Ferris Wheel moved.
February	16	8	7	..	293	14	1	5	3	8	5	11	....	60.00	J1148 sample copy. One cable moved.
March	46	27	16	1	913	39	5	8	20	17	28	17	$4 1	117.00	J1198 supplementary to J1173. One cable moved.
April	43	23	22	..	877	39	3	6	13	24	30	13	....	95.00	J1221 duplicate for J1199. One cable moved.
May	69	39	29	1	1,487	50	19	5	33	31	45	24	....	165.00	J1281 duplicate for J1199, for corporation council office.
June	85	37	46	1	1,822	70	14	11	33	43	47	36	$10 2	247.00	J1323 spoiled. J1402 duplicate. Three cables moved.
July	81	48	30	2	1,726	60	20	8	48	25	32	49	....	277.00	One cable moved.
August	61	29	29	2	1,334	45	15	4	26	31	33	28	....	173.00	J1500 sample. J1543 spoiled. One cable moved.
September	46	17	24	2	918	38	5	2	21	23	27	19	....	122.00	Two cables moved. One armature moved.
October	44	21	19	..	890	36	7	8	15	21	27	17	....	112.00	One cable moved.
November	50	23	25	1	1,052	41	8	6	25	20	28	21	$10 1	143.00	Two cables moved.
December	24	6	18	..	503	19	5	3	11	11	11	12	$10 1	81.00	Two bldgs. on J1713. One cable moved.
		287	270	10		463	102	69	257	259	316	261	5		Seventeen cables. One Ferris Wheel axle. One vault. One Armature.
Total	582	567			12,040	565		585			582			$1,665.00	20

In conclusion, I wish to state that I consider the work accomplished by the department during the past year very gratifying and desire to thank my assistant superintendents and the various employees connected with this bureau for their hearty co-operation.

Respectfully submitted,

M. J. DOHERTY,
Superintendent of Streets.

SOUTH WESTERN AVENUE BOULEVARD.— LOOKING NORTH.

ANNUAL REPORT

Bureau of Maps and Plats

CITY OF CHICAGO

1904

CHAS. J. BUHMANN
Superintendent

BUREAU OF MAPS AND PLATS.

CHICAGO, January 1, 1905.

HON. F. W. BLOCKI,

Commissioner of Public Works.

DEAR SIR:—I respectfully herewith submit the annual report of the Bureau of Maps and Plats for the year ending December 31, 1904.

It was the duty in former years of this bureau to almost exclusively prepare plats for estimating assessments of streets and sidewalks, and to verify an occasional petition; but in the year last passed, the numerous demands made upon this bureau by various City officials and City departments have taxed the capacity of this bureau to such an extent that the work for the board of Local Improvements is somewhat behind.

Besides the regular duties performed by this bureau, of investigating, platting and reporting on all street and alley obstructions, examining and platting neighborhoods within one-eighth of a mile surrounding the location of saloons, the applications for licenses of which have been protested, this bureau has completed drawings for all of the public bathhouses for the Department of Health, which plans were exhibited at the Louisiana Purchase Exposition at St. Louis, and is now preparing an atlas of all of the property belonging to the City of Chicago for use of the City Comptroller.

It has been the practice in this City, through misunderstanding or otherwise, for a great many property owners to incorrectly house-number their property. Since the new system of billing water tax bills was inaugurated, these discrepancies have been brought to light in overwhelming numbers. This, and objections of some property owners and tenants to certain numbers, has required the constant attention of two employes of this bureau.

At this time I respectfully recommend for your consideration the necessity of an immediate convening of the Committee of Street Nomenclature and House Numbering to devise ways and means for the installation of a simple and systematic method of naming streets and numbering houses, as the duplication of names and numbers greatly complicates the work of this bureau and other departments of the City.

During the past year, as formerly, many vacations of streets and alleys have been attempted, by means of placing on record instruments pretending

to vacate such parcels of land, and this we have been very instrumental in checking, and in many cases have forced the beneficiaries of such vacations to secure an ordinance authorizing such vacation, and securing payment therefor.

The other work performed by this bureau during the year 1904 is as follows:

No.		Miles.
440	Assessment plats, street improvement, containing	263.00
419	Estimate plats, street improvement, containing	220.00
525	Assessment plats, sidewalk improvement, containing	943 05
348	Assessment plats, sewer and drains, containing	4.67
94	Assessment plats, water pipe extension, containing	47.25
23	Survey plats, containing	19.50
12	Condemnation plats for record, containing	21.25
27	Street and alley opening plats, containing	40.50
15	Vacation and dedication plats, containing	2.25
32	Miscellaneous plats for record, containing	9.50
24	Condemnation plats across R. R. R. of W. containing 120 acres	.....
1959	Total number of plats, containing	2,033.25

MISCELLANEOUS PLATS FOR VARIOUS DEPARTMENTS AND OFFICIALS.

For Commissioner of Public Works, miscellaneous plats	15
For Commissioner of Public Works, obstruction plats	22
For City Engineer	5
For City Collector	19
For Corporation Counsel	35
For City Counsel	14
For Comptroller	12
For Street Department	11
For Aldermen	32
For Track Elevation Department (6.5 miles)	12
For Board of Local Improvements (22 days)	18
Plans for Health Department, 1 man, 60 days	..
Real Estate Maps for Comptroller, 1 man, 390 days	..
Map of fire limits	1
Maps showing sidewalk district	2
Pound limits map of Chicago	1
Signs for various departments	73
Total	272
Verified miscellaneous petitions, viz.: Electric light, street railways, saloon license protests, etc	101
Verified house moving petitions	404
Total	505

OUTSIDE WORK OF MISCELLANEOUS CHARACTER.

1 man 260 days, house numbers.
1 man 94 days, obstruction investigation.
1 man 29 days, license protest investigation.
1 man 18 days, miscellaneous work for Alderman.
1 man 184 days, outside work.

5 men 584 days.

OTHER MISCELLANEOUS LABORS PERFORMED BY THIS DEPARTMENT.

1 man 210 days, atlas work.
1 man 33 days, searching records in Recorder's office.
1 man 236 days, checking plats.

3 men 479 days.
Grand total: 8 men 1,013 days.

23 new subdivisions approved.
4,658 legal descriptions issued, at 25c.
818 legal descriptions issued free.
9,498 house numbers issued free.

14,997 people requiring the service of an employe in this bureau.

Following were the changes in street names ordered by the City Council:

Naslund Place changed to *Pensacola Avenue* from N. Robey Street to Lincoln Avenue.

10.30 miles of streets vacated during the year.
10.241 miles of streets added during the year.

.059 miles of streets lost during the year.

7.11 miles of alleys vacated during the year.
3.66 miles of alleys added during the year.

3.45 miles of alleys lost during the year.

1,278.72 miles of improved streets, Dec. 31, 1903.
1,527.32 miles of unimproved streets, Dec. 31, 1903.

2,806.04 miles of streets, Dec. 31, 1903.
.059 miles of streets lost during year 1904.

2,805.981 total miles of streets, Dec. 31, 1904.

120.24 miles of improved alleys, Dec. 31, 1903.
260.70 miles of unimproved alleys, Dec. 31, 1903.

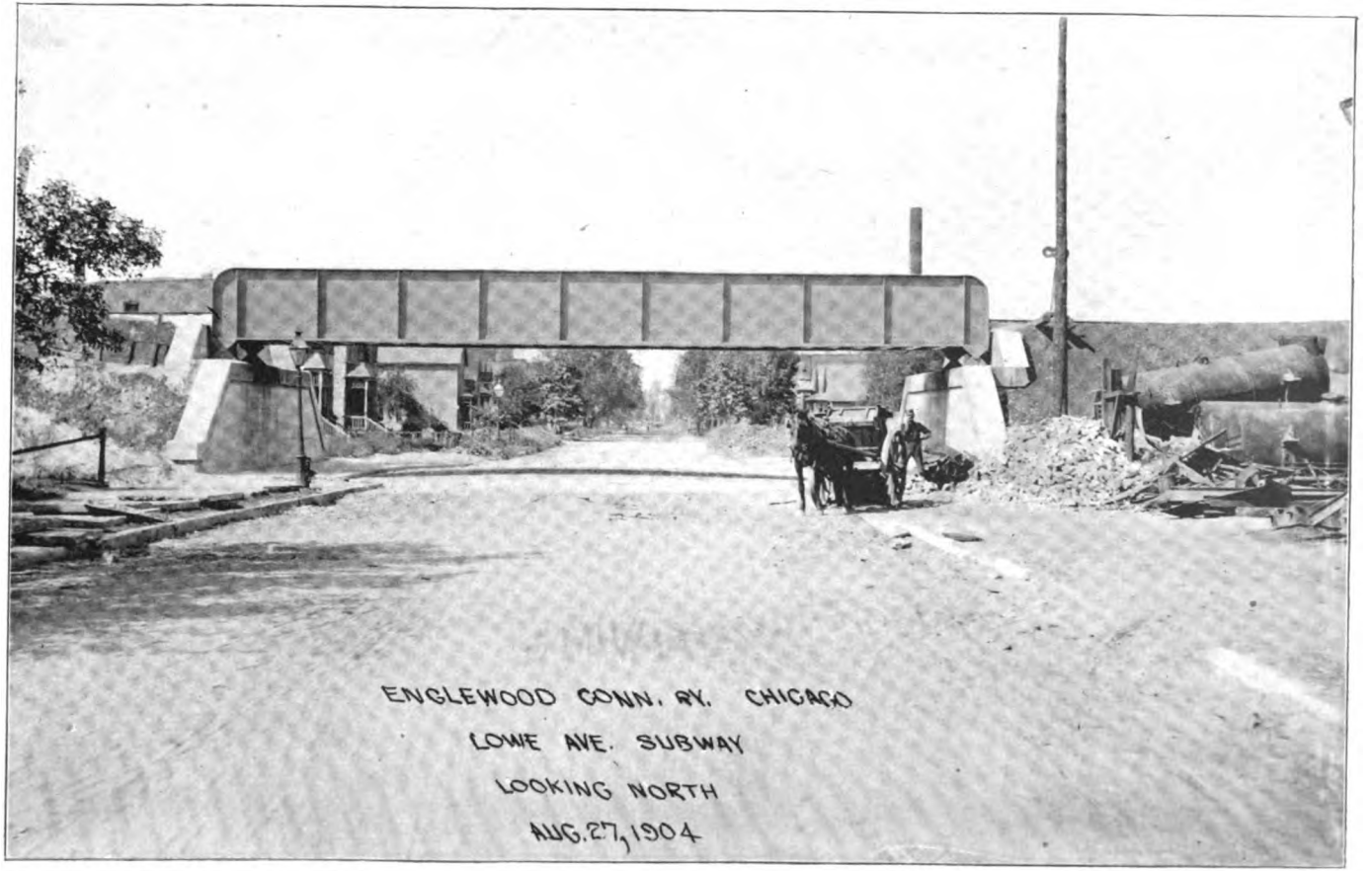
380.94 miles of alleys, Dec. 31, 1903.
3.45 miles of alleys lost during year 1904.

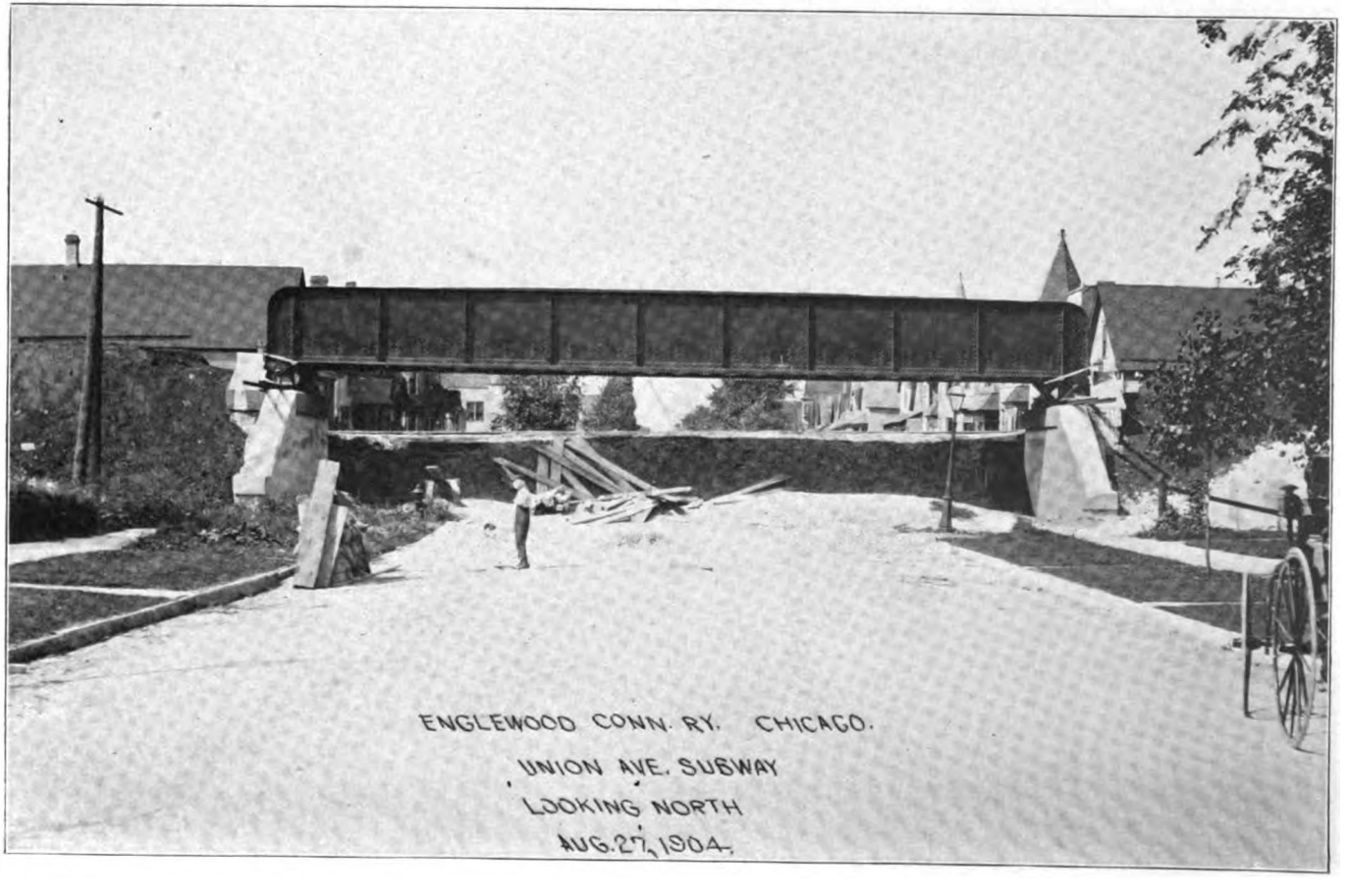
377.49 total miles of alleys, Dec. 31, 1904.

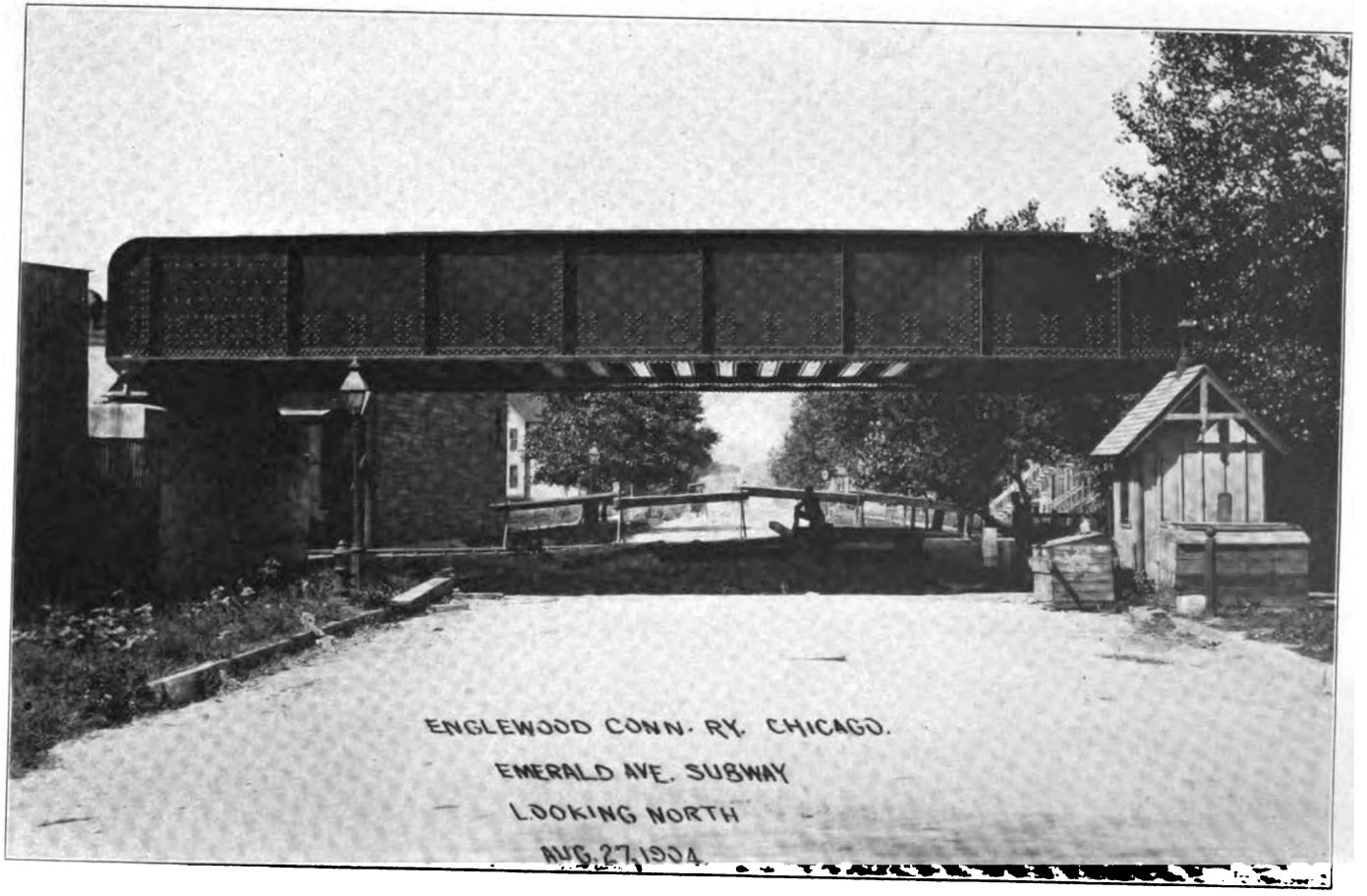
In conclusion I wish to say that I am sincerely grateful to yourself and to the various officials who have extended their assistance and courtesy.

Very respectfully submitted,

CHAS. J. BUHMANN,
Superintendent of Maps.







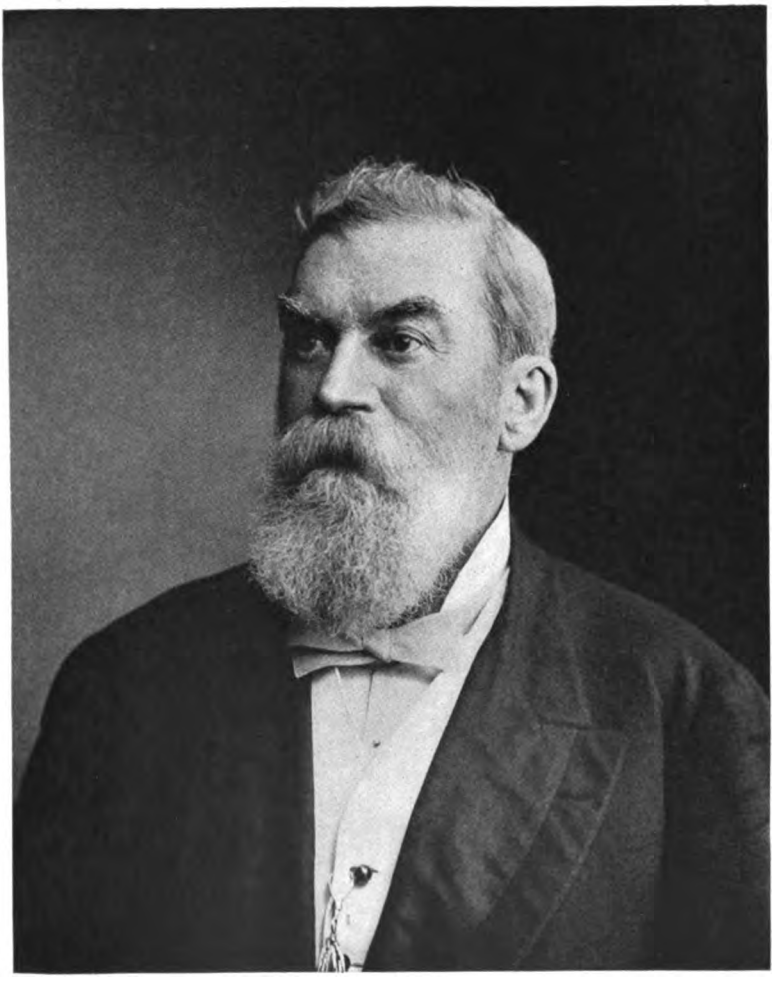
ANNUAL REPORT

Department of Track Elevation

CITY OF CHICAGO

1904

JOHN O'NEILL
Superintendent



John O'Neill

EXPERT ON TRACK ELEVATION.

DEPARTMENT OF

TRACK ELEVATION.

REPORT FOR THE YEAR 1904.

The work of track elevation for the year 1904 is similar to the work done in the year 1903, that is, of a preliminary character in the construction of retaining walls and preparing the foundations for the abutments at the intersection of streets so that there may be no unnecessary delay when the railroad companies commence the final work of the elevation of their tracks by filling in the embankments and placing in position the bridges to carry the tracks across intersecting streets. The right-of-way of many of the railroads is only sixty-six feet in width and it is almost impossible to elevate the roadbed and tracks and keep the traffic moving in the narrow space occupied by the railroads without first making this preparation.

Under the ordinance passed June 18, 1900, for the elevation of the roadbed, and tracks of the Pittsburgh, Fort Wayne & Chicago Railway the entire yard located between Fifty-fifth street or Garfield boulevard and Forty-seventh street is almost elevated and the subway at Fifty-first street is completed. This company commenced the filling of these yards on the 7th day of May, 1903, and for two consecutive seasons they have placed under their tracks from 150 to 175 car loads of sand daily and it will take at least another season to complete the entire work of filling. Retaining walls of concrete masonry have been constructed from Fifty-fifth street to Twenty-third street, a distance of about 3¼ miles, and at a number of street intersections the foundations have been put in for abutment walls at an estimated cost of about $1,000,000 for the entire work.

Under the same ordinance of June 18, 1900, the Pittsburgh, Cincinnati, Chicago & St. Louis Railway Company under the Englewood connecting branch have about completed the work of the elevation of this branch road to Halsted street at an expense of about $200,000.

Under the ordinance of May 22, 1899, the railroad and railway companies have done work as follows:

Pittsburg, Cincinnati, Chicago & St. Louis Railway	$140,000
Union Stock Yard & Transit Company	70,000
Chicago Terminal Transfer Railroad	70,000
Chicago & Alton Railroad	70,000
Making the total cost for the entire work	$350,000

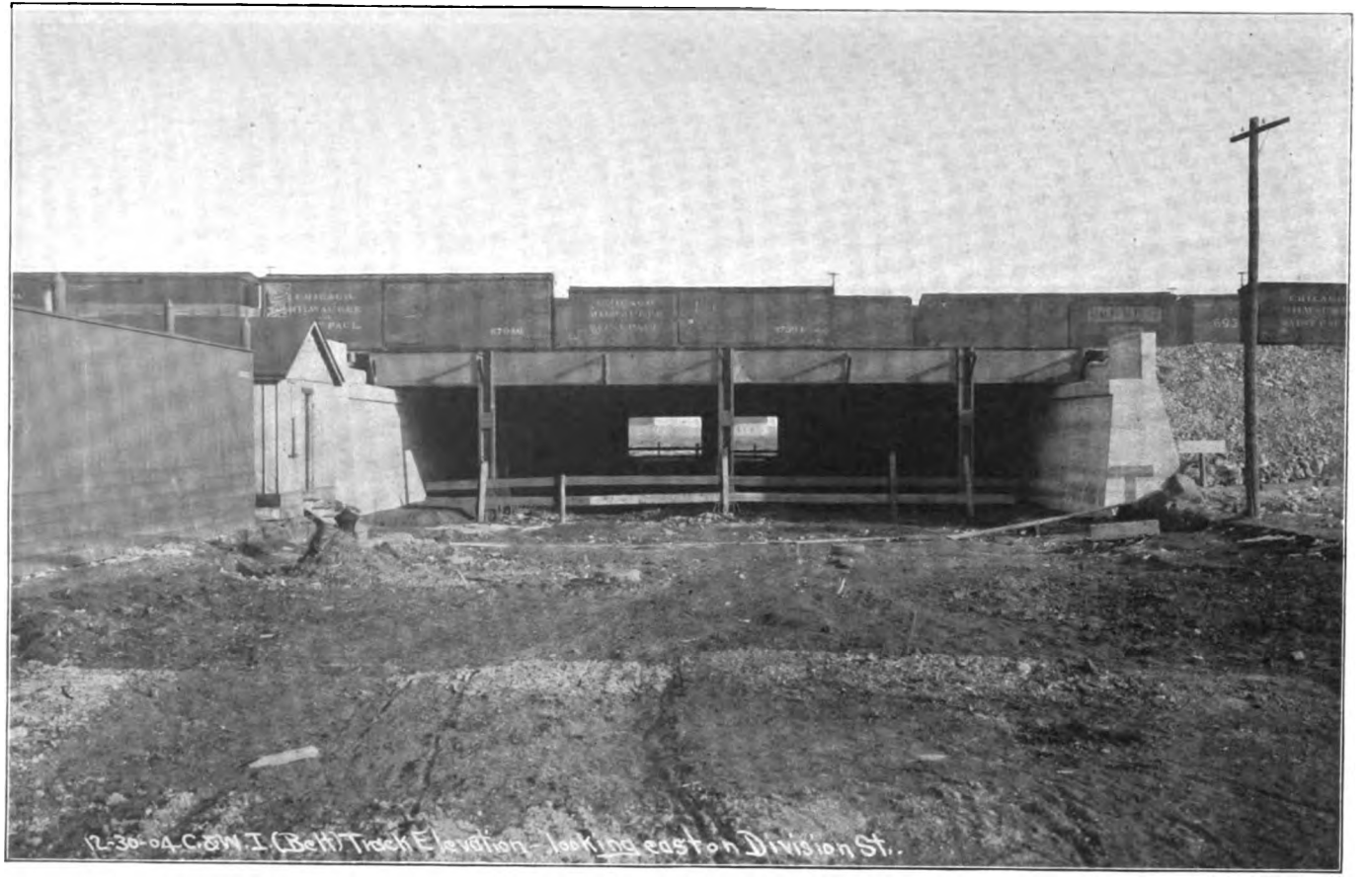
Under the ordinance of July 7, 1902, the Chicago, Burlington & Quincy Railway Company have done work in the construction of retaining walls on the south line of their right-of-way along Sixteenth street to the amount of $325,000.

Under the ordinance of February 11, 1901, the Chicago & North-Western Railway Company have done work in the construction of retaining walls along the north line of their right-of-way in Kinzie street and built foundations for the abutment walls at the street intersections between Ashland avenue and Western avenue, including the construction of a new sewer in Kinzie street, as specified in the ordinance, at a cost of about $500,000 for the entire work.

Under the ordinance of February 3, 1903, the Union Stock Yard & Transit Company have fully and finally completed the subway in Forty-seventh street between Morgan and Halsted streets, at a cost of about $200,000.

Under the ordinance of October 23, 1899, the Chicago & Western Indiana Railroad Company have done work in the elevation of their yard between Forty-seventh street and Fifty-fifth street in filling in the embankment, the construction of retaining walls, erecting power houses and other buildings in the equipment of this yard, at an expense of about $500,000. The total cost of the preparatory work done this year amounts to about $3,075,000.

November 21, 1904, an ordinance was prepared and presented to the City Council and passed April 6th, 1905, for the elevation of the roadbed and tracks of the Pittsburgh, Fort Wayne & Chicago Railway, the South Chicago Railroad, the Cummings branch of the Pittsburgh, Fort Wayne & Chicago Railway, the Lake Shore & Michigan Southern Railway, the Baltimore & Ohio Railroad, the South Chicago & Southern Railroad, the Chicago & Western Indiana Railroad, the Chicago, Rock Island & Pacific Railway and the Chicago, Lake Shore & Eastern Railway in the territory bounded by Stony Island avenue on the west, Indiana state line on the east, Seventy-ninth street on the north and 101st street on the south, elevating 15.13



miles of main tracks, 36.38 miles of all tracks and eliminating 63 grade crossings by subways, at an estimated cost of $3,710,000 as follows:

RAILROADS.	Main Tracks.	All Tracks.	Sub-ways.	Estimated Cost.
Pittsburgh, Fort Wayne & Chicago R'y.....	4.5	14.3	19	$1,340,000.00
Lake Shore & Michigan Southern R'y.....	4.5	11.25	19	1,200,000.00
Baltimore & Ohio R. R.....	2.33	3.33	11	500,000.00
South Chicago R. R.	.6	1.2	4	150,000.00
Chicago & Western Indiana R. R.....	1.8	3.8	6	250,000.00
Chicago, Rock Island & Pacific R'y.....	1.4	2.5	4	250,000.00
Chicago, Lake Shore & Eastern R'y.....	.....	.....	.....	20,000.00
	15.13	36.38	63	$3,710,000.00

November 21, 1904, an ordinance was prepared and presented to the City Council for the elevation of the roadbed and tracks of the Chicago & North-Western Railway and the Chicago & Oak Park Elevated Railroad from North Forty-sixth avenue to Austin avenue, elevating 2.53 miles of main tracks and 4.06 miles of all tracks, eliminating 22 grade crossings by subways, at an estimated cost of about $900,000, as follows:

RAILROADS.	Main Tracks.	All Tracks.	Sub-ways.	Estimated Cost.
Chicago & North-Western R'y.....	1.75	2.5	13.	$600,000.00
Chicago & Oak Park Elevated R. R.....	.78	1.56	9.	300,000.00
	2.53	4.06	22.	$900,000.00

February 6, 1905, an ordinance was prepared and presented to the City Council for the elevation of the roadbed and tracks of the Pittsburgh, Cincinnati, Chicago & St. Louis Railway, the Chicago & North-Western Railway, Chicago Terminal Transfer Railroad, Chicago Junction Railway, Chicago, Burlington & Quincy Railroad and the Illinois Northern Railroad in the territory bounded by Twelfth street on the north, Drainage canal on the south, Washtenaw avenue on the west and Robey street on the east, elevating 8.36 miles of main tracks and 26.77 miles of all tracks, eliminating 47 grade crossings by subways, at an estimated cost of $2,050,000, as follows:

RAILROADS.	Main Tracks.	All Tracks.	Sub-ways.	Estimated Cost.
Pittsburgh, Cincinnati, Chicago & St. Louis R'y.	2.20	4.30	12	$900,000.00
Chicago & North-Western R'y	.5	1.25	2	200,000.00
Chicago Terminal Transfer R. R.	2.4	2.5	13	400,000.00
Chicago Junction R'y	1.13	1.2	12	250,000.00
Chicago, Burlington & Quincy R'y	1.73	17.17	8	800,000.00
Illinois Northern R. R.	.30	.60	1	100,000.00
	8.26	27.02	48	$2,050,000.00

GRAND SUMMARY.

Ordinances have been passed by the City Council and accepted by the railroad companies for the elevation of their roadbed and railway tracks from May 23, 1892, to April 6, 1905, covering the following amount of work:

Total number miles of main tracks to be elevated.....153.23
Total number miles of all tracks to be elevated.....746.33
Total number of subways to be constructed..... 567
Total estimated cost of entire work when completed.$48,910,250

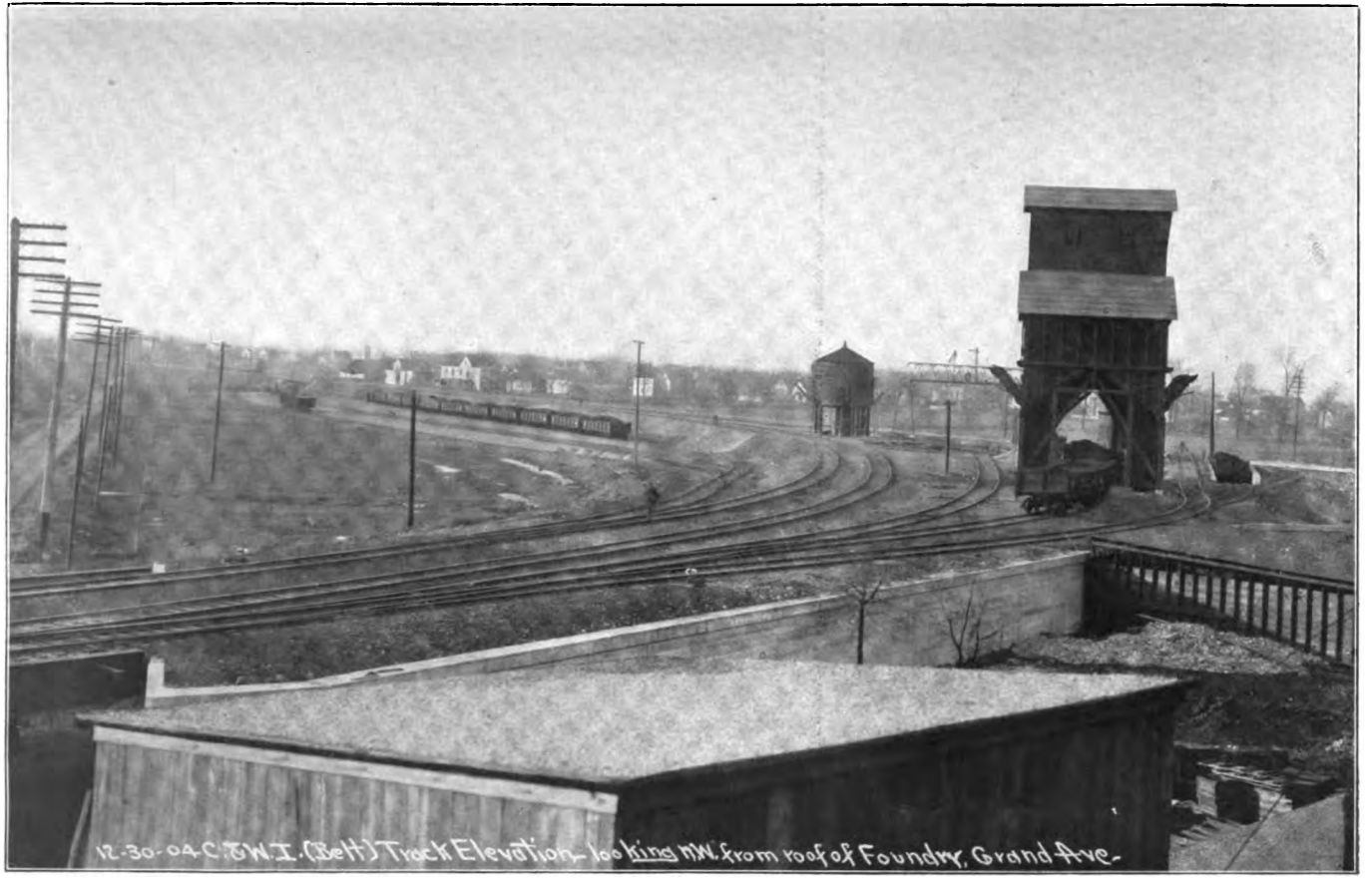
Amount of elevation that has been done from May 23, 1892, to December 31, 1904 as follows:

Total number miles of main tracks elevated.....82.84
Total number miles of all tracks elevated.....425.19
Total number of subways constructed.....360
Total estimated cost of work done.....$28,725,250

Leaving work to be done under all ordinances that have been passed from May 23, 1892, to April 6, 1905, as follows:

Total number of miles of main tracks yet to be elevated.. 70.39
Total number of miles of all tracks yet to be elevated.... 321.14
Total number of subways yet to be constructed..... 216
Total estimated cost of work yet to be completed....$20,185,000

Whenever the two ordinances that have been prepared and presented to the City Council for the elevation of the roadbed and tracks of the Chicago & Northwestern Railway Company and the Chicago & Oak Park Elevated Railroad Company, also the Pittsburgh, Cincinnati, Chicago & St. Louis Railway Company, the Chicago & Northwestern Railway Company, the Chicago

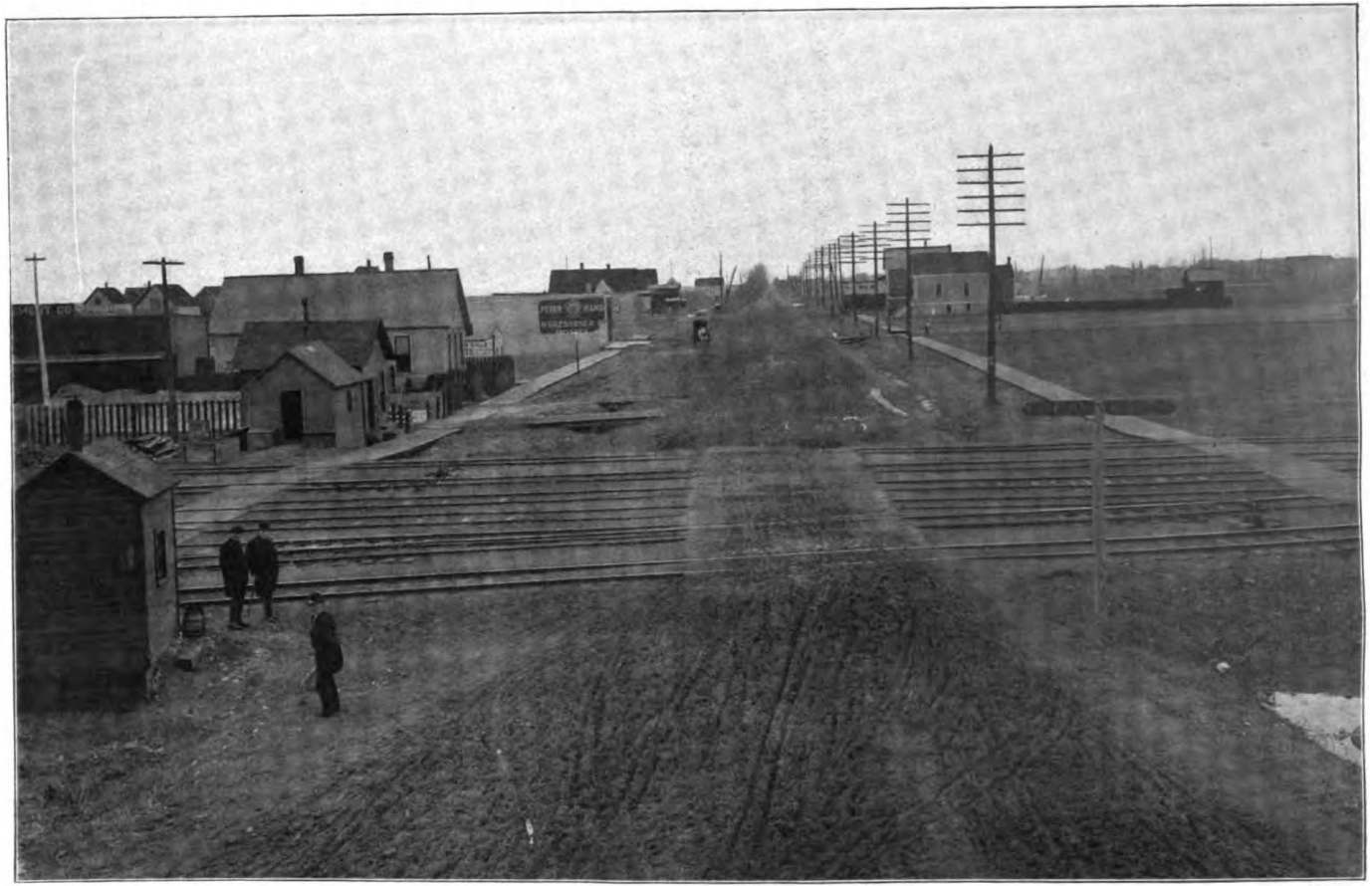


Terminal Transfer Railroad Company, the Chicago Junction Railway Company, the Chicago, Burlington & Quincy Railway Company and the Illinois Northern Railroad Company, in the territory bounded by Twelfth street on the north, Drainage Canal on the south, Washtenaw avenue on the west and Robey street on the east, shall have been passed by the City Council and accepted by the railroad companies, it will make a grand total of work done and to be done under all ordinances passed.....$51,860,250
Leaving work yet to be done..... 23,135,000

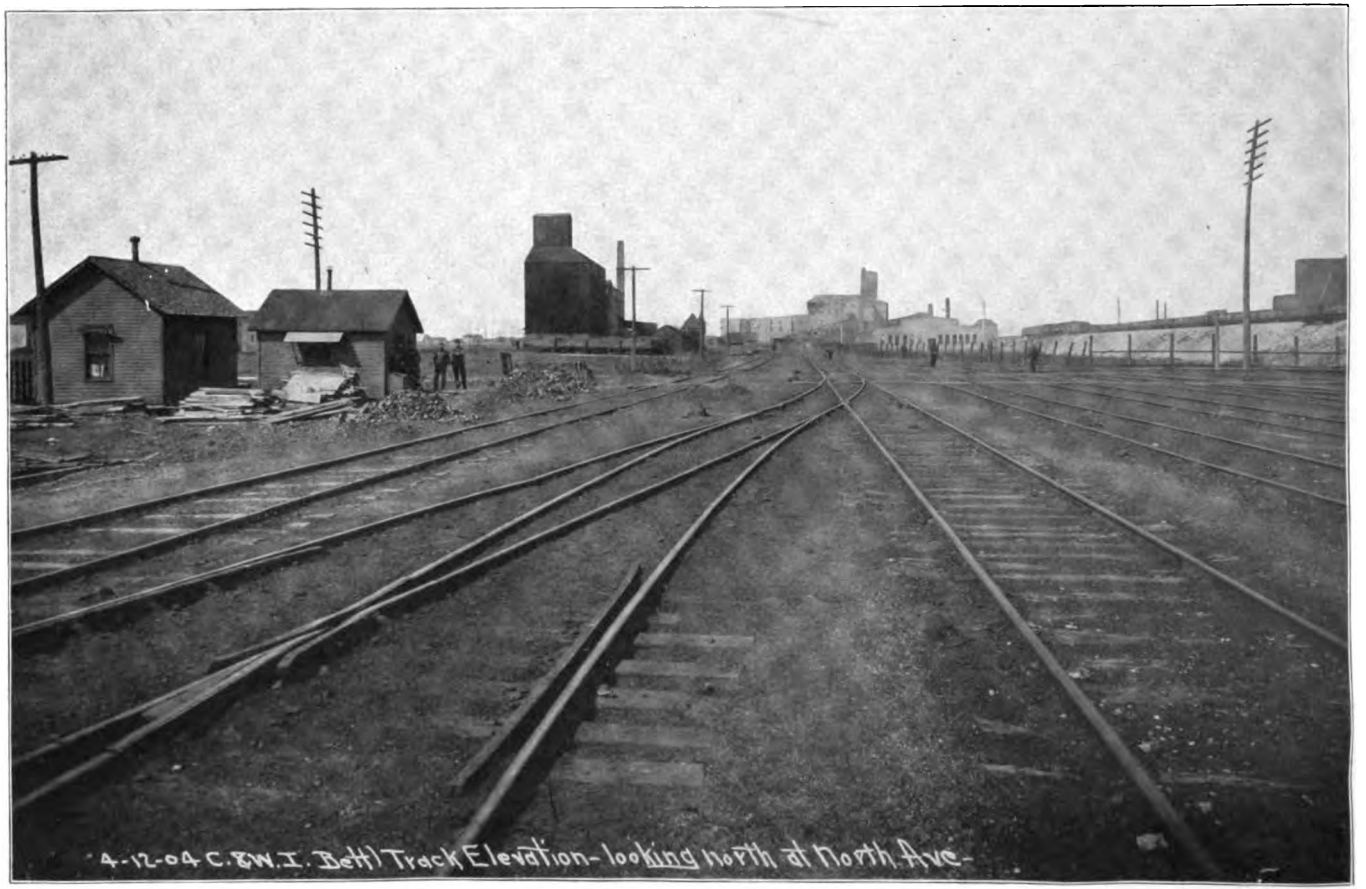
Respectfully submitted,

JOHN O'NEILL,
Track Elevation Expert.

ERFORMED AND UNDER WHAT ADMINISTRATION.

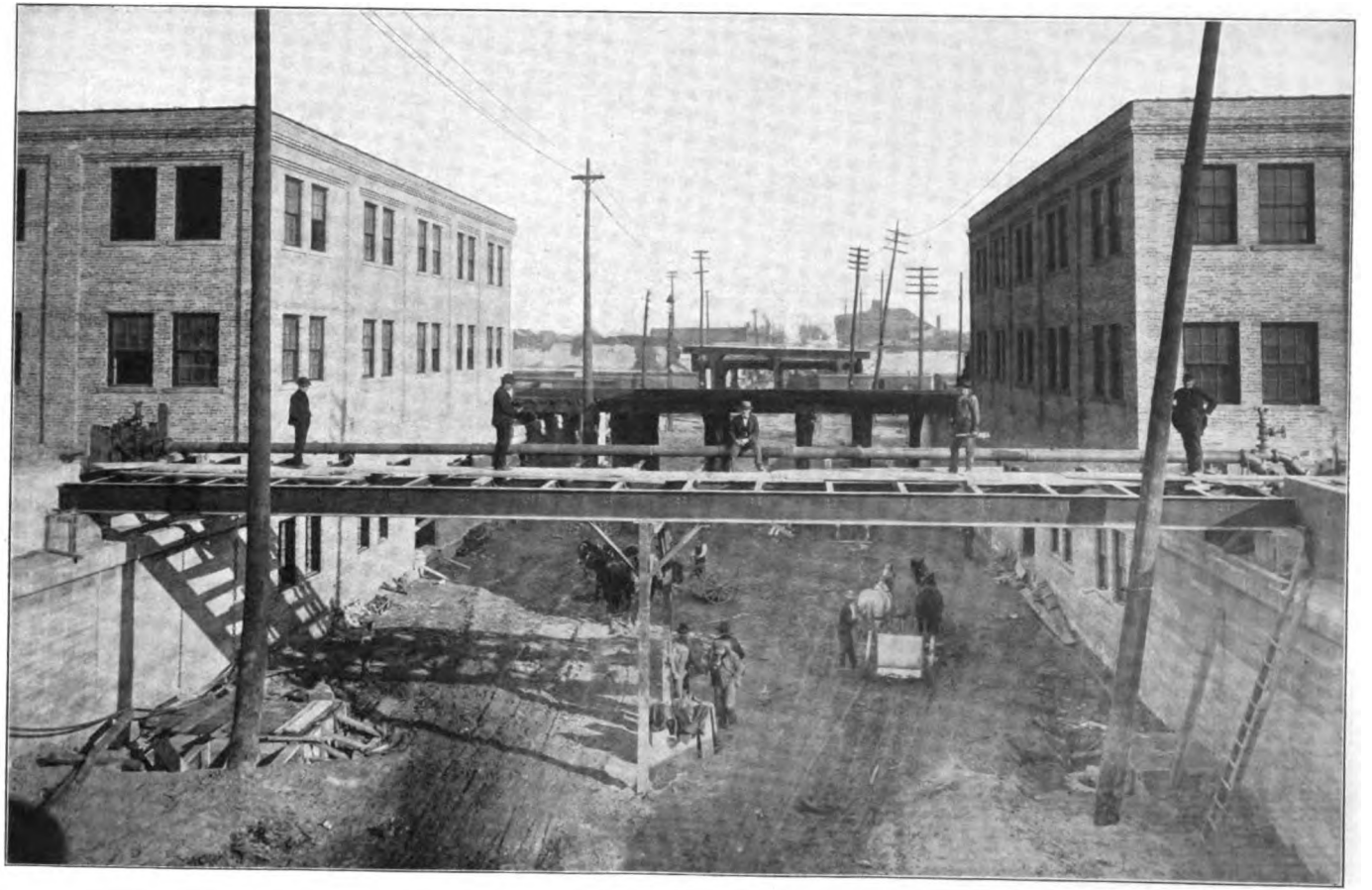


C. & W. I. (BELT) TRACK ELEVATION.—LOOKING WEST ON NORTH AVENUE.—APRIL 12, 1904.



C. & W. I. (Belt Line) Track Elevation.—Looking East on North Avenue.—December 30, 1904.

YARD OF C. & W. I. R. R. BETWEEN FIFTY-FIRST STREET AND FORTY-SEVENTH STREET.

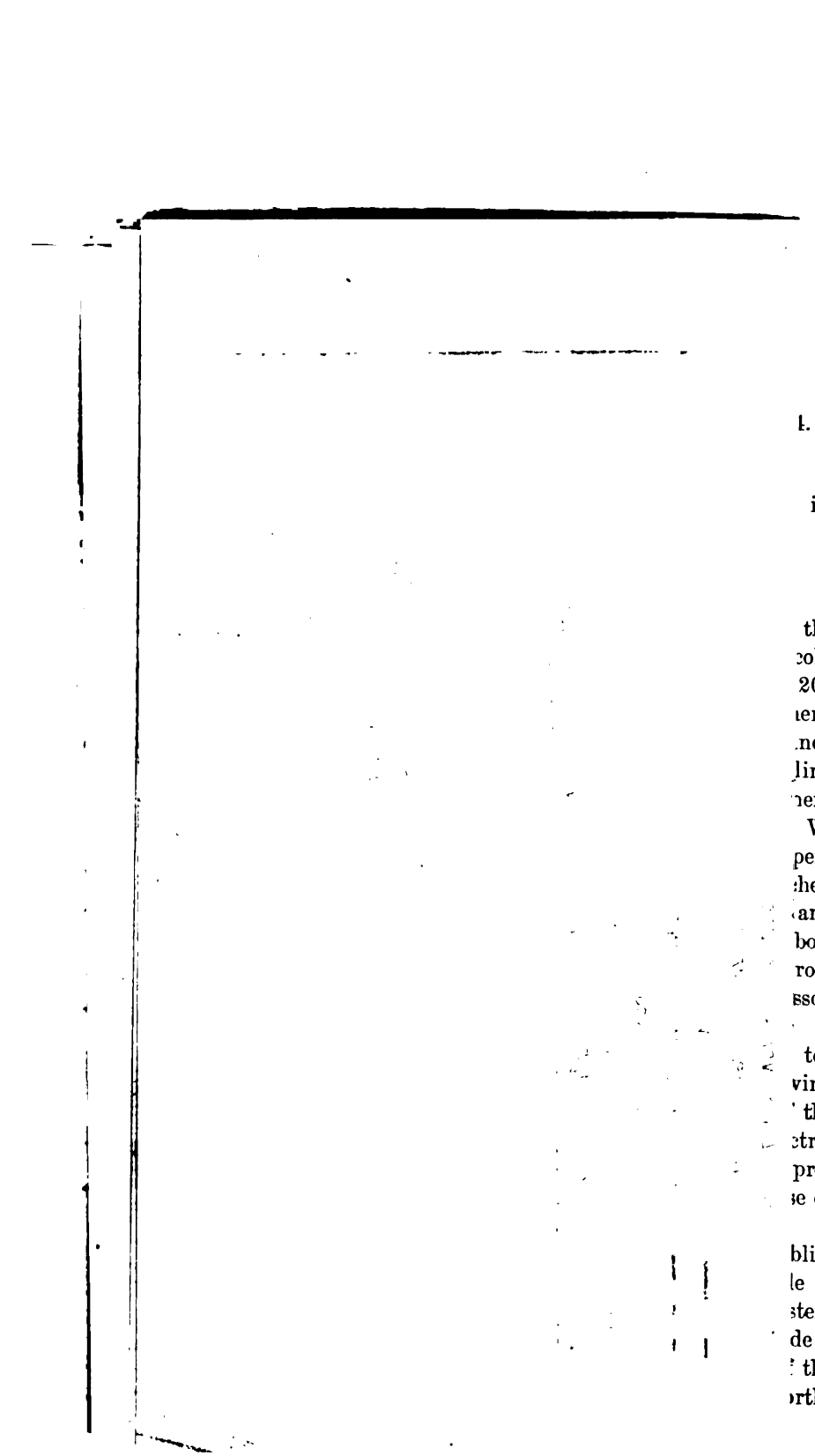


FIFTY-FIRST STREET SUBWAY, C. & W. I. R. R., LOOKING EAST, ALSO POWER HOUSE.

REPORT OF

Special Park Commission

1904



SPECIAL PARK COMMISSION.

CHICAGO, December 31, 1904.

To the Honorable Mayor and City Council of the City of Chicago.

GENTLEMEN: The Special Park Commission herewith submits its report for the year 1904:

MUNICIPAL PLAYGROUNDS.

Your Commission established one additional playground during the year, making nine in operation. The new ground—named the Lincoln—is located on West Chicago avenue, east of Lincoln street. It is 200 feet long and 125 feet deep. Mr. John A. Spoor, acting for the owners, gave the City permission to use the site free of cost as long as it remained unsold. The cost of buildings, electric lights, apparatus, grading, filling and supplies was $2,175. In a large measure the successful establishment of this playground is due to the active co-operation of Alderman A. W. Beilfuss, in whose ward it is located. On the occasion of the formal opening, August 6th, standing room was at a premium. A program of speeches, calisthenics and gymnastic exercises, performances on the apparatus and band music was provided for several thousand residents of the neighborhood. The physical exercises were contributed by groups of children from four other municipal playgrounds, the idea being to give an object lesson in physical culture as taught by playground directors.

The fact was obvious from the start that this playground was too small—due to its popularity and the many thousands of children living in that German neighborhood. If the Commission was given the use of the vacant City property across the alley on the north, adjoining the electric lighting station, an athletic field and a larger skating pond could be provided next year. The City Electrician has been asked to approve the use of this land for an extension of the playground.

The Northwestern Elevated Railroad Company, through the public-spirited efforts of its president, Mr. Clarence Buckingham, has made it possible for your Commission to add another playground to the system next year, providing the appropriation is sufficient. The company made a three-year lease to the City, free of cost, covering the vacant portion of the old Alexian Brothers' Hospital property, under and adjoining the North-

western Elevated structure on Orleans street, north of Schiller street. This site is 494 feet long and 101 feet deep, being situated in the west end of the Twenty-first ward.

Another lease, running three years, without cost to the City, was executed by the Northwestern Elevated Railroad Company for the Orleans playground, located at Orleans street and Institute place, which was opened last year. That makes the third playground site provided on the North side through the free use of this corporation's right of way property, the first one being at Alaska and Larrabee streets.

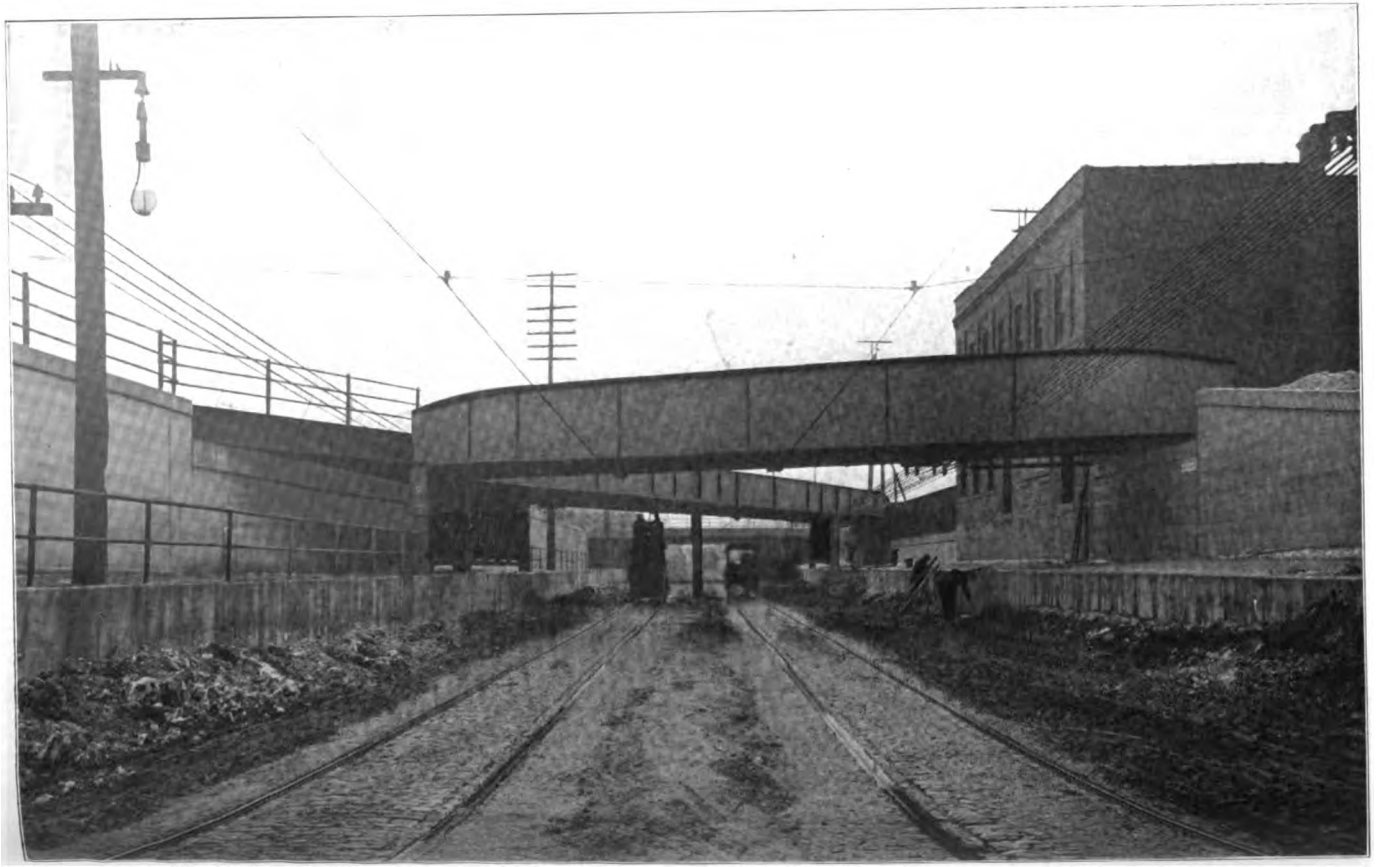
ATTENDANCE MORE THAN A MILLION.

We were fortunate in the small number of accidents and injuries at all the grounds. With an attendance of 1,015,000 for the year, no accident of serious consequence occurred. There were a small number of fractures, involving expense to the parents of the victims; also a number of minor accidents, which the playground directors treated without cost to the family. But no child was crippled, and no permanent injuries were sustained with this immense attendance.

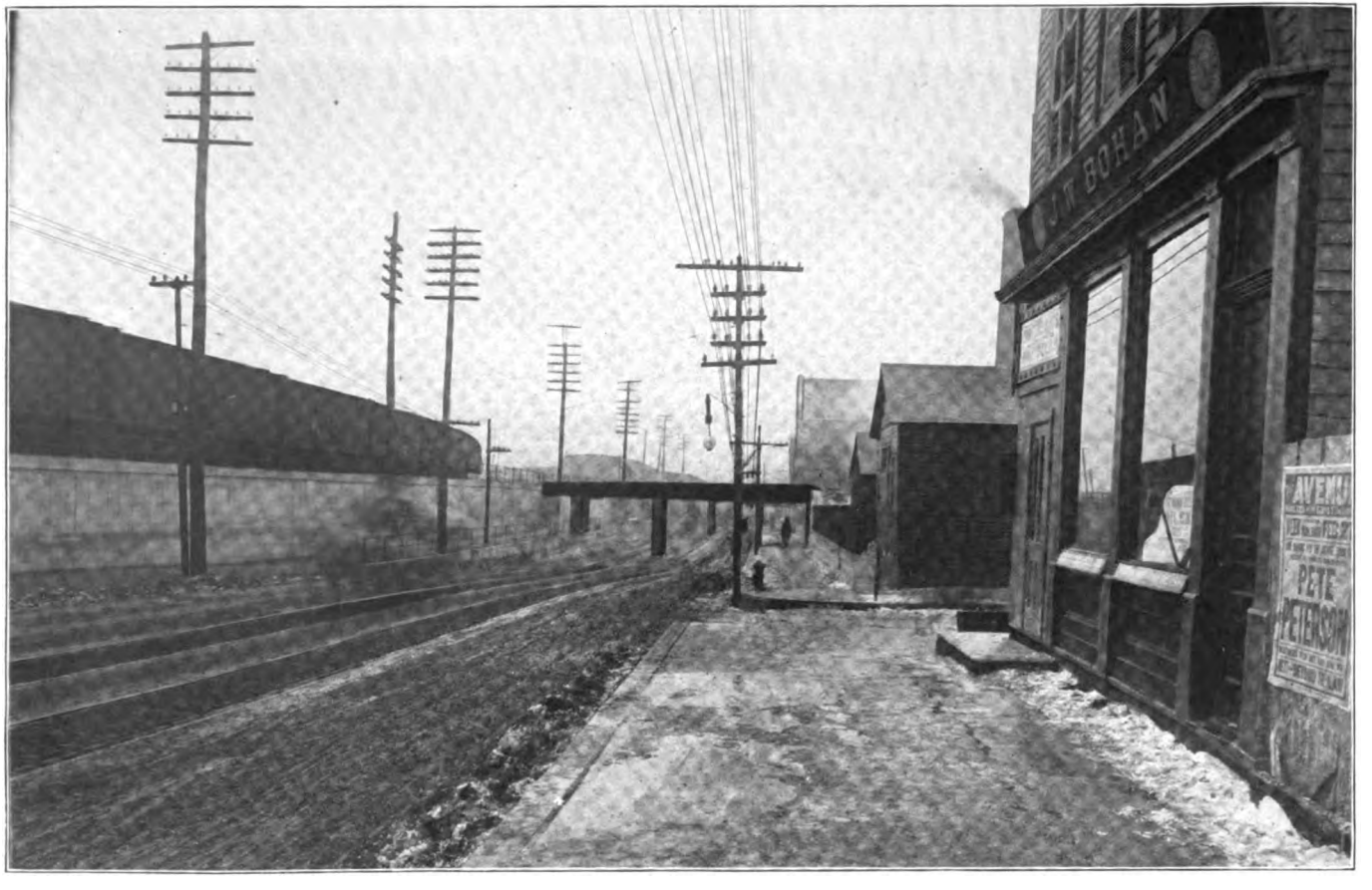
MONTHLY ATTENDANCE AT THE MUNICIPAL PLAYGROUNDS FOR THE YEAR 1904.

Month.	Webster.	McLaren.	Moseley.	Holden.	Adams.	Lincoln.*	North-western.	Orleans.	Jones.	Total.
January	25,955	12,875	11,785	12,200	9,900	.....	Closed	Closed	3,825	76,540
February	7,700	7,400	5,952	6,475	3,425	.....	Closed	Closed	1,625	32,577
March	Closed	Closed	Closed	Closed	Closed	.....	Closed	Closed	Closed	.....
April	9,200	6,350	3,300	Closed	2,075	.....	2,625	3,850	4,975	32,375
May	23,545	16,775	12,650	18,475	8,315	.....	10,100	6,225	4,950	101,035
June	22,575	17,475	10,850	18,205	9,400	.....	8,890	8,259	465	96,119
July	22,180	17,820	8,950	10,305	7,800	.....	11,390	8,373	870	87,688
August	26,000	21,850	10,990	10,370	10,145	20,965	14,540	10,645	4,550	130,055
September	34,450	16,300	11,300	19,790	8,260	25,117	11,880	7,245	6,010	140,352
October	51,350	14,935	10,230	23,362	8,030	17,892	8,925	7,409	5,625	147,758
November	43,300	10,800	8,415	19,513	5,390	11,505	5,890	5,890	1,375	112,078
December	24,600	8,400	6,280	12,500	2,300	4,020	Closed	Closed	Closed	58,100
Total	290,855	150,980	100,702	151,195	75,040	79,499	74,240	57,896	34,270	1,014,677
Grand total										1,014,677

* Playground not established until August 1st.



IN FORTY-SEVENTH STREET SUBWAY.—LOOKING EAST.



FROM THE HEAD OF FORTY-SEVENTH STREET SUBWAY.—LOOKING EAST.

There was a conspicuous improvement over previous years in the desire of patrons to participate in physical culture work. Remarkably few visitors came to the grounds merely to sit around or look on in idleness. Nearly every one wanted to take a hand in one of the various branches of athletics, or else they started some recreation on their own account if a game was not in progress. This gratifying spirit was found principally among the older boys. A visitor at the Webster grounds during the season, after supper time, would find two hundred to three hundred young men in keen competition, jumping, vaulting, running or exercising on various apparatus.

It has been found much easier to start and maintain competitive individual or team sports than to engage boys in regular class exercises. The latter has been demonstrated to be unpopular among working boys. It is too monotonous after their day's toil. The director of athletics and the playground director have learned by experience that it is more successful and practical to allow older boys freedom to choose their forms of sport and exercises. With the younger boys and girls the experience has not been much different. If games or races are proposed, where one can get ahead of another, there will be a rush and scramble to get in. But if a class in calisthenics or gymnastics should be proposed, only a few interested ones respond.

Because of its ampler track and field facilities the bulk of athletic work was done at the Webster playground. At the McLaren and Moseley grounds, which have small fields, the athletic spirit was fostered so far as practicable. At the Holden, Northwestern, Adams and Lincoln grounds the work was limited necessarily to calisthenics, flag drills, class and "home-made" exercises on apparatus. The smallness of the Orleans and Jones grounds precluded the working out of physical culture plans with any degree of success.

SUCCESSFUL FOOTBALL AND BASEBALL SEASONS.

Free entertainment was afforded thousands of people on the Webster field during the football and baseball seasons. Owing to the injection of "prairie football" tactics into regular games played on the Webster field it was found necessary last year to discontinue Sunday games between prairie elevens. However, under different regulations, Sunday sport was resumed this year, with the result that former obnoxious and dangerous features were eliminated. This improvement was accomplished by the athletic director, Max Beutner, appointing his own officials, by insisting upon rigid compliance with the rulings, by having ample police protection and by confining the thousands of spectators back of the side lines by means of special wooden railings. There were approximately 50,000 onlookers

during the season of twelve Sundays, who looked forward to these weekly contests for their regular holiday entertainment.

There were three home football teams—Cornells, Websters and Young Websters. Cornell played ten games and won all; Webster played eleven games and won eight; the Young Websters played fourteen games, won thirteen and tied one. Numerous minor teams also played games on this field.

Two track teams were organized at the Webster playground, one composed of boys over fifteen years, and the other of boys under twelve years. The older team was made up exclusively of working boys. The members of both teams were raw when they joined, their development being due entirely to municipal playground training. They trained in the summer evenings and competed Saturday afternoons. Their opponents were mostly high school boys. The Websters won twelve competitive meets, the Young Websters winning four out of six meets. In basketball the Websters won all of six games played. In baseball the Festeens, a Webster playground team, played twenty-four games and lost two. They played Saturday and Sunday afternoons, affording entertainment for thousands of spectators.

A specialty of running and indoor baseball was made on the field of the McLaren playground, contests between boy and girl teams being a successful novelty.

At the Moseley playground the twelve-lap running track gave the younger element an opportunity to develop in athletics. The field was large enough for the practice work of two football teams, the competitive games being played on the Webster gridiron.

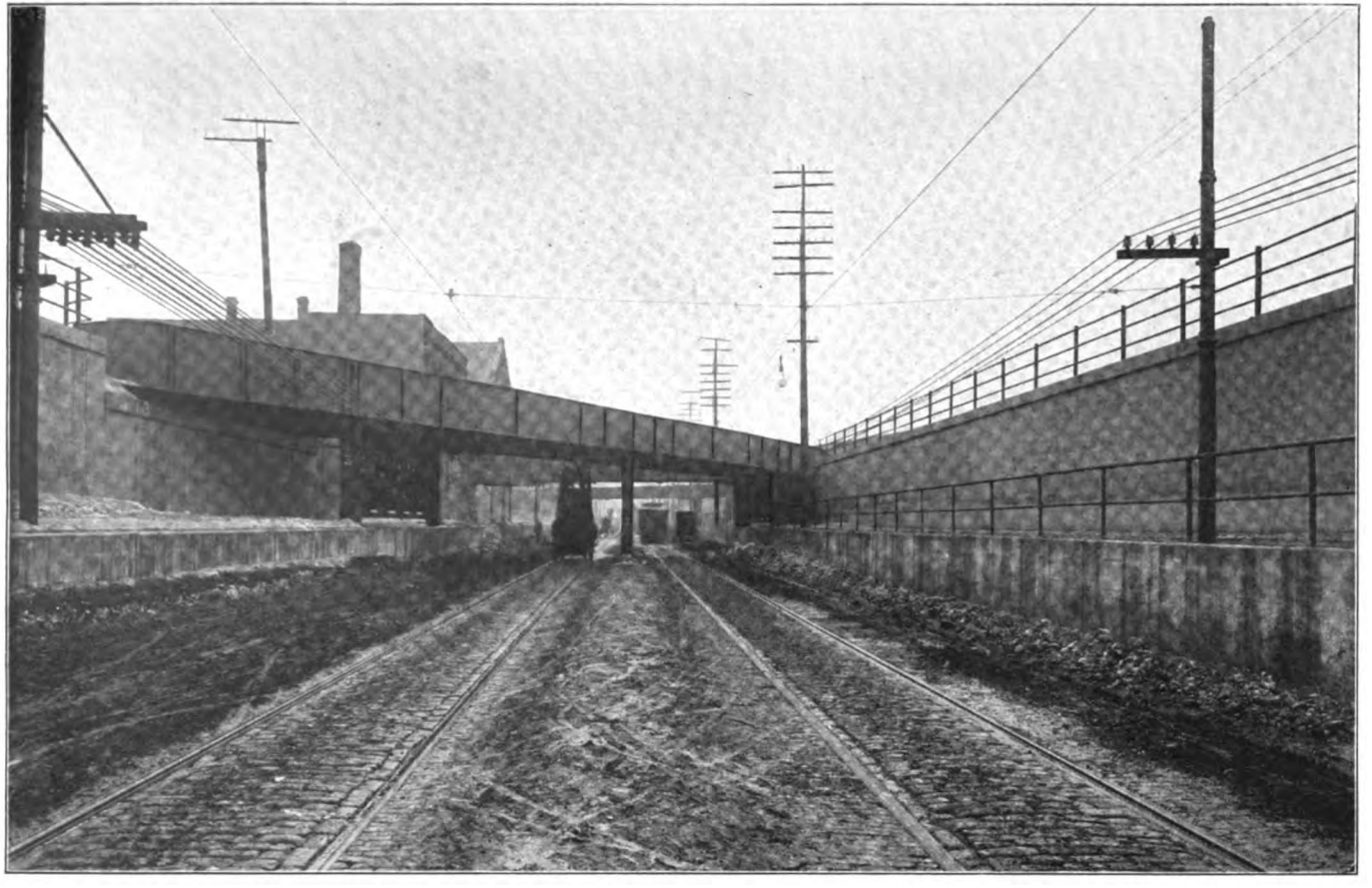
During last winter the public was given sixty-seven days of good skating at all grounds where ponds were provided.

PROBLEM OF WEST SIDE PLAYGROUNDS.

Alderman Hoffmann has urged the establishment of a municipal playground in the Eleventh ward, at Ashland avenue and Thirteenth street. He believes the use of an ample site could be obtained at little or no cost to the City. However, it would be waste of effort and imposing on the owners of the land for your Commission to arrange a lease before funds were available, either from City Council appropriation or from gifts of citizens.

The Eleventh ward is only one of half a dozen in the so-called tenement or river wards of the densely populated West side that are barren of playgrounds for children. The other wards are the Ninth, Tenth, Twelfth, Sixteenth and Seventeenth. Criticism has been heard that we do not provide recreation grounds in these neglected centers of congestion. Your Commission would do so quickly if sites and money for equipment and maintenance were within reach. Not a dollar has been paid in the last four

FROM THE HEAD OF THE APPROACH OF FORTY-SEVENTH STREET SUBWAY. LOOKING WEST.



IN THE FORTY-SEVENTH STREET SUBWAY.—LOOKING EAST.

years for purchase and only a nominal amount for lease of playground property. The site question is the most troublesome one to overcome in these West side wards. The majority of them have no suitable vacant land. Density of population means building on all available land. So the making of small parks and playgrounds in those wards means the purchase of many buildings before the land can be used.

Relief has been hoped for by citizens of the West side through the sale of $1,000,000 of bonds by the West Park Board since 1901, but their deliverance from intolerable conditions appears far off. Consolidation of the park boards under the new charter may bring these recreation spots to the West side. If authority is given the City to largely increase its bonded indebtedness, your Commission urges that ample provision be made for the purchase of small park and playground property, not only for the purpose of rounding out a system for the populous regions, but also for the purpose of securing to the public those playgrounds which are being held now by a slender thread.

As an instance of the insecure tenure of half a dozen municipal playgrounds may be cited the Jones ground, on Plymouth court, near Polk street. This resort for First ward children was conducted as a philanthropic enterprise originally by Mrs. N. Alma Courtright, then a teacher at the Jones school, close by the playground. Verbal permission to use the land free of cost until it was sold or leased was granted by the owners, the M. C. Stearns estate. Upon the departure of Mrs. Courtright for India your Commission was asked to maintain this playground, and has done so since October, 1901, under the same agreement with the land owners. On December 9 legal notice was received from the agents of the Stearns estate that it was desired to terminate the City's tenancy of the property thirty days from that date. This action was not a surprise, as with new buildings reared on both sides of this site we expected that such valuable land would soon be needed for commercial purposes.

ASSISTANCE GIVEN TO PLAYGROUNDS.

A small summer playground was established in the Twenty-eighth ward at the urgent request of Alderman Walter J. Raymer and Mrs. H. Falkenstein, head resident of the Armitage Avenue Social Settlement. It is located next to the settlement house, on Armitage avenue, opposite Francisco avenue, the area being 38 by 150 feet. Mr. Clarence Buckingham, a member of your Commission, gave $151 toward the equipment, and the remainder of the expense, $171, was met by the Commission. Management of the playground was undertaken by the settlement workers, who report it a boon to their community.

At the solicitation of Alderman John E. Scully, $205 was expended by the Commission in improving the athletic field at Washtenaw avenue and Lexington street, in the Thirteenth ward. A regulation baseball diamond was made and ample seating accommodation provided for spectators. During the season many high-class games were played between regular club teams on this field. A start was also made in excavating for a cinder running track outside the ball field.

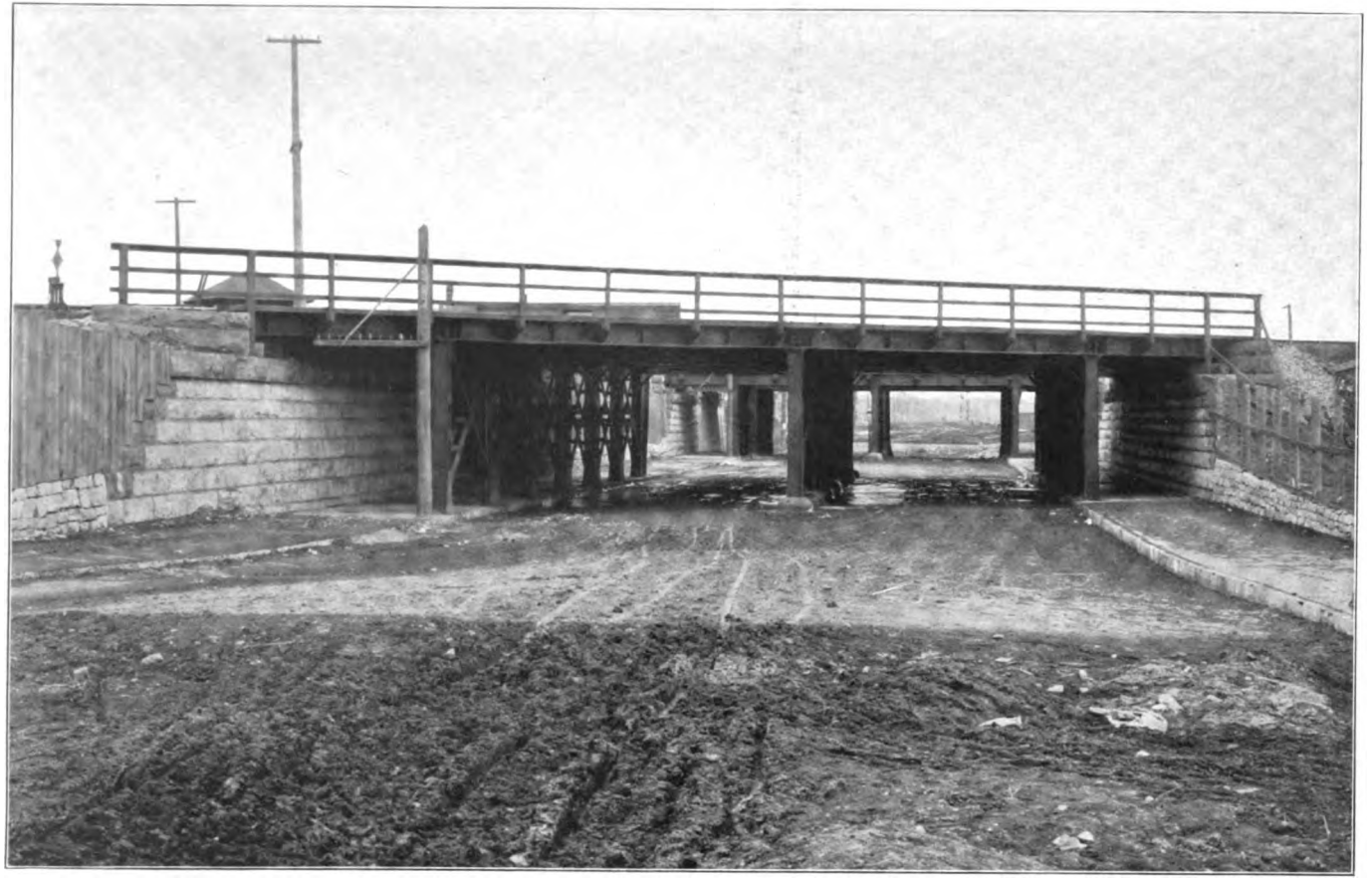
The third annual gift of $100 came from the Merchants' Club for the purchase of prizes to be awarded to winners in athletic sports. For the first two years this practical gift has been used for one central meet held on the Webster field, competitors coming there from the other municipal playgrounds. But it was felt that this arrangement favored the children who attended the Webster grounds, while placing a financial handicap on the outsiders who were compelled to pay street car fares. So this year the money was divided into eight parts, more races provided for small children and separate meets held at all grounds except the Jones. As a result the children and their parents were better pleased, there was a greater range as to ages and the smaller grounds could hardly contain the lines of eager competitors. About 800 boys and girls put their best foot forward at each of the playgrounds.

For the physical culture competition at the Northwestern Elevated playground Mr. Buckingham gave $20 to add to the prize list. At this ground also a party of women interested in the work brought bouquets of flowers and distributed them among the children. A small number of prizes at all the grounds was provided for the girls who had excelled in the raffia weaving work under supervision of the assistant directors.

KINDERGARTEN WORK ENLARGED.

Such beneficial work was done by the trained kindergarten women, serving as assistant directors during July and August last year at five of the playgrounds, that this feature of the system was extended to three other grounds—the Orleans, the Northwestern Elevated and the Lincoln. Mothers compelled to work for the support of their families brought their little ones to the nearest playground before going to their daily toil, leaving them in full confidence to the care of the assistant director. On their way home these mothers would find their children tired, but safe and happy after a day of play and instruction in kindergarten work. During the first year the attendance of small children during the summer vacation was small. They did not want to be taught anything during the holidays. But gradually all prejudice and opposition have been overcome. Last summer groups of children waited on the street corner for the coming of the kindergartner, not only willing, but anxious to spend all day with their "teach-

C. & N.-W. Ry., Mayfair Cut-off, Track Elevation.—Chicago Avenue Subway.



C. & N.-W. Ry., Mayfair Cut-off, Track Elevation.—Chicago Avenue Subway.

ers." On the closing day of this branch of work the youngsters exhibited with pride the various objects of their handiwork.

The beautifying of the playgrounds has not been an unqualified success. The trees have been a welcome improvement, affording some shade and relieving the monotony of the playground view. But with the exception of the Adams ground, where the flowers, vines and shrubs were protected by special fences, vines in all grounds have been a failure. It has been impossible during the first season to preserve the vines in these grounds from the fingers of children who do not realize that their acts are destructive. It is intended to repeat the vine planting next year and better results will be sought.

A successful beautifying scheme was put in operation at two playgrounds by Mr. Buckingham. He gave large baskets of flowers, ferns and other plants for the Orleans and Northwestern Elevated grounds. At the former ground the baskets were suspended from brackets attached to the electric light poles. At the latter ground the baskets were hung out from the superstructure of the elevated road, in both cases out of harm's way.

PLAYGROUND IMPROVEMENT WORK.

The principal improvements made at the playgrounds, in addition to miscellaneous repairs, new apparatus and painting, was as follows:

WEBSTER—Seventy-five lockers added to the shower-bath house, running track resurfaced, baseball diamond laid out, athletic field graded, skating pond enlarged practically to the boundary of the athletic field, making the largest skating area outside of the large parks. The summer shelter building was enclosed and heated, making a warming house during the skating season.

HOLDEN—Skeleton plank walk on Bonfield street side removed and cinder walk laid; grounds filled and graded with cinders; new wire put on Bonfield street fence.

ADAMS—Fencing to protect shrubbery and vines inside ground.

ORLEANS—Three electric lights, water supply for drinking purposes and sprinkling; canvas shelter for summer use; ground graded with cinders.

MCLAREN—Water supply in parkway for sprinkling; south division of grounds filled and graded with cinders.

MOSELEY—New wire put on street sides of fence.

Because of the overloaded condition of the City's circuit it was impossible to obtain current from the municipal station for the electric lights at the Orleans playground. The Commonwealth Electric Company made a gift of the current until the close of the ground, December 1st, the cost of which would have been $218.

Your Commission desires to thank the Commonwealth Electric Company, Mr. Clarence Buckingham, the Merchants' Club, the Northwestern Elevated Railroad Company and the chiefs of the police, fire and electrical departments for donations mentioned and services rendered.

COMMISSION AND PLAYGROUND EXPENDITURES.

Following is a statement of expenditures for the year:

General office supplies, stationery, printing maps, advertising, telephone, draughtsmen's work on maps and plans, expenses of Superintendent and Secretary		$ 557 69
Secretary		1,350 00
Superintendent and athletic director		1,350 00
Teaming, labor and lumber for athletic field at Washtenaw avenue and Lexington street		205 52
Apparatus, sand court, cinders and supplies for playground on Armitage avenue, opposite Francisco avenue		171 27
General supplies, grading, teaming, cinders and dirt filling, removing snow and material, nine playgrounds		682 88
Lincoln Playground, West Chicago avenue, east of Lincoln street:		
Buildings, new apparatus, electric lights, sundry construction	$1,503 87	
Supplies, repairs, painting, teaming, grading	422 81	
Playground director, five months	424 00	
Assistant director, one month	50 00	
Labor	248 25	
		2,648 93
Webster Playground, Thirty-third and La Salle streets:		
Supplies, apparatus, repairs, renewals, painting, teaming, grading	966 93	
Playground director	1,080 00	
Assistant director, two months	100 00	
Labor	780 59	
		2,927 52
Holden Playground, Bonfield street, north of Thirty-first street:		
Supplies, apparatus, repairs, renewals, painting, teaming	410 96	
Playground director	1,029 45	
Assistant director, two months	100 00	
Labor	11 25	
		1,551 66
Adams Playground, Seminary avenue, south of Center street:		
Supplies, repairs, renewals, painting	401 24	
Playground director	1,032 00	
Assistant director, two months	100 00	
		1,533 24

C. & N.-W. Ry., Mayfair Cut-off, Track Elevation. – North Avenue Subway.

C. & N.-W. Ry., Mayfair Cut-off, Track Elevation.—Grand Avenue Subway.

Moseley Playground, Twenty-fourth street and Wabash avenue:		
Supplies, repairs, apparatus, renewals, painting	$ 309 33	
Playground director	1,032 00	
Assistant director, two months	100 00	
Labor	13 25	
		$ 1,454 58
McLaren Playground, West Polk street, west of Laflin street:		
Supplies, apparatus, renewals, repairs, painting, teaming	305 99	
Playground director	1,032 00	
Assistant director, two months	100 00	
Labor	13 25	
		1,451 24
Jones Playground, Plymouth court, south of Harrison street:		
Supplies, repairs, renewals, painting	134 52	
Playground director	864 00	
		998 52
Orleans Playground, Orleans street and Institute place:		
Apparatus, repairs, supplies, water service, electric lights	326 67	
Playground director, eight months	592 50	
Assistant director, one month	50 00	
		969 17
Northwestern Elevated Playground, Alaska and Town streets:		
Supplies, repairs, renewals, painting	234 09	
Playground director, eight months	565 00	
Assistant director, one month	50 00	
		849 09
Total		$18,701 31
Under contract for printing Metropolitan Park report.		1,296 00
Total expended and under contract		$19,997 31
Unexpended balance of appropriation		2 69

Expenditures for salaries of Superintendent, Directors, Assistant Directors and labor, six playgrounds for twelve months, two playgrounds for eight months and one playground for five months aggregated $10,717.54.

Expenditures for equipment, construction, supplies, repairs, teaming, grading and filling, nine playgrounds, aggregated $5,699.29, a total for all purposes of $16,416.83.

NORTH SIDE PARK AND PLAYGROUND EXTENSION.

After making a careful study of the sites recommended by your Commission for small parks and playgrounds in the town of North Chicago and obtaining expert valuation the Commissioners of Lincoln Park decided to accept three of the four recommendations submitted two years ago. The fourth site, located north of Willow street, between Burling and Orchard

streets, was discarded for the present, partly because conditions are not so bad as farther south and partly because the board has estimated it cannot establish four parks out of the $500,000 bond issue authorized.

The first site which will be acquired is known as the House of Good Shepherd property, a block of 1¾ acres bounded by Elm, Hill, Orleans and Sedgwick streets. An agreement has been reached between the Park Board and the owners to buy the land and building for $100,000. The Convent Sisters have asked to retain possession until they can remove to their new home, so that the work of park improvement may not be started until August 1st.

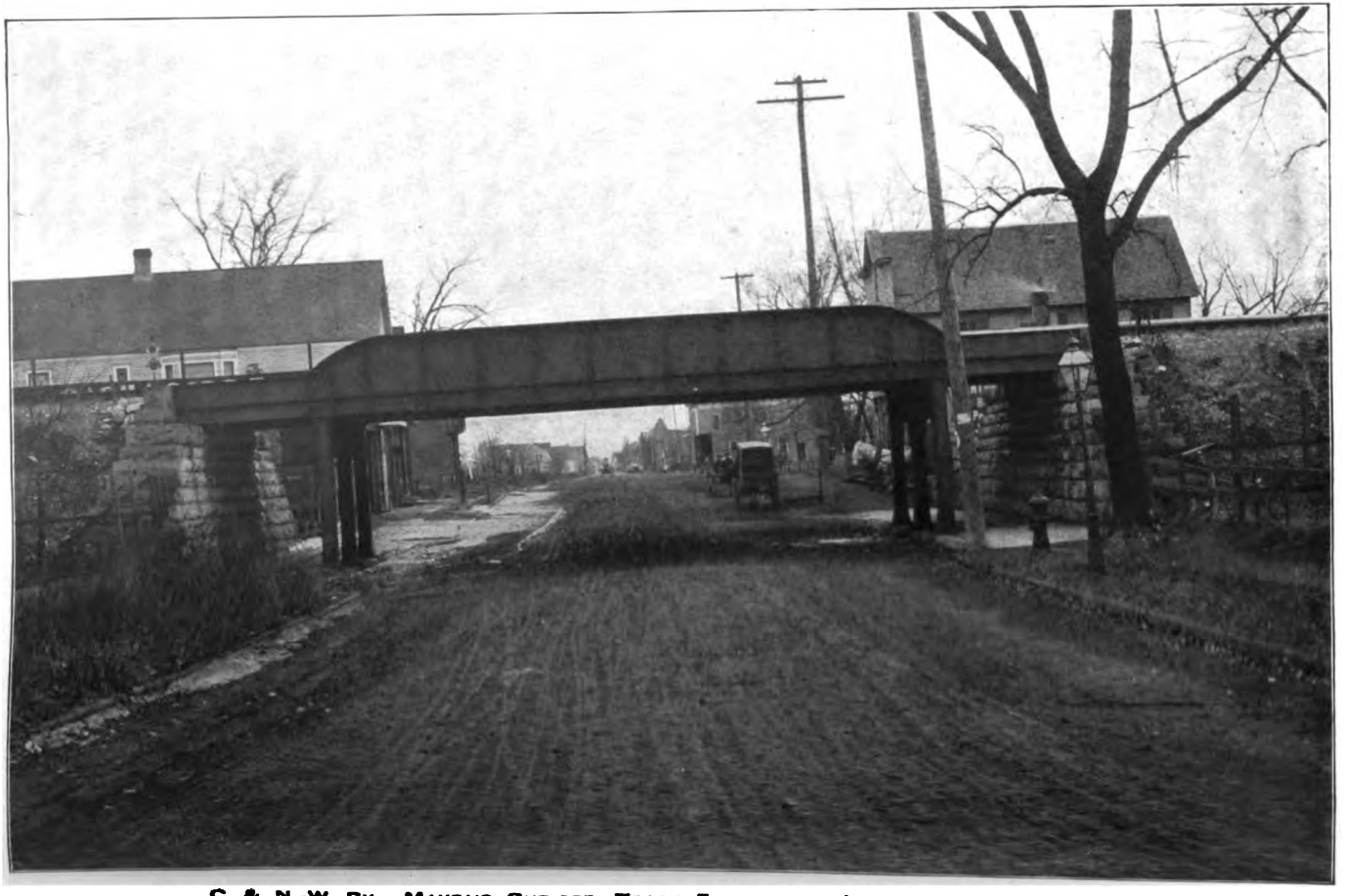
The second recreation ground is situated on the south side of Oak street, between Gault court and Milton avenue, extending 333 feet, an area of 1 3-10 acres.

Out of the large area submitted for the third site the Park Board has selected a compact piece bounded by Vine street, Gardner street, Vedder street and the Schiller School property, in area 2 54-100 acres. This selection was governed chiefly by the considerations of comparative cost. It is hoped by the board that the last two sites will be acquired quickly, providing the property can be bought at a reasonable price without the tedious delay of condemnation proceedings. The bonds are ready to be sold whenever funds are needed for the purchase of property.

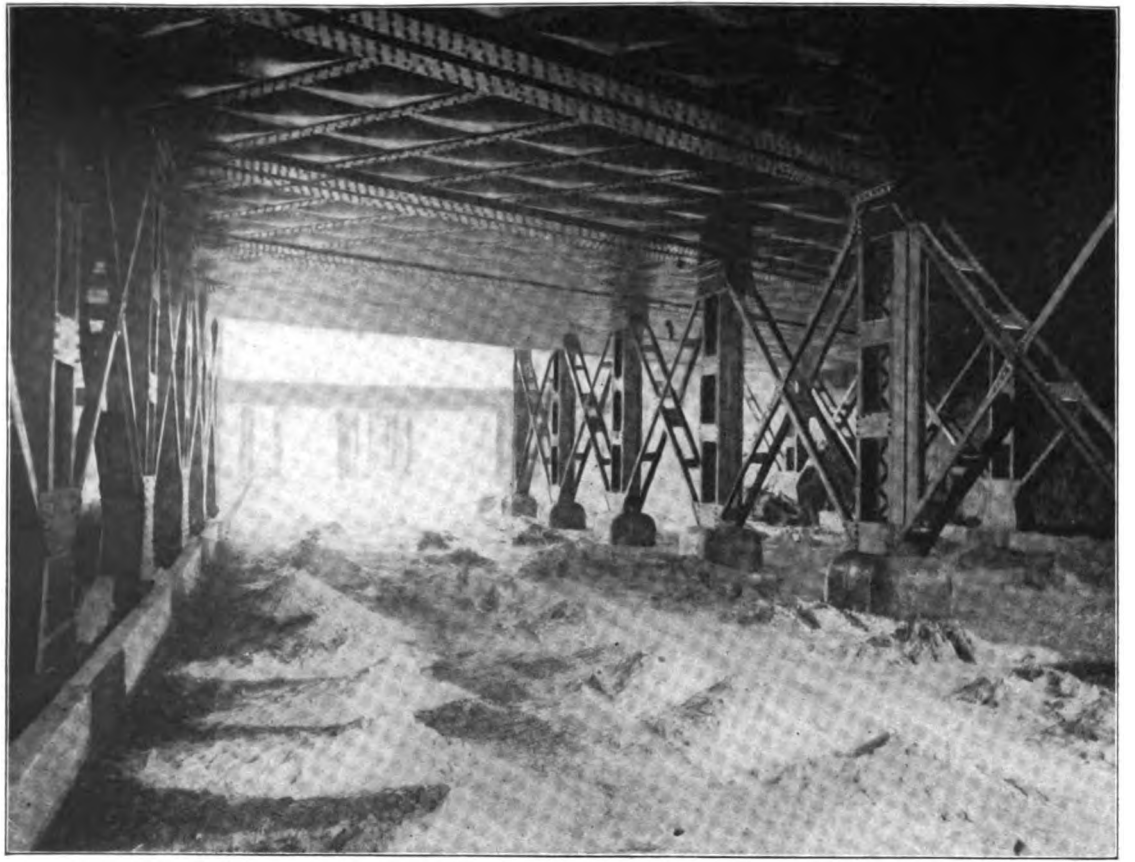
The sale of $1,000,000 of bonds authorized by the Legislature for the extension of Lincoln Park was negotiated by the Board. Settlements were reached with property owners along the lake shore between Fullerton avenue and Cornelia street as to their holdings and riparian rights. Considerable work has been done by the Board preparatory to filling in the submerged land and constructing breakwaters. Difficult engineering problems have to be met on account of the deep water of variable depth and the strong wave action along that part of the lake shore.

SMALL PARKS—WEST DIVISION.

For the purpose of having the validity of the small park bond act applicable to the West side adjudicated by the Supreme Court, proceedings were begun during the summer. Such action was necessary before a market could be found for the $1,000,000 of bonds authorized by the Legislature in 1901 to be issued by the West Park Board. First a suit for an injunction restraining the Park Commission and other officials from issuing the bonds was filed in the Superior Court by Charles Hull Ewing, a West side taxpayer. The bill alleged that the act which your Commission was instrumental in having enacted was unconstitutional in so far as it was special legislation. A demurrer to the petition was filed by the West Chicago Park



C. & N.-W. Ry., Mayfair Cut-off, Track Elevation.—Armitage Avenue Subway.



UNDER CHICAGO AVENUE SUBWAY.

Commission. June 20th this demurrer was sustained by Judge Brentano, who granted an appeal to the Supreme Court.

After this appeal was taken it was discovered that the bill did not cover another contention raised by the West Park Board and bond attorneys, namely, that the act did not comply with the constitutional requirement in failing to provide a sufficient tax to create a sinking fund for the redemption of the bonds in twenty years and to pay interest charges. Accordingly a second suit for an injunction similar to the original one was filed by Philo F. Pettibone, raising the other technicality. Another demurrer, filed by the West Park Board, was sustained by the court and an appeal taken.

The case on both points was argued before the Supreme Court and taken under advisement. A decision was expected to be handed down in December, but it is now looked for during the next term of the Supreme Court, about the middle of February. The City Homes Association was actively interested in the prosecution of both these suits, with the knowledge and approval of your Commission, as the quickest measure of relief from the vexatious delays in getting breathing spaces and playgrounds on the West Side.

SOUTH DIVISION—NEW PARKS.

Partial fruition of the movement initiated by your Commission for park and playground extension was in evidence this winter on the South side. The Park Commissioners of that district made rapid progress in improvement work on several of the smaller sites, which are expected to be finished early next summer. Ten of the fourteen parks and squares which are being established in the south division were provided this winter with skating ponds and toboggan slides. This is a welcome addition to Chicago's public recreation facilities.

The South Park Commissioners rescinded their action in selecting for the Thirtieth ward small park and playground the tract bounded by Forty-fourth street, Forty-fifth street, Wallace street and Butler street, which was three blocks from one of two sites recommended by your Commission for that ward. After a year's delay considering other sites in the ward the Board selected the larger site recommended by your Commission—the tract bounded by Forty-fifth place, Forty-sixth place, Princeton avenue and the Chicago & Fort Wayne Railroad, an area of 7 acres. The selection of this site made the last link in the chain of new parks and playgrounds which are being established out of the recent bond issues on the South side.

It is gratifying to note that the general recommendations made by your Commission in regard to the improvement of new park sites have been car-

ried out by the South Park Commissioners. Where the areas acquired come within the limitations of the small park act, the Board has adopted a uniform policy of having predominating playground features in preference to ornamental park effects. Each park, or square, is being provided with a field house, containing gymnasiums, shower and plunge baths, refectory, a neighborhood assembly hall, with rooms for a library, clubs, lectures and social gatherings; also outdoor recreation facilities, such as gymnasiums, wading pool, natatorium, athletic field, concert grove, running track, football, baseball, tennis court, skating and tobogganing.

The South Park Commissioners accepted the ordinance which was passed by the City Council July 20, 1903, transferring from the jurisdiction of the City to that of the Park Board that portion of Grant Park lying west of the Illinois Central Railroad, between Jackson boulevard and Randolph street. This act completed the legislation needed to vest title in the Park Commissioners to the whole of the lake front park, existing and projected.

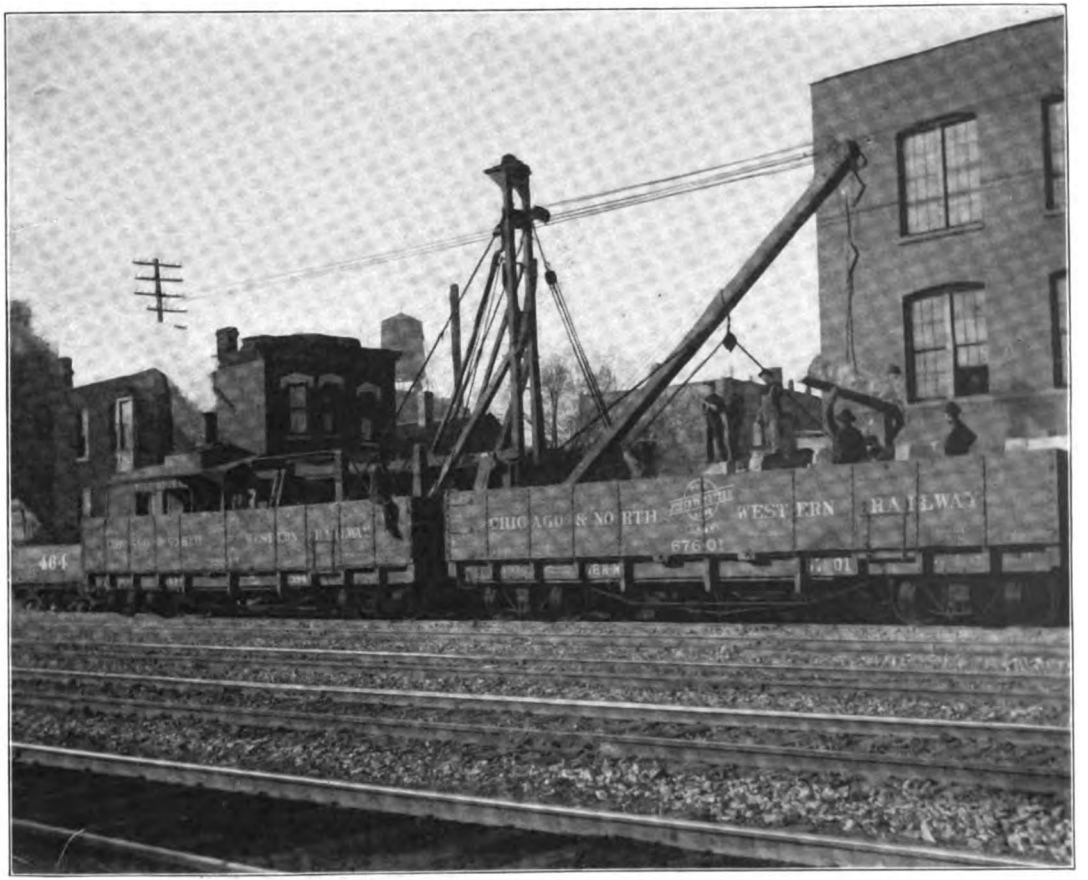
Mr. Dwight H. Perkins completed his special report on the subject of a metropolitan park system, which was approved by your Commission and ordered published for transmission to your honorable body.

July 12th the Outer Belt Park Commission, reference to which was made in the last annual report, effected a permanent organization by the election of officers for the ensuing year, and by the adoption of by-laws. Since then the activity of this organization has been suspended, pending the receipt of the metropolitan park system report from your Commission.

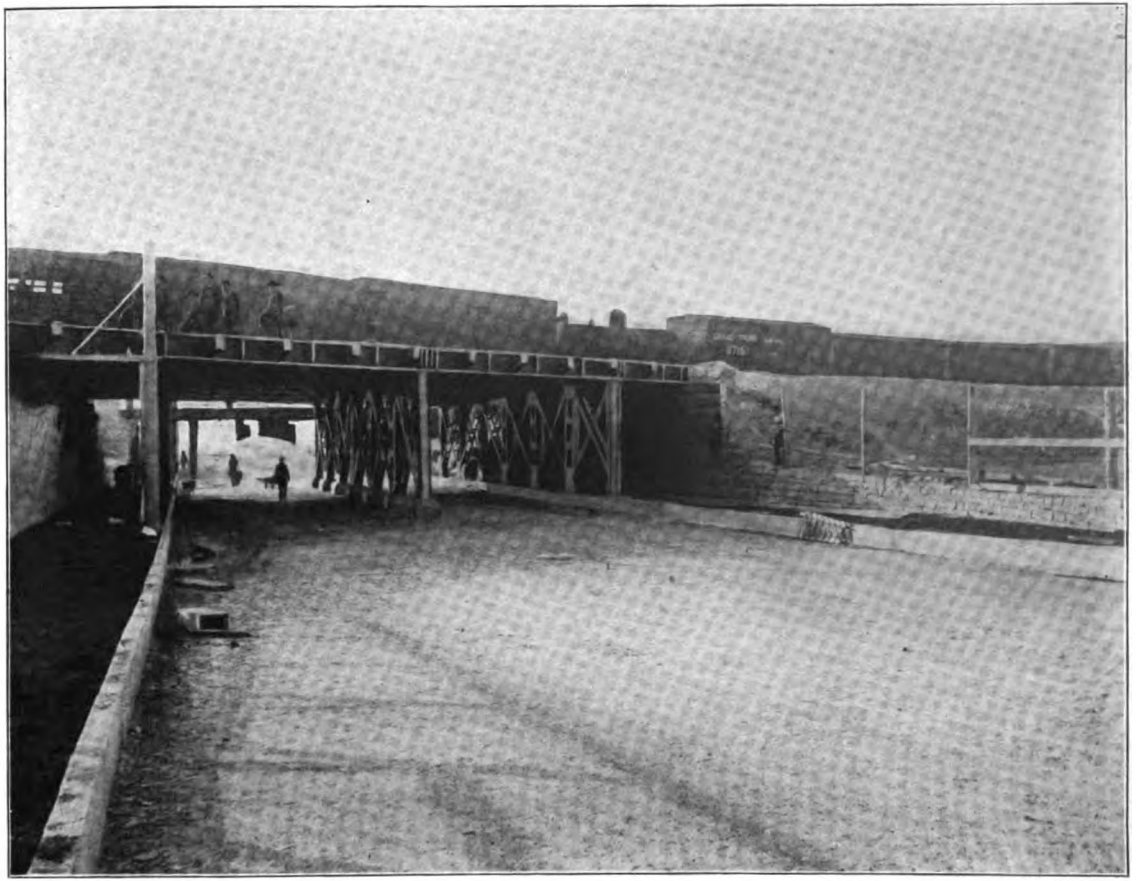
Respectfully submitted,

A. W. O'NEILL,
Secretary.

JOHN J. BRADLEY,
Chairman.



PILE DRIVER DERRICK, WEST OF WOOD STREET.



CHICAGO AVENUE SUBWAY FROM EAST.

ARMITAGE AVENUE SUBWAY FROM SOUTHWEST.

Bookkeeper's Statement

BOOKKEEPER'S STATEMENT.

HON. F. W. BLOCKI,
Commissioner of Public Works.

DEAR SIR: I herewith respectfully submit statement in detail of the receipts and expenditures of the Department of Public Works for fiscal year ending December 31, 1904:

CORPORATE FUND.

EXPENDITURES.

		Appropriation, 1904.	Expenditures, 1904.	Unexpended Balance Transferred to General Fund.
ORDINARY EXPENSES.				
OFFICE OF COMMISSIONER OF PUBLIC WORKS.				
Office salaries—10 per cent.		$ 1,715.00	$ 1,652.31	$ 62.69
Office expenses, printing, etc.—10 per cent.—(including unpaid bills)		453.95	269.22	184.73
BUREAU OF MAPS AND PLATS.				
Office salaries—25 per cent	$5,254.50			
Less transfer to City Hall account ordered by the City Council	300.00	4,954.50	4,755.23	199.27
Office expenses, drawing material, etc.—25 per cent		500.00	196.41	303.59
BUREAU OF ENGINEERING.				
City Architect: Office salaries—10 per cent.		285.00	149.98	135.02
City Engineer: Office salaries—10 per cent.		1,497.50	1,372.37	125.13
Office expenses, stationery, etc.—10 per cent.		250.00	197.27	52.73
Bridges and viaducts:				
Repairs and renewals (including unpaid bills)	$157,649.00			
By transfers ordered by the City Council:				
From appropriation from West Division street bridge	2,931.90			
From appropriations from Eighteenth street bridge	45,000.00	205,580.90		
Expenditures as follows:				
Labor, material and supplies, and contract work	$197,792.17			
15 per cent reserve, withheld on contracts	6,914.91		204,707.08	873.82
Carried forward		$ 215,236.85	$ 213,299.87	$ 1,936.98

CORPORATE FUND — CONTINUED.

		Appropriation, 1904.	Expenditures, 1904.	Unexpended Balance Transferred to General Fund.
Brought forward		$ 215,236.85	$ 213,299.87	$ 1,936.98
Repairs of viaducts for account of railway companies (expenditures not to exceed receipt)		50,000.00		
Expenditures as follows:				
Labor, material and supplies	$ 8,823.49			
15 per cent reserve, withheld on contract	112.30		8,935.79	41,064.21
Repairs of bridges, damaged by steamers, etc. (expenditures not to exceed receipts)		25,000.00		
Expenditures:				
Labor, material, etc	$ 2,001.67			
15 per cent reserve, withheld on contracts	36.18		2,037.85	22,962.15
Bridges. Operation.				
Superintendent of bridge tenders, salary		2,616.00	2,616.00	
Bridge tenders, salaries	$106,530.00			
Less transfer to City Hall account, ordered by the City Council	2,500.00	104,030.00	101,224.41	2,805.59
Fuel	$ 5,153.76	6,000.00		
15 per cent reserve, withheld on contracts	201.57		5,355.33	644.67
Material and supplies, etc		14,500.00	12,682.29	1,817.71
Chicago Harbor:				
Salaries		19,180.00	19,169.88	10.12
Removal of sunken vessels and obstructions		1,000.00	969.50	30.50
Renewal of docks and street ends		1,500.00	1,274.22	225.78
Platting lake front survey		1,080.00	1,080.00	
Inspection and engineering to be refunded by corporations		15,000.00	2,947.00	12,053.00
BUREAU OF STREETS.				
Office salaries		20,220.00	20,220.00	
Inspectors of street openings and obstructions salaries		9,000.00	6,797.95	2,202.05
Office expenses, stationery, etc		1,500.00	1,430.99	69.01
Thirty-six ward superintendents, salaries	$ 50,400.00			
Less transfer to City Hall account, ordered by the City Council	600.00	49,800.00	49,487.93	312.07
Steam roller, salaries		1,630.00	1,629.50	.50
Snow removal, salaries	$ 60,000.00			
Additional appropriation, Council order December 12, 1904	25,000.00	85,000.00	74,284.27	10,715.73
Snow dump repairs		3,000.00		
Carried forward		$ 625,292.85	$ 525,442.78	$ 96,850.07

CORPORATE FUND — CONTINUED.

		Appropriation, 1904.	Expenditures, 1904.	Unexpended Balance Transferred to General Fund.
Brought forward		$ 625,292.85	$ 525,442.78	$ 96,850.07
Expenditures:				
Labor and material	$ 2,114.02			
15 per cent reserve, withheld on contract	67.12		2,181.14	818.86
City dumps (4 per cent of ward appropriations)		41,465.00		
Expenditures:				
Labor and material	$ 40,903.52			
15 per cent reserve, withheld on contract	67.96		40,971.48	493.52
Rental of ward yards		8,000.00	5,830.79	2,169.21
Special appropriation for teams in each ward		45,000.00	43,789.50	1,210.50
Clearing right of way for account of railway companies		200,000.00		200,000.00
Unpaid bills		1,491.96	1,241.90	250.00
General corporation and sub corporation inspectors, salaries		40,000.00	29,586.00	10,414.00
Restoration of streets		40,000.00		
Expenditures:				
Labor, material, etc.	$ 25,558.26			
15 per cent reserve, withheld on contract	88.92		25,647.18	14,352.82
Repairing right of way for account of traction or railway companies		60,000.00		60,000.00
Repairs of asphalt streets (outside of contract reservations)		50,000.00	50,000.00	
Small Parks:				
Ellis and Douglas Monument Parks and Aldine square		3,000.00		
Expenditures:				
Ellis Park	$ 937.68			
Douglas Monument Park	957.20			
Aldine square	738.05		2,632.93	367.07
Washington square, Green Bay and Oak Parks	$ 2,500.0			
By transfer from appropriations from sundry parks, Council order, December 12, 1904	150.00	2,650.00		
Expenditures:				
Washington square	$ 1,880.78			
Green Bay Park	528.02			
Oak Park	233.00		2,641.75	8.25
Lakewood Park		300.00	208.12	91.88
Kedzie Park		500.00	482.64	17.36
Sundry Parks and squares	$ 5,700.00			
Less transfer to Washington square and Oak Park, as above	150.00	5,550.00		
Carried forward		$ 1,123,249.81	$ 730,656.27	$ 387,043.54

CORPORATE FUND — CONTINUED.

		Appropriation, 1904.	Expenditures, 1904.	Unexpended Balance Transferred to General Fund.
Brought forward		$ 1,123,249.81	$ 730,656.27	$ 387,043.54
Expenditures:				
Bickerdyke square	$401.90			
Congress Park	428.15			
Irving Park	886.75			
Jefferson Park	541.43			
Gross Park	496.00			
DeKalb square	518.73			
Norwood Park	595.59			
Dauphin Park	183.00			
Austin Park	48.50			
Eldred Park	351.00			
Merrick Park	468.00			
Holden Park	538.96			
	$ 4,948.01		4,948.01	601.99
Two triangular pieces of ground between Ogden, North Clark and Wells streets and North Clark street, Belden avenue and Sedgwick street		300.00	108.00	192.00
Normal Park		1,000.00	928.97	71.03
Fernwood Park	$ 1,000.00			
By transfer from appropriation for Seventy-second street Park Council order, December 12, 1904	200.00	1,200.00	1,130.83	69.17
Temporary Playgrounds		1,000.00	993.14	6.86
Seventy-second Street Park	$ 750.00			
Less transfer to Fernwood Park	200.00	550.00	544.50	5.50
Patterson Park		200.00	148.17	51.83
Barnard Park		500.00	474.25	25.75
East End Park		5,000.00	300.03	4,699.97
Triangular strip at Canalport avenue and West Eighteenth street		500.00		500.00
Culvert on Seventy-seventh		350.00	350.00	
Repairing and ditching Lincoln avenue, Twenty-seventh ward		812.50	800.16	12.34
Repairing and ditching Milwaukee avenue, Twenty-seventh ward		1,625.00	1,625.00	
Repairing and ditching Norwood Park avenue, Twenty-seventh ward		650.00	650.00	
Repairing and ditching Grand avenue, Twenty-seventh ward		650.00	465.42	184.58
Repairing and ditching Seventy-ninth street, Eighth ward		747.50		
Expenditures:				
Labor	$ 265.00			
Material	410.12			
15 per cent reserve, withheld on contract	72.38		747.50	
Carried forward		$ 1,138,334.81	$ 744,870.25	$ 393,464.56

CORPORATE FUND — CONTINUED.

	Appropriation, 1904.	Expenditures, 1904.	Unexpended Balance Transferred to General Fund.
Brought forward	$1,138,334.81	$ 744,870.25	$ 393,464.56
Repairing and ditching territory between Commercial and Anthony avenues, and Ninety-third and Ninety-eighth streets	585.00	585.00	
Repairing and ditching 103d and 108th streets, and Ewing and Indiana avenues	390.00	376.50	13.50
Cement walks in and around Washington square	2,000.00		2,000.00
Repairing Michigan avenue, 123d street, Indiana avenue, Cottage Grove avenue, 111th street and Laydon avenue in Thirty-third ward	1,625.00	1,617.47	7.53
Ditching in Thirty-third ward	650.00	645.61	4.39
Repaving and crowning Western avenue, California avenue, Patterson avenue and Devon avenue in Twenty-sixth ward	1,625.00	1,624.90	.10
Ditching in Twenty-sixth ward	812.50	812.50	
Repairing Vincennes road, Thirty-second ward	812.50	812.50	
Ditching in Thirty-second ward	487.50	487.50	
Repairing and ditching Fifty-second avenue, Forty-eighth avenue, Thomas street and Division street in Thirty-fifth ward	975.00		
Expenditures vouchered $932.47			
15 per cent reserve withheld on contract 42.53			
		975.00	
Repairing Western avenue, Thirty-first ward	3,000.00	2,978.09	21.91
Repairing Western avenue, between Sanitary district bridge and Illinois and Michigan canal bridge	500.00	308.25	191.75
Repairing and ditching in Twenty-ninth ward	1,300.00	1,300.00	
Ditching in Thirty-first ward	1,300.00	1,261.00	39.00
Ditching in Fifth ward	975.00		
Expenditures vouchered $881.55			
15 per cent reserve withheld on contract 93.45			
		975.00	
Repairing Forty-fifth avenue, Thirty-fourth ward	487.50	487.50	
Repairing Peterson avenue, Twenty-seventh ward	500.00	499.88	.12
Widening roadway and paving widened portion of West Lake street, removing girders, etc., under the Lake street Elevated Railroad	40,000.00		40,000.00
Repairs of streets in Twenty-second ward	500.00	463.00	37.00
Removal of garbage, street cleaning, etc. (4 per cent of appropriation deducted for City dumps), see detailed statement:			
First ward, appropriation and reimbursement $88,360.00			
Additional appropriation 3,600.00			
	91,960 00	91 458.36	501.64
Carried forward	$1,288.819.81	$ 852,538.31	$ 436,281.50

CORPORATE FUND — CONTINUED.

		Appropriation, 1904.	Expenditures, 1904.	Unexpended Balance Transferred to General Fund.
Brought forward		$1,288,819.81	$ 852,538.31	$ 436,281.50
Second ward	$34,040.00			
Additional appropriation	150.00	34,190.00	34,164.86	25.14
Third ward	$33,320.00			
Additional appropriation	100.00	33,420.00	33,301.82	118.18
Fourth ward	$24,830.00			
Additional appropriation	125.00	24,955.00	24,942.59	12.41
Fifth ward		23,330.00	23,196.36	133.64
Sixth ward	$39,670.00			
Additional appropriation	75.00	39,745.00	39,724.25	20.75
Seventh ward	$38,390.00			
Additional appropriation	200.00	38,590.00	38,589.80	.20
Eighth ward		23,540.00	22,736.75	803.25
Ninth ward		23,330.00	22,976.35	353.65
Tenth ward		21,435.00	21,414.32	20.68
Eleventh ward	$20,585.00			
Additional appropriation	175.00	20,760.00	20,740.76	19.24
Twelfth ward	$22,000.00			
Additional appropriation	125.00	22,125.00	22,100.02	24.98
Thirteenth ward		26,440.00	26,395.47	44.53
Fourteenth ward	$28,420.00			
Additional appropriation	250.00	28,670.00	28,665.20	4.80
Fifteenth ward	$23,760.00			
Additional appropriation	150.00	23,910.00	23,891.24	18.76
Sixteenth ward		26,785.00	25,410.58	1,374.42
Seventeenth ward		29,110.00	28,969.55	140.45
Eighteenth ward	$35,880.00			
Additional appropriation	50.00	35,930.00	35,911.00	19.00
Nineteenth ward	$32,815.00			
Additional appropriation	50.00	32,865.00	32,862.53	2.47
Twentieth ward		34,835.00	34,620 87	214.13
Twenty-first ward	$38,670.00			
Additional appropriation	25.00	38,695.00	38,687.12	7.88
Twenty-second ward	$27,945.00			
Additional appropriation	75.00	28,020.00	28,003.40	16.60
Twenty-third ward	$25,765.00			
Additional appropriation	150.00	25,915.00	25,897.44	17.56
Twenty-fourth ward		22,665.00	22,655.27	9.73
Twenty-fifth ward		35,050.00	34,707.57	342.43
Carried forward		$1,983,129.81	$1,543,103.43	$ 440,026.38

CORPORATE FUND — CONTINUED.

		Appropriation, 1904.	Expenditures, 1904.	Unexpended Balance Transferred to General Fund.
Brought forward		$1,983,129.81	$1,543,103.43	$ 440,026.38
Twenty-sixth ward	$26,620.00			
Additional appropriation	50.00			
		26,670.00	26,645.15	24.85
Twenty-seventh ward		20,645.00	20,506.45	138.55
Twenty-eighth ward	$23,980.00			
Additional appropriation	50.00			
		23,980.00	23,971.95	8.05
Twenty-ninth ward	$28,895.00			
Additional appropriation	50.00			
		28,945.00	28,928.97	16.03
Thirtieth ward		28,555.00	28,518.60	36.40
Thirty-first ward	$23,925.00			
Additional appropriation	75.00			
		24,000.00	23,975.96	24.04
Thirty-second ward		28,535.00	28,240.36	294.64
Thirty-third ward		24,495.00	24,490.33	4.67
Thirty-fourth ward	$18,060.00			
Additional appropriation	50.00			
		18,110.00	18,096.05	13.95
Thirty-fifth ward		16,165.00	16,119.63	45.37
[The above additional appropriations are reimbursements from receipts for cleaning "right of way" of street railway companies.]				
BUREAU OF SEWERS.				
Office salaries	$9,180.00			
Less transfer to catch-basin repairs, Council order, October 24, 1904	900.00			
		8,280.00	8,280.00	
Office expenses	$757.50			
Less transfer to catch-basin repairs, Council order, October 24, 1904	400.00			
		357.50	346.78	10.72
Pumping Stations—Operation.				
Sixty-ninth Street Pumping Station:				
Salaries		3,285.00	3,273.22	11.78
Supplies, etc	$345.00			
By transfer, Council order, October 24, 1904	250.00			
		595.00	449.49	145.51
Operating air-compressor, Rogers Park system, including repairs		3,500.00		
Expenditures:				
Operation	$3,310.53			
Repairs	65.83			
			3,376 36	123.64
Carried forward		$2,239,247.31	$1,798,322.73	$ 440,924.58

CORPORATE FUND — CONTINUED.

			Appropriation, 1904.	Expenditures, 1904.	Unexpended Balance Transferred to General Fund.
Brought forward			$2,239,247.31	$1,798,322.78	$ 440,924.58
Woodlawn Pumping Station:					
Salaries			6,105.00	6,073.58	31.42
Supplies	$1,200.00				
Less transfer for repairs to Pullman Pumping Station	200.00				
			1,000.00	845.67	154 33
Coal			6,200.00	5,484.41	715.59
Seventieth Street Pumping Station:					
Salaries			4,305.00	4,305.00	
Coal			1,900.00	1,597.56	302.44
Supplies, etc			900.00	782.69	117.31
Seventy-third Street Pumping Station:					
Salaries			4,305.00	4,305 00	
Coal			1,500.00	1,063.39	436 61
Supplies	$500.00				
Less transfer to repairs for Seventy-third Street Pumping Station	100.00				
			400.00	341.84	58.16
Kensington Pumping Station:					
Salaries			4,305.00	4,305.00	
Coal			1,500.00	1,119.78	380.22
Supplies, etc	$600.00				
Less transfer to repairs for Kensington Pumping Station	100.00				
			500.00	480.36	19.64
Pullman Pumping Station:					
Salaries			6,105.00	5,952.69	152.31
Coal			3,000.00	1,935.78	1,064 22
Supplies, etc	$1,000.00				
Less transfer to repairs, Council order, June 20, 1904	$200.00				
By transfer from repairs for Seventieth Street Pumping Station, Council order, October 24, 1904	100 00				
		$100.00			
			900.00	857.49	42.51
Sixty-ninth street:					
Power and attendance at plant Sixty-fourth street and Wentworth avenue:					
Appropriation		$4,000.00			
Less transfers by Council order, October 24, 1904:					
To supplies Sixty-ninth street	$ 250.00				
To repairs Sixty-ninth street	750 00				
Carried forward	$1,000.00	$4,000 00	$2,282,172.31	$1,837,772.97	$ 444,399.34

CORPORATE FUND—CONTINUED.

		Appropriation, 1904.	Expenditures, 1904.	Unexpended Balance Transferred to General Fund.
Brought forward.....	$1,000.00 $4,000.00	$2,282,172.31	$1,837,772.97	$ 444,399.34
To repairing sewers..	2,500.00			
To repairing catch-basins.....	500.00			
	$4,000.00			
Pumping Stations—Repairs and Renewals.				
Woodlawn Pumping Station.....		3,500.00	3,476.45	23.55
Seventieth Street Pumping Station ..	$1,500.00			
Less transfers by Council order, October 24, 1904:				
To repairing catch-basins.	$500.00			
To Pullman Pumping Station.....	100.00			
	$600.00			
		900.00	443.47	456.53
Seventy-third Street Pumping Station	$700.00			
By transfer from operation (supplies).....	100.00			
		800.00	650.34	149.66
Kensington Pumping Station.....	$800.00			
By transfer from operation (supplies).....	100.00			
		900.00	802.83	97.17
Pullman Pumping Station.....	$1,200.00			
By transfer from operation (supplies).....	200.00			
By transfer from Woodlawn Pumping Station.....	200.00			
		1,600.00	1,572.01	27.99
Sixty-ninth Street Pumping Station..	$450.00			
By transfer from power and attendance at plant, Sixty-fourth street.	750.00			
		1,200.00	1,026 61	173.39
Repairing Sewers:				
Salaries.....	$26,290.00			
By transfers ordered by the City Council:				
From repairs for catch-basins.	5,000.00			
From salaries for cleaning sewers.....	10,000.00			
From plant at Sixty-fourth street.....	2,500.00			
		43,790.00	43,768.16	21.84
Building new catch-basins		5,000.00	4,994.77	5.23
Repairing sewers, supplies, etc.....		6,710.00	6,704.81	5.19
Repairing sewers, unpaid bills.....		195.29	194.60	.69
Repairing catch-basins:				
Salaries.....	$20,000.00			
Less transfer to repairing sewers, salaries, Council order, May 16, 1904.....	5,000.00			
Carried forward.....	$15,000.00	$2,346,767.60	$1,901,407.02	$ 445,360.58

CORPORATE FUND — CONTINUED.

		Appropriation, 1904.	Expenditures, 1904.	Unexpended Balance Transferred to General Fund.
Brought forward	$15,000.00	$2,346,767.60	$1,901,407.02	$ 445,360.58
By transfer from office salaries and office expenses, Council order, October 24, 1904	1,300.00	16,300.00	16,299.86	.14
Repairing catch-basins:				
Supplies	$5,000.00			
By transfer, Council order, October 24, 1904	1,000.00	6,000.00	5,993.67	6.33
Bench monuments, salaries		3,080.00	3,030.20	49.80
New bench monuments	$1,200.00			
Less transfer to cleaning sewers, Council order, October 24, 1904	1,000.00	200.00	10.00	190.00
Restoration of streets	$5,000.00			
Less transfer to cleaning sewers, Council order, October 24, 1904	2,500.00	2,500.00	2,203.62	296.38
Miscellaneous work on account of deposits and for other departments		5,000.00	1,302.00	3 698.00
House drain division:				
Salaries	$35,820.00			
Less transfer to cleaning sewers, Council order, October 24, 1904	2,500.00	33,300.00	33,067.49	232.51
House drain division: Maps, atlases and other expenses		600.00	258.69	341.31
Cleaning sewers:				
Salaries	$123,500.00			
Less transfer to repairing sewers, Council order, May 14, 1904	10,000.00			
	$113,500.00			
By transfers, Council order, October 24, 1904	6,000.00	119,500.00	119,414.28	85.72
Cleaning sewers, supplies, etc		1,500.00	1,464.34	35.66
Dredging slip "A"		3,510.00	3,445.70	64.30
Total		$2,538,257.60	$2,087,896.87	$ 450,360.73

EXTRAORDINARY EXPENSES.

BUREAU OF ENGINEERING.

Construction:				
West Division street bridge	$9,000.00			
Less transfer to repairing bridges, Council order, October 3, 1904	2,931.90	$ 6,068.10	$ 6,068.10	
Carried forward		$ 6,068.10	$ 6,068.10	

CORPORATE FUND — CONTINUED.

		Appropriation, 1904.	Expenditures, 1904.	Unexpended Balance Transferred to General Fund.
Brought forward		$ 6,068.10	$ 6,068.10	
North Western avenue bridge		103,000.00	100,414.39	$ 2,585.61
Removing old bridge from Eighteenth street to South Western avenue and building new substructure	$45,000.00			
Less transfer to repairing bridges, Council order, October 3, 1904	45,000.00			
Archer avenue bridge		240,000.00	5,146.50	234,853.50
North avenue bridge		240,000.00	5,153.82	234,846.18
Thirty-seventh street bridge		250,000.00		250,000.00
For plans for Market street bridge and viaduct and Thirty-first street bridge		1,000.00		1,000.00
Gates for bascule bridges		8,000.00	173.81	7,826.19
Eggleston avenue bridge		5,000.00	4,769.72	230.28
Total Extraordinary Expenses		$ 853,068.10	$ 121,726.34	$ 731,341.76
CITY HALL.				
ORDINARY EXPENSES.				
Operation:				
Salaries for janitors, elevator operators, engineers, firemen, etc.	$40,259.30			
Less transfer to supplies and repairs and renewals, Council order, December 12, 1904	1,100.00			
		$ 39,159.30	$ 39,157.03	$ 2.27
For coal supplies, electric current, ice for fountain and offices, etc., including unpaid bills	$18,331.87			
By transfer, Council order, December 12, 1904	3,089.21			
		21,421.08	21,352.02	69.06
Repairs and renewals:				
Repairs to building, machinery, boilers, elevators, steamfitting, plumbing, etc., including unpaid bills	$10,069.71			
By transfers, Council order, December 12, 1904	1,410.79			
		11,480.50	11,362.73	117.77
Total		$ 72,060.88	$ 71,871.78	$ 189.10
EXTRAORDINARY EXPENSES.				
Construction of vaults, Council order, November 21, 1904		3,000.00	399.35	2,600.56
Total		$ 3,000.00	$ 399.35	$ 2,600.56

CORPORATE FUND — CONTINUED.

	Appropriation, 1904	Expenditures, 1904.	Unexpended Balance Transferred to General Fund.
RECAPITULATION.			
ORDINARY EXPENSES.			
Commissioner's Office	$ 2,168.95	$ 1,921.53	$ 247.42
Bureau of Maps and Plats	5,454.50	4,951.64	502.86
Bureau of Engineering	447,519.40	364,718.97	82,800.43
Bureau of Streets	1,768,086.96	1,411,004.74	357,082.22
Bureau of Sewers	315,027.79	305,299.99	9,727.80
	$2,538,257.60	$2,087,896.87	$ 450,360.73
City Hall	72,060.88	71,871.78	189.10
Total ordinary expenses	$2,610,318.48	$2,159,768.65	$ 450,549.83
EXTRAORDINARY EXPENSES.			
Bureau of Engineering	853,068.10	121,726.34	731,341.76
City Hall	3,000.00	399.35	2,600.65
Total	$3,466,386.58	$2,281,894.34	$1,184,492.24

REVENUE.

JANUARY 1 TO DECEMBER 31, 1904.

Bureau of Maps—Fees	$ 1,164.50
Bureau of Engineering—Permits	2,164.13
Bureau of Engineering—Bridges and viaducts	19,018.51
Bureau of Engineering—Miscellaneous	2,355.00
Bureau of Streets—Permits	1,681.00
Bureau of Streets—Space permits	4,406.00
Bureau of Streets—Dumps	254.00
Bureau of Streets—Sidewalk certificates	658.50
Bureau of Streets—Corporation Inspectors	29,995.73
Bureau of Streets—Miscellaneous	76,684.39
Bureau of Sewers—Permits	19,745.00
Bureau of Sewers—Miscellaneous	4,220.71
Total	$162,347.47

EXPENDITURES FOR REMOVAL OF GARBAGE, STREET CLEANING, ETC., 1904.

WARDS.	Cleaning Streets.	Garbage.	Repairing Streets.	Unimproved Streets.	Repairing Sidewalks.	Miscellaneous Expenditures.	Total Vouchered.	Repair'g Sidewalks, 15 per cent Reserve on Contracts.	Total.
First	$ 62,558.82	$ 23,833.50	$ 2,784.71	.....	$ 271.60	$1,986.70	$ 91,435.33	$ 23.03	$ 91,458.36
Second	7,878.51	25,527.75	422.50	$ 17.00	231.14	87.96	34,164.86	.....	34,164.86
Third	6,320.90	26,473.75	202.75	22.50	101.45	180.47	33,301.82	.....	33,301.82
Fourth	6,475.42	14,091.00	838.50	682.25	2,436.61	223.72	24,747.50	195.09	24,942.59
Fifth	6,330.96	11,673.00	543.00	2,614.75	1,852.89	165.26	23,179 86	16.50	23.196.36
Sixth	8,391.43	29,789.50	1,464.51	.....	5.75	73.06	39,724.25	.....	39,724.25
Seventh	9,817.34	25,407.26	2,634.95	129.00	484.52	84.17	38,557.24	32.56	38,589.80
Eighth	3,572.35	10,270.75	95.13	6,382.78	2,118.68	158.99	22,598.68	138.07	22,736.75
Ninth	6,142.55	15,486.75	640.10	166.00	429.78	82.53	22,947.71	28.64	22,976.35
Tenth	4,949.36	14,034.50	1,017.52	113.50	1,087.61	144.74	21,347.23	67.09	21,414.32
Eleventh	4,107.56	14,219.25	1,247.25	.....	975.68	142.76	20,692.50	48.26	20,740.76
Twelfth	3,915.79	11,367.50	2,319.06	1,941.50	2,285.25	164.83	21,993.93	106.09	22,100.02
Thirteenth	6,130.55	18,354.75	1,046.71	46.25	555.97	231.14	26,365.37	30.10	26,395.47
Fourteenth	5,660.19	21,704.50	161.25	62.75	929.28	122.61	28,640 58	24.62	28,665.20
Fifteenth	4,479.16	17,721.00	950.51	.....	641.51	99.06	23,891.24	.....	23,891.24
Sixteenth	7,075.87	15,523 50	1,332.77	86.25	1,008.60	322.84	25,349.83	60.75	25,410.58
Seventeenth	6,482.37	21,881.99	265.67	3.00	137.10	192.97	28,963.10	6.45	28,969.55
Eighteenth	18,977.11	15,776.75	832.43	.....	169 51	151.83	35,907.63	3.37	35,911.00
Nineteenth	7,792.92	23,807.63	687.25	28.50	465.11	81.12	32,862.53	.....	32,862.53
Twentieth	6,213.39	28,178.00	127.25	.....	20.78	81.45	34,620.87	.....	34,620.87
Twenty-first	10,668.73	26,550.00	857.87	36.00	196.96	362.26	38,671.82	15.30	38,687.12
Twenty-second	7,330.41	19,098.50	694.64	71.87	565.92	232.35	27,993.69	9.71	28,003.40
Twenty-third	6,535.06	17,873.50	489.12	145.75	621.00	232.24	25,886.67	10.77	25,897.44
Twenty-fourth	3,925.03	16,395.87	1,368.90	191.75	566.43	193.59	22,641.57	13.70	22,655.27
Twenty-fifth	6,232.46	27,522.62	853.79	.....	6.60	92.10	34,707.57	.....	34,707.57
Twenty-sixth	4,272.41	20,194.87	475.00	281.00	916.66	381.12	26,521.06	124.09	26,645.15
Twenty-seventh	3,689.02	9,406.50	777.46	4,665.78	1,273.60	528.33	20,340.69	165.76	20,506.45
Twenty-eighth	5,198.43	15,953.75	1,633.25	12.50	898.63	242.77	23,939.33	32.62	23,971.95
Twenty-ninth	4,122.59	17,436.25	833.99	4,987.12	1,333.24	95.81	28,809.00	119.97	28,928.97
Thirtieth	7,252.04	20,081.50	916.08	9.00	192.25	67.73	28,518.60	.....	28,518.60
Thirty-first	4,532.59	17,502.13	623.38	451.88	681 02	145.97	23,936.97	38.99	23,975.96
Thirty-second	6,066.33	17,741.75	996.16	1,308.15	1,813.09	138.01	28,063.49	176.87	28,240.36
Thirty-third	2,206.11	13,190.37	144.76	6,864.73	1,710.75	162.85	24,279.57	210.76	24,490.33
Thirty-fourth	4,800.32	8,681.50	916.50	1,692.49	1,798.10	106.48	17,995.39	100.66	18,096.05
Thirty-fifth	4,427.62	7,850.76	798.59	788.51	1,576.89	567.18	16,009.55	110.08	16,119.63
Total	$274,531.70	$640,602.50	$31,993.31	$33,802.56	$30,359.96	$8,317.00	$1,019,607.03	$1,909.90	$1,021,516.93

WATER FUND.

REVENUE, JANUARY 1 TO DECEMBER 31, 1904.

Assessed rates collected	$2,350,011.69	
Miscellaneous water sales	20,086.95	
Meter service	1,577,523.36	
Permits	24,776.28	
Meter Division, miscellaneous receipts	27,845.47	
Rent of Rookery	35,000.04	
Miscellaneous receipts	51,692.56	
		$4,086,936.35
EXTRAORDINARY.		
Sanitary District, account intercepting sewers	$ 79,672.70	
W. F. Brennan, account intercepting sewers	150.00	
Byrne Construction Company, account intercepting sewers	112.00	
South Park Commissioners, account intercepting sewers	1,793.55	
Illinois Central Railroad Company, account intercepting sewers	2,454.08	
City Engineer, account intercepting sewers	75.00	
		$ 84,257.33
Total		$4,171,193.68

EXPENDITURES.

	Appropriation 1904.	Expenditures, 1904.	Unexpended Balance December 31, 1904.
ORDINARY EXPENSES.			
OFFICE OF COMMISSIONER OF PUBLIC WORKS.			
Office salaries—90 per cent	$ 15,435.00	$ 14,790.23	$ 644.77
Office expenses, printing, stationery, etc., including unpaid bills—90 per cent	4,051.80	2,407.58	1,644.22
BUREAU OF MAPS AND PLATS.			
Office salaries—75 per cent	15,763.50	14,265.80	1,497.70
Office expenses, drawing materials, rebinding atlases, etc.—75 per cent	1,500.00	582.49	917.51
PAYMASTER'S BUREAU.			
Office salaries—30 per cent	3,675.00	3,069.90	605.10
Maintaining pay-wagon—30 per cent	37.50	37 50	
BOARD OF LOCAL IMPROVEMENTS.			
Proportionate amount of salaries chargeable to Water Fund	15,000.00	15,000.00	
DEPARTMENT OF SUPPLIES.			
Office salaries—40 per cent	5,282.00	5,150.71	81.29
Office expenses—40 per cent	1,329.96	1,216.89	113.07
Carried forward	$ 62,024.76	$ 56,521.10	$ 5,503.66

WATER FUND — CONTINUED.

	Appropriation, 1904.	Expenditures, 1904.	Unexpended Balance December 31, 1904.
Brought forward	$ 62,024.76	$ 56,521.10	$ 5,503.66
BUREAU OF WATER.			
Collection division—salaries	60,110.00	56,225.38	3,884.62
Assessor's division—salaries	18,110.00	18,012.91	97.09
Permit division—salaries	48,370.75	46,596.22	1,774.53
Inspection division—salaries	36,700.00	34,254.17	2,445.83
Meter mechanical division—salaries	29,482.50	19,817.27	9,665.23
Meter rate division—salaries	34,468.50	33,336 54	1,131.96
Shut-off division—salaries	31,238.00	28,534.57	2,703.43
Postage	8,000.00	8,000.00	
Office expense, writing, stationery, horse board, etc	12,500.00	11,530.44	969.56
Street car and railroad tickets	7,650.00	6,430.00	1,220.00
Rent of office space occupied by the Bureau of Water in the City Hall for the year 1904	11,845.00	11,845.00	
Meter merchandise $50,000.00 Less transfer, Council order, November 28, 1904, to Water Tax refunds $2,500.00 And Council order, December 12, 1904, to appropriation for street car tickets 2,500.00 — $ 5,000.00	45,000.00	11,555.22	33,444.78
Permit merchandise	7,500.00		
Expenses vouchered $4,813.31 Reserves withheld on contracts 690.30		5,503.61	1,996.39
Refunds on erroneous water assessments $10,000.00 By transfer from meter merchandise, Council order, November 28, 1904 2,500.00	12,500.00	11,047.75	1,452.25
Reimbursing Bureaus of Streets and Engineering for repairs of streets and work done	5,000.00	9.00	4,991.00
Sundry bills	25.00		25.00
BUREAU OF ENGINEERING.			
City Architect's office, salaries—90 per cent	2,565.00	1,350 02	1,214.98
City Engineer's office, salaries—90 per cent	13,477.50	12,351.64	1,125.86
Office expenses, stationery, drawing material, etc.—90 per cent	2,251.00	1,777.88	473.12
City Engineer's miscellaneous pay roll	4,225.00	2,719.98	1,505.02
Work done for Board of Local Improvements	6,000.00	5,359.81	640.19
Water Works shops, including unpaid bills Expenditures: Material, supplies, etc. $12,530.35 Salaries 55,397.93	72,127.25	67,928.28	4,198.97
Carried forward	$ 531,170.26	$ 450,706.79	$ 80,463.47

WATER FUND — CONTINUED.

			Appropriation, 1904.	Expenditures, 1904.	Unexpended Balance December 31, 1904.
Brought forward			$ 531,170.26	$ 450,706.79	$ 80,463.47
Cribs—operation:					
Salaries, including meals, fuel and supplies			36,740.00		
Expenditures:					
Two-mile crib		$15,728.61			
Four-mile crib		4,064.60			
Lake View crib		4,553.27			
Hyde Park crib		4 425.99			
Carter H. Harrison crib		5,655.96			
				34,428.43	2,311.57
Cribs—repairs and renewals:					
Appropriation		$10,000.00			
Less transfer to winter tug service, Council order, May 16, 1904		3,200.00			
			6,800.00		
Expenditures:					
Two-mile crib, vouchered	$1,886.72				
Reserve withheld on contracts	10.59				
		$1,897.31			
Four-mile crib, vouchered	$1,297.91				
Reserve withheld on contracts	5.63				
		1,303.54			
Lake View crib, vouchered	$493.97				
Reserve withheld on contracts	19.89				
		513.86			
Hyde Park crib, vouchered	$454.89				
Reserve withheld on contracts	1.07				
		455.96			
Carter H. Harrison crib		991.81			
				5,162.48	1,637.52
Tug service:					
Three winter months	$16,000.00				
By transfer, Council order, May 16, 1904.	3,200.00				
		$19,200.00			
Nine summer months		6,300.00			
Extra tug and scow hire		500.00			
			26,000.00	24,582.08	1,417.92
Pumping stations:					
Appropriation for repairs, renewals and operation			831,242.74		
Carried forward			$1,431,953.00	$ 514,879.78	$ 85,830.48

WATER FUND — CONTINUED.

		Appropriation, 1904.	Expenditures, 1904.	Unexpended Balance December 31, 1904.
Brought forward		$1,431,953.00	$514,879.78	$85,830.48
Expenditures as per detailed statements:				
Operation	$691,358.24			
Repairs and renewals	109,048.29			
			800,406.53	30,836.21
WATER PIPE EXTENSION.				
Repairs and maintenance of pipes and hydrants:				
Office salaries		8,793.00	8,326.65	466.35
Labor		284,893.90	221,854.86	12,999.54
Horse board		4,122.00	4,116.11	5.89
Miscellaneous material, supplies, etc.		25,200.00	25,036.05	163.95
City pipe yards, salaries		22,864.60	16,787.71	6,076.89
Special castings		1,000.00	380.43	619.57
Lumber		8,000.00		
Expenses vouchered	$7,977.71			
Reserve withheld on contracts	22.29			
			8,000.00	
Hydrant rings and covers		4,000.00		
Expenses vouchered	$1,414.42			
Reserve withheld on contracts	196.67			
			1,611.09	2,388.91
Teaming	$22,000.00			
By transfers, Council order, October 3, 1904, from restoration of streets	$4,000.00			
By transfers, Council order, October 3, 1904, from miscellaneous material, extraordinary expenses	5,000.00			
	9,000.00			
		31,000.00	29,538.10	1,461.90
Cast iron water pipe		4,000.00		4,000.00
Valve basin covers	$12,000.00			
Less transfer to extraordinary miscellaneous material, Council order, October 3, 1904	3,000.00			
		9,000.00		
Expenditures vouchered	$5,614.87			
Reserve withheld on contracts	761.54			
			6,376.41	2,623.59
Labor, teams and manure for fire hydrants		37,500.00		
Expenditures vouchered	$28,181.49			
Reserve withheld on contract	2,130.65			
			30,312.14	7,187.86
Restoration of streets and alleys	$18,046.30			
Less transfers, Council order, October 3, 1904	7,000.00			
		11,046.30	7,487.49	3,558.81
Carried forward		$1,833,372.80	$1,675,152.85	$158,219.95

WATER FUND — CONTINUED.

	Appropriation, 1904.	Expenditures, 1904.	Unexpended Balance December 31, 1904.
Brought forward	$1,833,372.80	$1,675,152.85	$158,219.95
Maintenance of tunnel plants	3,000.00		
Expenses vouchered $1,710.70			
Reserve withheld on contract 31.25			
		1,741.95	1,258.05
MISCELLANEOUS.			
Legal expenses, including one attorney	6,000.00	3,213.28	2,786.72
Supplies, etc., for operating baths at the Fourteenth and Twenty-second street pumping stations	1,515.00	715.09	799.91
Labor at Fourteenth street pumping station bath	720.00	720.00	
Labor at Twenty-second street pumping station bath	780.00	780.00	
Hydrant rentals, Chicago Suburban Water and Light Company	6,500.00	6,160.00	340.00
Hydrant rentals, Rogers Park Water Works	10,000.00	9,925.89	74.11
Chicago Harbor, harbor police and dredging inspectors, salaries	10,800.00	9,672.70	1,127.30
Meter and private work and laying water pipe by deposits	50,000.00		
Expenditures vouchered $20,621.97			
Reserve withheld on contract 1 764.70			
		22,386.67	27,613.33
Expert investigators, salaries, Council order, July 14, 1904	2,100.00	2,038.75	61.25
Investigation of water waste, Council order, June 3, 1904	3,600.00		
Expenses vouchered $2,943.92			
Reserve withheld on contract 3.00			
		2,946.92	653.08
Judgment, Selz, Schwab & Co., Council order, October 3, 1904	27,793.50	27,793.50	
BUREAU OF SEWERS.			
Fullerton Avenue Pumping Station:			
Salaries	10,905.00	9,824.96	1,080.04
Coal $10,000.00			
Less transfer to repairs, Council order, November 21, 1904 3,500.00	6,500.00		
Expenditures vouchered $3,676.45			
Reserve withheld on contract 325.35			
		4,001.80	2,498.20
Repairs, supplies, etc $3,000.00			
By transfer from appropriation for coal 3,500.00			
	6,500.00	4,385.98	2,114.02
DEPARTMENT OF FINANCE.			
Interest on Water Loan bonds	179,650.00	164,727.20	25,422.80
Interest on Water certificates	10,500.00		
Total ordinary expenses	$2,170,236.30	$1,946,187.54	$224,048.76

WATER FUND — CONTINUED.

	Appropriation, 1904.	Expenditures, 1904.	Unexpended Balance December 31, 1904.
EXTRAORDINARY EXPENSES.			
WATER PIPE EXTENSION.			
Construction:			
Miscellaneous material, supplies, etc. $9,000.00			
By transfers, Council orders..... 7,000.00			
	$ 16,000.00	$ 15,836.67	$ 163.33
Office salaries.....	8,793.00	8,212.21	580.79
Labor.....	26,800.00	24,441.64	2,358.36
Labor, including supervision.....	65,000.00	64,830.01	169.99
City pipe yards, salaries.....	14,000.00	13,803.33	196.67
Special castings	4,000.00	3,913.05	86.95
Brass castings.....	7,500.00		
Expenditures vouchered $7,050.33			
Reserve withheld on contract..... 449.67			
		7,500.00	
Hydrant and stop valve castings.....	11,250.00		
Expenditures vouchered..... $10,145.36			
Reserve withheld on contract..... 1,104.64			
		11,250.00	
Hydrant rings and covers.....	3,035.44	335.39	2,700.05
Teaming..... $4,000.00			
By transfers, Council order, October 3, 1904..... 6,000.00			
	10,000.00	9,396.36	603.64
Cast iron water pipe.....	66,705.00		
Expenditures vouchered..... $45,669.90			
Reserve withheld on contract..... 1,965.92			
		47,635.82	19,069.18
PUMPING STATIONS.			
New boiler plant at Fourteenth Street Pumping Station.....	60,000.00		
Expenditures vouchered..... $47,230.78			
Reserves withheld on contracts... 12,769.22			
		60,000.00	
Pumping engines and appurtenances for new pumping plants..... $70,000.00			
Less transfer to new cement walks for pumping stations..... 200.00			
	69,800.00		
Expenditures:			
Central Park Ave. Pumping Station, vouchered. $32,961.87			
Reserve withheld on contract..... 635.25			
$33,597.12			
Springfield Ave. Pumping Station, vouchered. $32,961.88			
Reserve withheld on contract..... 635.26			
33,597.14			
		67,194.26	2,605.74
Carried forward.....	$362,883.44	$334,348.74	$28,534.70

WATER FUND — CONTINUED.

	Appropriation, 1904.	Expenditures, 1904.	Unexpended Balance December 31, 1904.
Brought forward	$ 362,883.44	$ 334,348.74	$ 28,534.70
Chicago Avenue Pumping Station, new boiler plant	2,800.00	1,086.28	1,713.72
New pumping engines, foundations and remodeling of tunnels at Chicago Avenue Pumping Station	164,021.60		
Expenditures vouchered $145,664.93			
Reserves withheld on contracts 18,356.67			
		164,021.60	
New cement sidewalks at Central Park Avenue and Springfield Avenue Pumping Stations $1,000.00			
By transfers 360.00			
	1,360.00	1,357.58	2.42
Addition to building at Sixty-eighth Street Pumping Station	40,000.00		40,000.00
Engines and foundations for Central Park Avenue and Springfield Avenue Pumping Stations	25,000.00		
Springfield avenue $124.66			
Central Park avenue 124.66			
		249.32	24,750.68
Engines and foundations for the Sixty-eighth Street Pumping Station	20,000.00	78.32	19,921.68
MISCELLANEOUS.			
Legal expenses on account of Water Works	9,000.00		9,000.00
For the purchase and installation of water meters	200,000.00		200,000.00
For the purchase of new pipe yard	16,000.00	14,405.77	1,594.23
New feeder mains in Hyde Park, appropriation $10,000.00			
Less transfer for water pipe in Oglesby avenue, Council order, November 21, 1904 700.00			
	9,300.00	7,172.48	2,127.52
Repairs of damages caused by water tunnel $30,000.00			
By Council orders, May 28, 1904, and October 31, 1904 90,000.00			
	120,000.00		
Expenditures vouchered $116,573.64			
To complete contract 3,426.36			
		120,000.00	
Extension of Two-mile tunnel to Carter H. Harrison crib	100,000.00		100,000.00
New distribution pipe system for Jefferson and Austin	192,000.00		
Expenditures vouchered $175,542.19			
Reserves withheld on contracts 6,079.03			
		181,621.22	10,378.78
Carried forward	$1,262,365.04	$824,341.31	$438,023.73

WATER FUND — CONTINUED.

	Appropriation, 1904.	Expenditures, 1904.	Unexpended Balance December 31, 1904.
Brought forward	$1,262,365.04	$ 824,341.31	$ 438,023.73
New Southwest land and lake tunnel, with pumping station	35,000.00		
For purchase of property		4,000.00	31,000.00
For water pipe in Oglesby avenue, from Sixty-eighth Street Pumping station to Seventy-ninth street.... $7,000.00			
By transfer, Council order, November 21, 1904 700.00			
	7,700.00	6,177.40	1,522.60
Lake View crib, new superstructure	75,000.00	60.50	74,939.50
Erection of pumping station for Ninety-fifth street sewerage system. (Expert mechanical engineer and architect.)	2,500.00	2,500.00	
Board of Local Improvements, public benefits payable from water fund. (Special assessments for water supply pipe.)	20,563.35	19,224.23	1,339.12
Special assessments for improvements of property (pumping stations)	3,100.00	3,057.95	42.05
Meter testing plant	5,000.00		
Expenditures vouchered.... $4,738.84			
Reserve withheld on contracts.... 261.16			
		5,000.00	
City water tunnel from Peck court to Fifth avenue, Council order, May 3, 1904	25,000.00		
Expenditures vouchered.....$11,182.06			
Reserves withheld on contracts... 43.97			
		11,226.03	13,773.97
Water pipe in Fifty-sixth street, Council order, August 24, 1904	692.47	692.47	
Water pipe in Seventy-third street, Council order, August 24, 1904	1,205.17	1,205.17	
Water pipe in Iowa street, Council order, August 24, 1904	208.32	208.32	
Hyde Park Water bonds, due January 1, 1904	50,000.00	50,000.00	
Lake View Water bonds, due June 1, 1904...	23,000.00	23,000.00	
For payment of maturing water pipe advance certificates	20,625.44	20,625.44	
Water certificates, due July 1, 1904	500,000.00	500,000.00	
Water certificates, due January 1, 1905	250,000.00	250,000.00	
INTERCEPTING SEWERS.			
Section "C," conduit in Thirty-ninth street...	8,331.77	8,331.77	
Section "C," cleaning constructed work	15,000.00	12,982.75	2,017.25
Pumping at Halsted street	14,600.00	13,937.80	662.20
Section "D," conduit in Lawrence avenue $150,000.00			
Less transfer to Section "P," Council order, July 4, 1904.... 50,000.00			
	100,000.00	2,749.78	97,250.22
Carried forward	$2,419,891.56	$1,759,320.92	$660,570.64

WATER FUND — CONTINUED.

	Appropriation, 1904.	Expenditures, 1904.	Unexpended Balance December 31, 1904.
Brought forward	$2,419,891.56	$1,759,320.92	$ 660,570.64
Restoration of Lawrence avenue	2,000.00		2,000.00
Pumping at Lake Michigan	11,200.00		
Expenditures vouchered $6,989.66			
Reserve withheld on contract. 4,210.34		11,200.00	
Section "G," Thirty-ninth street to Fifty-sixth street	13,674 13	1,090.40	12,583.73
Section "H," Fifty-sixth street to Seventy-third street	150,807.04	63,707.91	87,099.13
Section "I," Thirty-fifth street to Thirty-ninth street	43,460.00	39,144.74	4,315.26
Section "O," wells and building at Thirty-ninth street pumping station	200,000.00		
Expenditures vouchered $104,281 85			
Reserves withheld on contracts 78,688.63		182.970.48	17,029.52
Section "P," wells, buildings and grounds at Lawrence Avenue Pumping Station $10,000.00			
By transfer, Council order, July 14, 1904 50,000.00	60,000.00	27,420.00	32,580.00
Section "S," machinery for Thirty-ninth Street Pumping Station	90,000.00		
Reserves withheld and to complete contract work		90,000.00	
Reversal of sewers, south shore	121,900.00		121.900.00
Maintenance of intercepting sewers	10,000.00	3,025.95	6,974.05
Office expenses	12,000.00	10,355.64	1,644.36
Repairing Fullerton avenue crib	10,000.00		10,000.00
Total extraordinary expenses	$3,144,932.73	$2,188,236.04	$956,696.69

WATER FUND — CONTINUED.

	Appropriation, 1904.	Expenditures, 1904.	Amount of Appropriation 1904 Unexpended.
RECAPITULATION.			
ORDINARY EXPENSES.			
Office of Commissioner of Public Works	$ 19,486.80	$ 17,197.81	$ 2,288.99
Bureau of Maps and Plats	17,263.50	14,848.29	2,415.21
Paymaster's Bureau	3,712.50	3,107.40	605.10
Board of Local Improvements	15,000.00	15,000.00	
Department of Supplies	6,561.96	6,367.60	194.36
Bureau of Water	368,499.75	302,698.08	65,801.67
Bureau of Engineering	28,518.50	23,559.33	4,959.17
Water Works shops	72,127.25	67,928.28	4,198.97
Cribs and tug service	69,540.00	64,172.99	5,367.01
Maintenance of tunnel plants	3,000.00	1,741.95	1,258.05
Pumping stations	831,242.74	800,406.53	30,836.21
Water pipe extension	401,419.80	359,866.54	41,553.26
Miscellaneous	119,808.50	86,352.80	33,455.70
Bureau of Sewers	23,905.00	18,212.74	5,692.26
Department of Finance	190,150.00	164,727.20	25,422.80
	$2,170,236.30	$1,946,187.54	$224,048.76
EXTRAORDINARY EXPENSES.			
Water pipe extension	$ 233,083.44	$ 207,154.48	$ 25,928.96
Pumping stations	382,981.60	293,987.36	88,994.24
Miscellaneous	1,665,894.75	1,220,176.98	445,717.77
Intercepting sewers	862,972.94	466,917.22	396,055.72
	$3,144,932.73	$2,188,236 04	$956,696.69
Ordinary expenses, total	$2,170,236.30	$1,946,187.54	$224,048.76
Extraordinary expenses, total	3,144,932.73	2,188,236.04	956,696.69
Total	$5,315,169.03	$4,134,423.58	$1,180,745,45

PUMPING STATIONS — OPERATION. — EXPENDITURES JANUARY 1 TO DECEMBER 31, 1904.

PUMPING STATIONS.	Salaries.	Fuel.	Fuel, 15 per cent Reserved on Contracts.	Oil, Grease and Waste.	Oil, 15 per cent Reserved on Contracts.	Miscellaneous Supplies.	Total, 1904.	Expenditures, 1903.
Chicago avenue pumping station	$ 48,058.82	$ 51,801.14	$ 6,208.74	$ 2,067.64	$ 23.95	$ 6,448.82	$114,609.11	$ 10,473.73
Fourteenth street pumping station	41,334.75	51,103.89	6,250.41	1,941.40	27.22	6,745.45	107,403.12	105,752.96
Harrison street pumping station	24,604.93	22,029.12	2,681.44	1,130.14	28.69	3,280.48	53,754 80	53,474.91
Lake View pumping station	29,876 44	24,980.77	2,976.97	1,583.48	28.35	3,481.36	62,936.37	58,277.94
Twenty-second street pumping station	37,206.45	46,270.35	5,786.05	1,048.61	22.13	4,677.39	95,010.98	86,490.12
Sixty-eighth street pumping station	46,746.98	45,822.53	5,622.42	1,912.51	20.41	7,642.33	107,767.18	97,901.33
Central Park avenue pumping station	33,655.16	30,875.65	3,603.87	1,938.74	31.06	2,648.42	72,747.90	70,887.60
Springfield avenue pumping station	28,094.54	28,204.31	3,426.96	1,594.24	23.19	1,906.28	63,249.52	55,202.65
Norwood Park pumping station	3,523.38	921.81	125.35	48.31	.....	69.20	4,688.05	4,170.78
Washington Heights pumping station	5,323 50	3,059.73	408.89	71.72	.....	332.37	9,196.21	8,485.56
Total	$298,424 95	$305,078.30	$37,091.10	$13,331.79	$205.00	$37,227.10	$691,358.24	$651,117.58

PUMPING STATIONS — REPAIRS AND RENEWALS. — EXPENDITURES JANUARY 1 TO DECEMBER 31, 1904.

PUMPING STATIONS.	Engines and Pumps.	Boilers.	Buildings.	15 per cent Reserve Retained on Contracts.	Total, 1904.	Total, 1903.
Chicago avenue pumping station	$ 5,503.80	$ 7,242.43	$ 5,234.76	$118.11	$ 18,099.10	$12,011.66
Fourteenth street pumping station	6,883.46	3,965.00	5,954.54	88.87	16,891.87	19,608.49
Harrison street pumping station	2,077.83	3,542.14	1,837.15	8.52	7,465.64	5,918.70
Lake View pumping station	4,888.39	4,025 30	2,875.86	5.69	11,795.24	7,083 22
Twenty-second street pumping station	2,693.28	4,274.72	4,992.59	72 59	12,033.18	14,702.08
Sixty eighth street pumping station	6,677.95	6,484.71	5,942.01	160.68	19,265.35	14,145.07
Central Park avenue pumping station	3,010.56	3,903.06	3,184.69	18.03	10,116.34	11,389.79
Springfield avenue pumping station	2,859.80	5,112.46	4,258 28	150.71	12,381.25	14,192.37
Norwood Park pumping station	201.61	100.43	82 21	.....	384.25	200.18
Washington Heights pumping station	29.70	212.09	374.28	.....	616.07	747.69
Total	$34,826.38	$38,862.34	$34,786.87	$623.20	$109,048.29	$99,994.25

WATER WORKS.

DECEMBER 31, 1904.

Cost up to May 1, 1861, when the works were transferred from the Board of Commissioners to the Board of Public Works	$ 1,020,160.21

EXPENDITURES SINCE 1861.

Cost of water pipe, including labor	$17,496,921.68
Mains for fire protection	79,537.41
Cost of works, annexed territory	1,160,164.24
Cost of North pumping works	1,389,024.56
Cost of South pumping works (Fourteenth street)	763,370.79
Cost of Fourteenth street bath	4,495.34
Cost of Central pumping works	421,196.15
Cost of West pumping works	944,393.77
Cost of Twenty-second street bath	1,423.04
Cost of Sixty-eighth street pumping works	395,317.88
Cost of Lake View pumping works	194,708.48
Cost of Washington Heights pumping works	27,720.95
Cost of Norwood Park pumping works	9,681.72
Cost of canal pumps for 1899	247.00
Cost of Springfield avenue pumping works	515,162.60
Cost of Central Park avenue pumping works	460,473.14
Reserves on contracts for Springfield avenue and Central Park avenue pumping works	110,954.26
Cost of real estate for sites for pumping stations, etc.	381,563.23
Cost of new lake tunnel	1,104,744.12
Cost of Lake View tunnel	701,792.45
Cost of Sixty-eighth street tunnel extension	771,556.07
Cost of Chicago avenue tunnel extension	42,436.45
Cost of Ashland avenue tunnel	17,453.36
Cost of Kedzie avenue tunnel extension	35,561.75
Cost of first lake tunnel	464,866.05
Cost of second lake tunnel	415,709.36
Cost of land tunnel to West pumping works	542,912.63
Cost of new land tunnel	284,380.04
Cost of new land tunnel, 1895	2,121,525.02
Cost of Western avenue tunnel	29,614.58
Cost of Northeast lake tunnel, 1895	677,577 55
Cost of Jefferson street tunnel	15,968.17
Cost of new Southwest land and lake tunnel, new Southwest pumping station, etc	61,530.95
Cost of new lake shore inlet	132,345.34
Cost of new lake shore inlet extension	167,552.13
Cost of Two-mile tunnel extension	37.50
Cost of North breakwater	41,780.11
Cost of Two-mile crib	102,984.43
Cost of Four-mile crib	469,574.83
Cost of Lake View crib	92,991.94
Cost of removal of Lake View inner crib	4,950.00
Cost of Sixty-eighth street crib	47,420.47
Cost of removal of intermediate crib	8,931.45
Cost of Carter H. Harrison crib	53,327.86
Cost of lake crib protection	149,431.63
Cost of intercepting sewers	4,430,851.24
Cost of Water Works shop	27,240.58
Cost of Water Works stock	29,318.00
Damages caused by water tunnel	120,000.00
Water tunnel from Peck Court to Fifth Avenue	11,226.03
Carried forward	$38,554,018.04

Brought forward	$38,554,018.04	
Cost of water reservoir fence	1,702.87	
Meter testing plant	50,000.00	
Cost of addition to stables	1,019.48	
Cost of new repair shops	42,749.11	
Division street water pipe tunnel	23,621.90	
Water pipe in Oglesby avenue	67,922.70	
High pressure water system	1,000.00	
Total		$38,742,034.10

BONDED DEBT OF WATER WORKS.

City of Chicago Water Loan bonds outstanding December 31, 1904, bearing 4 per cent interest and maturing as follows:

July 1, 1908	$ 150,000.00	
July 1, 1910	159,500.00	
July 1, 1912	821,000.00	
July 1, 1914	576,000.00	
July 1, 1915	1,485,000.00	
		$ 3,191,500.00

Bearing 3½ per cent interest, maturing:

July 1, 1909	$ 225,000.00	
July 1, 1910	103,500.00	
		328,500.00

ANNEXED DISTRICTS.

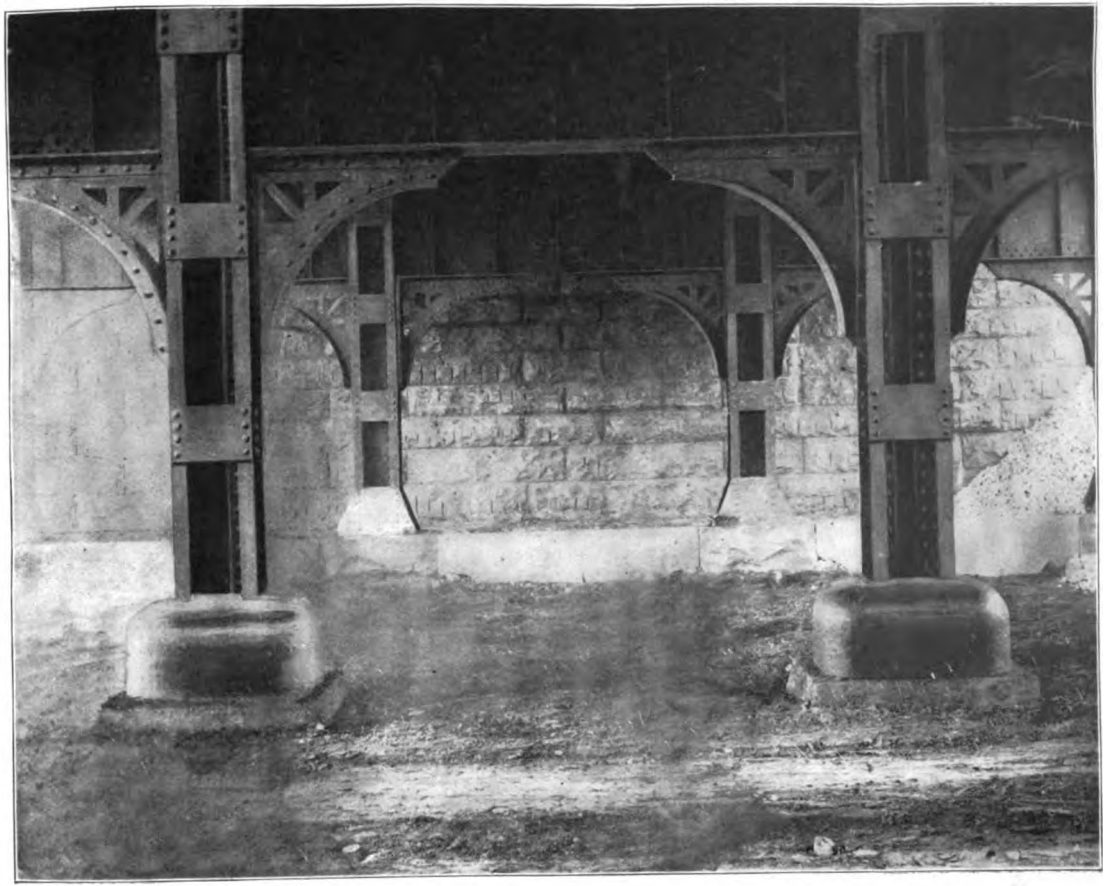
Lake View:

4 per cent bonds, due July 1, 1907	$ 50,000.00	
		50,000.00
Total bonded debt of Water Works		$ 3,570,000.00

Respectfully submitted,

HUGO RASPER,

Bookkeeper.



UNDER NORTH AVENUE SUBWAY—LOOKING NORTH.

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