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ANNUAL REPORT

OF THE

DIRECTOR OF THE

Department of Public Works

AND OF THE

CHIEF OF THE

BUREAU OF WATER

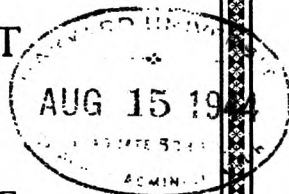
FOR THE

YEAR ENDING DECEMBER 31, 1912

ISSUED BY THE CITY OF PHILADELPHIA, 1913



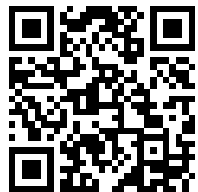
PHILADELPHIA
DUNLAP PRINTING CO., 1315-29 CHERRY STREET
1913



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DIRECTOR, DEPARTMENT OF PUBLIC WORKS
FOR THE YEAR 1912

HON. RUDOLPH BLANKENBURG,
Mayor, City of Philadelphia.

MY DEAR SIR:—I take pleasure in presenting to you my report as Director of the Department of Public Works for the year 1912, as follows:

QUALITY OF THE WATER IMPROVED.

In the operation of the Bureau of Water the quality of the water furnished is the most important factor. In several ways it has been made apparent that our control of this administrative feature has improved materially during the year.

(a) The typhoid death rate at present is lower than at any time within recent years, in the face of the increased pollution in the rivers.

(b) A series of experiments was begun looking toward the elimination of periodic turbidity of filtered water during the season of spring freshets. It is believed that at a comparatively slight expense a change can be made in the present filtering methods so as to remove a large proportion of the turbidity during times of flood discharge in the rivers. We should prefer to wait until these methods have

been actually tried on a large scale before stating definitely just what we believe can be accomplished.

We are also carrying on an extended series of experiments looking toward the utilization of lower grades of coal than have heretofore been used, so as to offset, if possible, the increasing cost of the coal per ton.

(c) Early in the year Hollis Godfrey, Sc. D., was retained to study those aspects of the water problem which affect public health. A copy of Dr. Godfrey's report is printed as an appendix in the report of the Bureau of Water. As a result of this study, a number of material changes were made, both in the manner of testing the water for quality and in details of the manufacturing process.

(d) The incident of the break of the 48-inch main at Upper Roxborough and the consequent turning of raw water into the mains of the Twenty-first and Twenty-second Wards, early in the morning of October 26th, was of such a nature as to put the present management of the Water Bureau on its mettle. I am glad to say that there have been very few incidents in the history of Philadelphia's Bureau of Water that have reflected greater credit on its officials. An almost identical break* occurred on November 28th of the previous year, resulting in 367 cases of typhoid and 25 deaths. Dr. Neff is my authority for the statement that owing to the method of handling the second break, which occurred during the year 1912, absolutely no cases of typhoid resulted.

The following list indicates the completeness of the preparations made and carried through by the Chief of the Bureau and his associates:

First. Upon the first indication of trouble the pipe at

* Fully described by Joseph S. Neff, M. D., LL. D., D. Ph., Director of Public Health and Charities, in a paper read in the section on "Preventive Medicine and Public Health" of the American Medical Association, at the Sixty-third Annual Session held in Atlantic City, June, 1913.

this main was patrolled and men were stationed at the valves to turn off the water should a break occur, and before any great amount of damage had been done.

Second. The water was finally turned off at an hour when it was still possible to reach the morning's papers with the news.

Third. The treatment of the raw water with hypochloride of lime was begun at once.

Fourth. Arrangements had been made with the night telephone operator to communicate with every man whose services were required, and most of these men were at work within an hour of the time that filtered water was turned off.

Fifth. Beginning at seven o'clock in the morning, the police in the districts affected began the distribution of upwards of 20,000 "Boil Your Water" cards to each individual home in the district affected.

Sixth. By noon the two telephone companies had telephoned to nearly 13,000 subscribers.

Seventh. During the day twenty-three Inspectors were sent through the district pasting notices on telegraph poles, in shop windows, etc.

Eighth. One hundred special delivery letters were sent to ministers in the district, asking for their co-operation in calling attention to the danger at each of the church and Sunday-school services on the following day.

Ninth. Through the Superintendent of Schools, it was arranged that on the following Monday morning the same announcement should be made to every school child.

Tenth. The work of repair was so planned as to make relatively sure that, first, the same accident will not occur again, and, second, it was done so energetically as to have filtered water again passing through the main in less than twenty-four hours.

WATER WASTE CAMPAIGN.

From a dollars and cents standpoint, by far the most important work of the Bureau during the course of the year has been a widely conducted campaign looking toward the education of the public to a more reasonable and economical use of water. That this campaign has been successful is indicated in many different ways. From the start, every effort has been made to impress upon the public that it is not desired that any one shall economize in the legitimate use of water. In a large part of our City it is unfortunately true that the per capita consumption of water for legitimate purposes should be increased, and it will be increased with the betterment of our living standards. It is equally true, however, that both for manufacturing and residential uses Philadelphia at the time we began this crusade—barring only two or three smaller cities—was the most wasteful city in the world in its use of water. We are undoubtedly fortunate in lying at the junction of two such magnificent waterways as the Delaware and Schuylkill. Under proper management this will always mean that our necessary expense for water under proper administration will be less than that of other cities not so favored. But it is not wise to allow this good fortune to be given as an excuse for a profligate waste of water—a waste certainly amounting to one-half of all we use, or perhaps 100 gallons per capita per day. Considering the fact that it has to be pumped, and sometimes pumped twice, and always allowed to settle and then filtered twice, water has become a manufactured product and therefore cannot be regarded “as free as air.”

The first step in the water-waste campaign was the securing of an ordinance allowing the installation of water meters, heretofore prohibited for residences and prohibited

for manufacturing establishments except where excessive waste was shown.

THE WATER CONSERVATION EXHIBIT.

This was followed by the Water Conservation Show, so successfully held in the City Hall court-yard, which was visited by nearly 400,000 people and indirectly resulted in a large number of meetings held both in the City Hall and in the several sections of the City. This Exhibit was entirely made up of meters and other water-saving appliances. No rent was charged for the space, the only restriction being that nothing was to be shown that did not have a direct bearing on the conservation of the City's water supply. It was the first time such an exhibit has been held, and as a result of it similar exhibits have been held and are being planned not only in other cities in this country, but abroad. In connection with the Water Conservation Exhibit many thousand buttons of unique design were circulated among school children, and prizes were offered to children of the Seventh and Eighth Grades for the best essays on the saving of water in domestic use. Two pamphlets were distributed in large quantities.

A large crew of water waste Inspectors was put on for house-to-house inspection. This scheme had formerly been tried and abandoned as too expensive. Under better supervision, and we believe a higher type of men, the cost has been gradually reduced until it is now in the neighborhood of four cents a house—obviously a figure at which work of this kind can be carried on profitably. During the year practically the entire City has been covered twice, and through the canvass hundreds of thousands of leaky fixtures have been located and repaired. This work is still being kept up. It is a curious commentary on human nature that of all the leaks detected not more than about

one in five thousand was that of a hot water fixture. The householder having an interest in the expense of heating the water, also apparently is interested in seeing that it is not wasted.

An exhaustive campaign for the detection and repairing of street leaks was begun and is still going on. This work is made possible largely through two instruments known as the pitometer and microphone. The work is done for the most part between twelve midnight and four o'clock in the morning. The night flow in most districts, less about 10 per cent. for legitimate leakage, is a good measure of the unwarranted waste. Through the use of the microphone, in the still watches of the night, water running sometimes far below the surface can be distinctly heard. After the street leaks have been fixed the remainder of the waste is chargeable to the houses and industrial establishments in the districts.

Metering City Hall Supply.

In order to set an example in municipal water saving, a 12-inch meter was installed in the City Hall. It resulted in immediately cutting the water consumption in that building in half. Through an arrangement with the Board of Education, the first of a series of steps has been taken which will result in metering all the school houses within the next four years. It is unfortunate that in these institutions, which should teach our young people good habits in this respect, we have found the most flagrant waste of water.

Elimination of the waste of water, of course, has the added good effect of giving us greater pressure both for fire and home purposes. Very marked betterment in this respect has been noticeable in several different sections of the City. When we began there were large areas of the

City where water never reached the third floor, and not even the second floor at certain hours of the day. The added pressure is obviously a big gain in the matter of fire fighting.

Our best advice is that Philadelphia's present water supply will be adequate for the next five or ten years if we can put its use on something near a proper basis. It is obvious that if we make any addition to our water facilities, it will mean an expenditure of \$15,000,000 or \$20,000,000, and every year that this can be postponed will mean a saving of at least \$1,000,000 in interest and Sinking Fund charges.

That this campaign for the conservation of the water has been in large measure successful is demonstrated by the reduced amount of water pumped. In the West Philadelphia district, where the work has been very thoroughly done, the daily pumpage has been reduced from 45,000,000—48,000,000 gallons to 32,000,000—35,000,000 gallons within a year. An interesting index of the lessened demand on the pumping stations is the fact that we are burning 3,000 tons less coal than for the corresponding month a year ago.

The demand for the introduction of meters has been as active as is desirable; in fact, the Bureau has not been able to meet the demand for meters with the limited resources at its disposal. It is felt, however, that the adoption of meters is going forward as rapidly as is at all desirable. Naturally, many of the meters that go in now are installed by those who are more anxious to save money than to save water, and especially in the early stages it seems a good policy to let the introduction of meters only keep pace with the growing appreciation on the part of the public of the fact that no final solution will be secured except through an almost universal introduction of meters.

We are convinced that it will not be necessary to raise the minimum rate for the more modest type of home; in fact, if any change is made in the rate for houses of this kind, it should be reduced. It has been our thought that it will probably be desirable to raise the price per thousand gallons, but only to a point where the great bulk of our citizens will still not pay more water rent on a metered basis than they did before the introduction of meters. In other words, the saving to the community, due to the introduction of meters and the more intelligent use of water, will be sufficient to offset any possible increase in the water charges due to an increase in the rate. * * *

Reorganization of the Purvey Districts.

The most notable improvement is in the Purvey Districts perhaps, where business methods have been introduced both in the storage and issuing of supplies, in time keeping and in the bringing of all work under regular job orders, as is common practice in industrial establishments. The demoralization in the Purvey Districts, both as to labor and material, was almost beyond description. Both in the Purvey Districts and in the Pumping Stations an effort has been made to increase the general orderliness, primarily for its effect on employes. In the Pumping Station all the men have been uniformed.

CONSTRUCTION WORK.

During the year we began the long desired improvement to the West Philadelphia water supply through the laying of two additional 48-inch lines from the Belmont filters, the extension of the Belmont filters and the installation of an additional 10,000,000 gallon pump. We hope to have this completed during 1913. A contract was let for the replacement of a number of condemned boilers at Queen

Lane Pumping Station, and the southern wall of the East Park Reservoir was found to be in unsafe condition and is being strengthened under a \$25,000 contract.

In the Registrar's office the methods have been standardized, simplified and modernized. Instead of having most of the work done long-hand, typewriters are used, which permits of several copies of the same schedule required being made at one writing, with the result that the lists are so much more legible that errors are less frequent.

In the same way modern manufacturing methods have been introduced into the Machine Shop operated by the Bureau. A systematic method of planning, routing and cost keeping has been introduced.

The operation of the High Pressure Fire Service was turned over to this Department during the year and very marked improvements in its organization and operating methods have been brought about. The station at Sixth and Lehigh avenue was only brought into service after the transfer.

After all, the most notable change is in the spirit of the men in the Bureau. There is everywhere noticeable a desire on the part of the employees to assist in the work of regenerating the Bureau and bringing up its personnel and performance so that it will compare favorably with the best water-works to be found anywhere.

Our aim must be to save wherever saving is possible without detriment to the service, to make the service as good as it can be made, and in the fixing of rates it is our theory that the income must always exceed the outgo, but that a waterworks system should not in the main be operated as a revenue producer.

HIGHWAY BUREAU.

The Highway Bureau of Philadelphia has never been looked upon as an engineering Bureau for reasons of

practical politics. At the beginning of this administration, almost incredible as it may seem, out of 1,001 employees of this Bureau only one was qualified, either by experience or education, to call himself an engineer. It follows that the shifting of this Bureau during the year to a straight engineering basis must be considered as our greatest accomplishment. The City has been divided into two divisions (these two divisions made up of three and four districts respectively) and each put in charge of a Division Engineer. With one exception, all employees above the grade of Inspector have either resigned or been dropped and their places filled by trained engineers. This is the only Bureau in which there has been any addition made to the salary roll. In the former regime there were practically three salary grades: the Chief of the Bureau received \$6,000, the Commissioners \$2,500 and the Inspectors \$1,300. Obviously promotion within the Bureau on a schedule such as this was impossible. Under the new salary schedule it begins with the Chief's salary at \$6,000; there are two Assistant Engineers at \$4,000, one at \$3,000, seven District Engineers at \$2,500, two at \$2,100 three at \$1,800, several at \$1,500, thirty or forty at \$1,300, and the balance at \$1,200, all of whom, however, are not employed throughout the year. This has involved an increase in the total salary roll for the Bureau of something less than \$30,000 a year. It has made possible the promotion of employees from one grade to another, and in addition to this it has given us a larger number of men in the lower grades, providing for more adequate inspection than we have ever had before. Formerly the contractors not only drew the specifications, but inspected the work, and therefore this was not an important factor, but now that the Bureau has assumed the responsibility not only for the specifications, but also for seeing that they are adhered to, this change was necessary.

Office Records.

When we took charge the Bureau was almost devoid of records and those that were available were unreliable. One of the most useful accomplishments of the year has been the building up of data in regard to the condition of our highways that can be depended upon. Among other features of this work was the preparation of a map showing how every street and road within the City limits is paved, together with an accurate statement as to the mileage and condition of these roads. The Contract Department has been brought up to date by either starting work on or canceling every contract made prior to January 1, 1911. Many of these contracts were eight and ten years old.

Every specification in this Bureau had to be rewritten. They were almost devoid of engineering value and were filled with jokers and clauses which made them almost impossible of proper execution.

Work on the Lowlands.

An aggressive campaign has been carried on in the matter of draining the lowlands found in the southern section of the City, between the Schuylkill and Delaware rivers, and in the Fortieth Ward, west of the Schuylkill. Some of these waterways had not been cleared for over thirty years by the private companies charged with their up-keep. As a recent Act of the Legislature has put the responsibility on the City for all this work, larger expenditures were required for getting these water courses into such shape as to protect both property and public health. With moneys either in hand or in sight, we are planning to continue this work aggressively during the coming year.

An appropriation of \$5,000 for a mosquito campaign was secured and by means of it a demonstration made as

to the effectiveness of scientific methods in mosquito extermination. A large area of the southern section was oiled and otherwise kept in first-class condition, and as a result mosquitoes practically disappeared. The educational work done under this appropriation will undoubtedly have a far-reaching effect. A great deal of literature was printed and distributed and many public meetings held at which the subject was explained by a lecture, lantern slides and moving pictures.

Construction Work.

When the new administration came in work had been interrupted on the Northeast Boulevard, the Plaza, the Southern Boulevard and League Island Park, because the Courts had declared unconstitutional the supplemental contracts under which this work for the most part was being done. Specifications for the Northeast Boulevard were completed during the year, and the contract for the continuance of this project will doubtless be let early in the new year. Data in regard to the three other projects was very inadequate and much scattered, and it has been very difficult to get together information absolutely necessary to have in hand before resuming operations. Under authorization of Councils, Olmstead Brothers, of Boston, were retained to re-study these three projects in order to make sure that the plans under which they were being developed were such as to make the final result as satisfactory as possible. The wisdom of this move has been amply demonstrated and when the work on these projects is resumed the plans will have been materially remodeled.

Garbage.

A sensational reduction in the cost of the collection and disposal of garbage has been made. During the last few years the City had been paying in the neighborhood of

\$500,000 for the work done under this contract. We were successful in reducing a price of \$510,000 for 1911 to \$279,000 for 1912 and \$229,000 for 1913. At this one point alone in two years over half a million has been saved the taxpayers. A bill has been introduced in the Legislature asking for the right to let this contract for five-year periods, and if this is passed it will probably be possible to reduce further this contract by over \$100,000 a year. It is entirely possible that the arrangement may be made so that in those years when the market for grease is favorable the contract will yield the City revenue from this source.

Notwithstanding the saving, the work has been done very much better, the men uniformed and the paraphernalia used in the collection kept in much more sanitary condition.

A large part of the credit for this pickup is due to Irving S. Osborne, B. S., a graduate of Purdue University, who is perhaps the leading authority on this subject in this country, and who, under a private retainer, afterward repaid under authority of Councils, made a very exhaustive study of our situation.

At the beginning of the year we had 30,000 pigs in Philadelphia, 20,000 of which were kept south of South street. Under the lower bid it has become necessary for the garbage contractor to be more careful to secure as much of the product as he can, and this has made it more and more difficult for the "pig men" to get food for their animals, which has had the effect of very materially reducing the number of pigs in Philadelphia. Inquiry has shown that New York and Boston together, including their farm areas, have less than 2,000 pigs. This shows how every consideration, both of good health and good business, requires that pigs practically be eliminated from the City limits, except where they are maintained on farms and fed on the products of the farms.

Street Cleaning.

One of the most difficult problems of any municipality is the cleaning of its streets. It is an art which has progressed very little and is one that has been absolutely unscientific in its conduct. After an exhaustive, privately financed study, new specifications were drawn, calling for certainly 20 per cent. less work than was called for in former specifications, but work which could be more definitely gauged. The bids received totaled approximately \$1,600,000, or \$50,000 in excess of what the City had formerly paid. To secure perfectly satisfactory results will require constant effort continued over a period of years. The present methods used in street cleaning are almost sure to be entirely obsoleted, and a satisfactory method of inspection yet remains to be developed.

Among the more important improvements in the specifications are: The provision calling for the uniforming of the men, with a definite statement as to how often and in what manner every block in every street is to be cleaned; a definite number of block men prescribed; a comprehensive schedule of penalties for failure to live up to the specifications and greater publicity as to what the specifications require.

Maintenance of Pavements and Country Roads.

The moneys available for the maintenance both of City pavements and country roads was entirely inadequate and will continue to be inadequate unless very material increases in appropriations for these purposes are made. In the matter of country roads, it was decided to spend the bulk of the available funds for putting in good condition the main traffic lines leading from the center of the City to the suburbs. After consultation with representatives of

practically every interest, these lines were determined upon and the work completed during the year. This policy of spending what money is available on roads that practically everybody uses has proven generally satisfactory.

Asphalt pavements were found in deplorable condition, but before the close of the year the worst sections had been patched and otherwise repaired. The maintenance of City pavements is perhaps the most critical problem before this Bureau. Unless some new method is developed of financing this particularly urgent work, the general condition of these pavements is going to continue to go down. One of the principal causes for this condition is that under an ordinance of 1907 the P. R. T. Company was relieved of the responsibility of doing about \$1,800,000 worth of work every year in lieu of an annual payment of \$500,000. No effort has been made to make up this discrepancy and pavements of this class are going behind at about this rate each year.

A notable undertaking is the beginning of the Bensalem Pike Service Test Roadway, a section of road with practically uniform traffic conditions, built in 26 sections, each along approved lines. This road runs for about three miles along a roadway formerly in very bad condition. Our idea is to study the conduct and cost of maintenance of these different types of suburban roads under uniform usage.

Office Procedure.

To any one simply entering the Bureau of Highways it will become apparent that things are different. The physical re-arrangement of the office has been radical and of such a character as to make possible efficient service on the part of the employees. The office procedure, the handling of correspondence, the keeping of records, and all that sort of thing, have been studied and marked improvements

inaugurated. It is believed that for the first time in the history of the Bureau it is now possible for any citizen to go into this Bureau and within a comparatively short time be advised as to the status of any piece of work now in progress, or as to the condition any of the City's 1,700 miles of streets and roads. This information is freely available to any one without the use of political influence or go-betweens.

During the year a number of studies not heretofore referred to have been undertaken, as, for instance: (a) that of sidewalk encroachments, (b) curbs, (c) the conduct of City dumps, (d) the crossing of driveways over sidewalks, and others.

Considering the absolute demoralization that was found in this Bureau and in practically every part of its work, great credit is due to the present staff for the way in which they have promptly "put the house in order." This was only done at great sacrifice on their part in the matter of overtime, and the only compensation for this has been the satisfaction of having put our road work in first-class shape.

SURVEY BUREAU.

The Survey Bureau, taken as a whole, is one of the most efficient branches of the administration. Certain parts of its work, especially certain parts of the work done by the District Surveyors, is finer than anything that can be found in sister municipalities. There is no other city in the world that is so fortunate in its system of laying out new streets. That all our surveying, public and private, is done through the District Offices accounts for the fact that Philadelphians have practically no trouble, relatively speaking, over property lines, a subject which gives rise to a great deal of litigation in other communities.

Our effort will be to make the Bureau of Surveys more

and more one of record and design, to make the Water Bureau one of operation, and to put into the Highway Bureau, whenever possible, matters involving construction. While this plan cannot be followed out too logically, and especially at this time, it is referred to here as suggesting that as time goes on our municipalities will probably have to face an entirely different subdivision of work. Functional management, as opposed to the military form of control, is bringing about a radical realignment, both of duties and of personnel in industrial establishments, and there are good reasons to believe that a similar readjustment will constantly go forward in municipal governments.

Grade Crossing Work.

Outside of its routine, the important matters taken up in this Bureau during the year have been studies and negotiations looking toward further grade crossing removals, the maturing of our plans for sewage disposal, and the rapid transit inquiry. The year's progress in grade crossing removal work has been notable. A definite arrangement with the Pennsylvania Railroad for the removal of its tracks on Lehigh avenue from Aramingo to Richmond streets has been concluded. Engineering conferences with the officials of the Philadelphia and Reading Railroad have been going on constantly throughout the year on the change in grade of the Norristown Branch, involving numerous grade crossing removals east of the Schuylkill and along the dangerous section through Manayunk and Roxborough. There were very serious engineering difficulties to be overcome. The matter is now in such shape that all it requires is the funds with which to meet the City's share of the expense. We are confident that we will reach a successful conclusion to negotiations with the same railroad looking toward open-

ing two additional streets—Emerald and Tulip along the Richmond Branch; \$500,000 is available for this work.

The move for the removal of the Baltimore and Ohio tracks from Oregon avenue, begun early in the administration, has broadened out into a joint undertaking on the part of the City, the Baltimore and Ohio Railroad and the Pennsylvania Railroad that will change the whole character of Philadelphia south of Oregon avenue and east of the Schuylkill river. There are approximately 4,000 acres of low-lying land in this section which will be immediately opened up to residential and industrial development, removing at the same time pests, such as piggeries, mosquito breeding swamps and poudrette pits, which have hung like millstones around the neck of this section and retarded its growth for a generation. This whole plan, involving, at it does, grade crossing removals, an extensive program of filling in, the development of a park system, and the building of a comprehensive scheme of municipal docks along the Delaware water-front, is perhaps the most important single municipal undertaking to which the municipality has ever been a party. The joint expenditure involved, something over \$15,000,000, does not begin to be an index to the importance of the undertaking.

Probably in no city in the country is this whole question of grade crossing removals being handled in a more competent manner or on a fairer basis than it is here in Philadelphia. Both sides to the work bring to bear on it a spirit of fairness and an engineering competence that leaves little to be desired.

Sewage Disposal Work.

Some radical changes have been made during the year in the plans for the development of a municipal sewage disposal works. Under pressure from the State, if for no other reason, the City must almost immediately begin

active operations and must look forward to an expenditure of not less than \$4,000,000 a year, continued over a period of five or six years. Owing to our very favorable location, the price to be ultimately paid for a complete disposal system will compare favorably with that paid by other municipalities. It is probable that before the close of 1913 our plans will have been fully developed and ready for announcement.

Under appropriations totaling something over \$100,000, and under the direction of Transit Commissioner Taylor, a comprehensive inquiry into the rapid transit requirements of the different sections of the City has been carried on and engineering studies made as to the possibilities of meeting them. Considering the length of time and the amount of money spent by other communities in this kind of work, it is very gratifying to be able to report that probably before the summer recess a final report on this work will be laid before City Councils.

One of the minor but interesting accomplishments of the year, for which this Bureau should receive credit, was the building of a temporary Convention Hall, seating approximately 20,000 people, with barely three months elapsing between the breaking of the ground and the occupying of the building by the National Saengerfest. It is doubtful whether there has ever been a better record made in the expeditious erection of a large building. Considering the delays which are supposed to be inherent in governmental undertakings of this kind, it is very gratifying to know that, when occasion demands it, the checks and safeguards can be made subordinate to the object to be accomplished.

As indicative of the desire on the part of the administration to bring the people more intimately in touch with the affairs of their government, it is interesting to note the night meetings held by the Board of Surveyors in order

to give citizens at interest a chance to be heard on proposed street openings and other public improvements. It was felt that a larger attendance would be secured if these hearings could be held out of working hours, and the result has justified the change in plan.

An examination of the City Hall tower by H. H. Quimby, Assistant Engineer in charge of the Bridge Division, resulted in the immediate removal of a large number of heavy ornaments which had become so badly rusted as to be removable by the hand. Certain minor modifications in the design of the tower have been made as the result of this study which it is hoped will reduce the cost of its proper up-keep. It has been found that an extensive overhauling of the tower, which had been planned, is not necessary, and an effort is being made to annul the contract, made under a former administration.

It becomes more and more apparent that during the last few years, in the matter of main sewers, branch sewers and bridges, the amounts of money set aside for new work have been entirely inadequate. The building up of new sections of the City has gone on at a very much more rapid rate than the corresponding City work. In the matter of sewers this has become a very serious question, as there are at the present time approximately 30,000 homes without underdrainage. This condition must be corrected. No self-respecting community can continue to face the danger to public health, the inconvenience and the demoralization that goes with 30,000 cesspools in the built-up sections of the City. The City Beautiful is undoubtedly the city of the future, but a genuine enthusiasm for beauty as a factor in City building cannot exist where considerations of health and sanitation are so widely ignored as they are in this City in the matter of sewer construction.

The year has been an active one in the Division of City

Planning. The Committee on Comprehensive Plans has taken an active interest in subjects coming within its province and along many different lines. New work has been inaugurated and further efforts made to allow aesthetic considerations to obtain in the development and treatment of streets, squares and parks.

LIGHTING.

There are two Bureaus in the Department which have to do with the matter of light—those of Lighting and Gas. All matters connected with electric lighting are in charge of the Electrical Bureau in the Department of Public Safety. We look forward to their consolidation in one central Bureau of Lighting in this Department, as provided for in the Bullitt Bill. Inasmuch as a number of other transfers were brought about during the past year, it was thought that this particular one should be postponed until the other readjustments had settled down to routine. The effort has been made, however, to handle the two Bureaus in this Department as much as possible as a single Bureau. A number of very notable changes have been made during the year.

For the second time in 35 years genuine competition was secured in the contract for gasoline lighting. The specifications had been carefully drawn, so as to provide for a more definite inspection and a better quality of work. Notwithstanding the increase in the wholesale price of gasoline from \$.07 to \$.13, involving an increase in the cost to the contractor of upward of \$100,000, we received a bid which was practically the same as we had been paying in past years. The fact that there are other responsible people willing to bid for this municipal work cannot help but have a very salutary effect.

Gasoline lighting is now really obsolete, and with every

increase in the cost of gasoline, due to its demand in the automobile field, it becomes more of a back number. Plans must then be made for taking care of the field now occupied by the gasoline lamp in some other way. Through an arrangement with the United Gas Improvement Company they have agreed to take over, at a price which nets a little more than \$23, those lamps situated along the lines of their gas mains. We have received a tender from the Philadelphia Electric Company for replacing some of these lamps with Tungsten lights. Other plans which we have in view make it appear that it will not be many years before gasoline as a source of light in Philadelphia will have been relegated to its proper sphere—that of simply acting as a temporary advance guard of other forms of lighting. This will reduce the number of lamps from nearly 19,000 to less than, say, 2,000 to 3,000.

Upward of 100 gasoline lamps, located on private property and serving no public use, have been removed and re-located along public thoroughfares. There were some instances where private places in the suburban districts had been lighted at City expense for a number of years.

Welsbach Mantles on Gas Lamps.

The most noteworthy accomplishment in this field was securing from the United Gas Improvement Company the promise to place on 24,000 street gas poles the new boulevard style of top, equipped with Welsbach mantle. These take the place of a similar number of the old-fashioned square housings, invented by Benjamin Franklin and equipped with flat flame burners. The flat flame gas burner is an obsolete mechanism, Philadelphia being the last of the large cities to abandon its use. It will probably take six months, or until July 1st, to complete the substitution. When completed it will mean that with the

burning of a smaller amount of gas we will have tripled the amount of light on the streets. The change involved a capital outlay of over \$100,000.

The procedure of the Bureau of Gas as it has been carried on during the last 15 years requires overhauling. Tests of the quality of the gas which have been conducted in the past would have practically no technical value or standing in court. It is believed that the testing of meters has not compared favorably either in quantity or in kind with that now being carried on in other communities. Fortunately, owing to the high-class organization of the United Gas Improvement Company, the poor quality of the work done in this Bureau has not meant as much to the community as it otherwise would. Undoubtedly, however, the City should not rely on the competence or honesty of the City's contractors with which it does business for the faithful execution of contracts. It has been very difficult for some reason to get funds authorized for carrying on this work and a good deal that has proven immensely profitable to the City has, in the absence of public appropriations, been financed privately.

The consolidation of the City's lighting interests must be the goal toward which we must work, and again, there is no part of the City's work where it is going to be more necessary to pay sufficiently high salaries to attract the most competent men as in these Bureaus. At every point they are in competition with the best brains that public service corporations can command and for which they pay high salaries.

CITY PROPERTY.

The Bureau of City Property, since the passage of the Bullitt Bill, against the provisions of the City Charter, has been in the care of the Department of Public Safety. A nominal transfer was made to this Department on

October 1st and confirmed by City Councils with the adoption of the budget for 1913. The Bureau is now in process of very radical reorganization and rejuvenation. Already a number of changes have been effected.

The bath-house superintendents, who formerly worked throughout the year with no active duties except during three or four months in mid-year, have been laid off and an ordinance has been introduced asking for the transfer of these bath houses to the Board of Recreation.

A competent architect has been temporarily designated as Superintendent of Independence Hall to direct the work of putting that national shrine in first-class order, both as to the buildings themselves and the staff which looks after them. No extensive scheme of restoration is planned, but rather a study of the details which make or mar the atmosphere of such historic buildings.

A citizens' association has been interested in the development of Washington Square at private expense, but under the direction of the Bureau of City Property. It is hoped that other similar associations may start in other sections of the City to take an interest in other squares.

The Bureau has also taken an active interest in the rearrangement of rooms in the City Hall, looking toward giving some of the overcrowded occupants more space and generally utilizing the space to better advantage.

Marked improvements have been made in the conduct of the Real Estate Division, especially in the raising of the standard of tenants occupying City properties and increasing the revenue by an advance in levying of rents.

In the conduct of some of the properties in the control of this Bureau the City has been the worst offender against the rules and regulations of the Board of Health. Every effort is being made to do away with this disgrace and to have the City in this respect become a model landlord.

Probably in no department of our work will more progress be shown during the next year than in the Bureau of City Property under its present direction.

A study was made of the rooms in City Hall in which fees are paid and permits issued, so as to bring them together along the hallway. The necessity for this was emphasized when it was discovered that the average home-builder, seeking the necessary licenses and permits, spent most of his time in elevators going from the top of the building to the bottom. Little progress has been made in placing these in one central location.

Use Made of Available Funds.

The total available funds for construction, maintenance and repairs for this Department during the year 1912 amount to \$10,399,507.95. Of this \$6,098,676.56 has been executed and put under contract, and much of the work has already been accomplished. Of the \$4,300,000 balance, about \$3,000,000 is held in large items, as follows:

For the Northeast Boulevard, \$1,000,000; \$500,000 reserved for payments of land damages along the Richmond Branch, Philadelphia and Reading Railway; 500,000 reserved to open two or three additional streets along Richmond Branch as soon as negotiations with the Philadelphia and Reading Railway are completed; \$1,000,000 for grade crossing work in South Philadelphia.

The balance is reserved for contracts advertised, but not yet let, awaiting Councilmanic action; reserved for completion of other public work or awaiting plans.

The smallness of this balance (\$250,000) shows how active the several Bureaus have been in getting promptly under way improvements for which funds are available.

High Cost of Living Inquiry,

Under instructions from you we undertook in this office an inquiry into some of the factors which have brought about the present high cost of living, with especial reference to those which are local in their origin. An interesting phase of this inquiry was the work done by Dr. Clyde L. King on the trolley light freight situation. His report is considered one of the most important contributions made anywhere to this general subject. Largely as a result of this study and the conferences which followed it, we have secured from the P. R. T. Company the promise to do its share toward co-operating with suburban trolley lines. The whole market situation is in deplorable condition and will undoubtedly get worse before it gets better. We are trying to plan out some scheme by which at least steps in the right direction can be taken.

The same physical changes that have been carried on so extensively in other divisions of the Department have been made in the Director's office. In the matter of lighting, furniture and general cleanliness marked improvements have been made. Modern office appliances of all kinds have been introduced and a new filing system for correspondence has been started. As soon as the system has been fully developed it is hoped to amalgamate the files of the Director's office with those of the Bureaus, in the hope of cutting down the expense of maintaining files and records.

In conclusion, it seems only fair to say that in the matter of administration the work of this Department, judged by any absolute standards, is in a very crude stage of development. In our industries and generally throughout the working world great changes in method are being brought about. In the municipal field there has been very little method of any kind, hence we will not be able to

claim any high degree of efficiency for many years to come, and then only on condition that there has been made a long-continued and well-sustained effort to bring it about. In other words—we will not be able to secure for the taxpayer a dollar of return for every dollar paid unless taxpayers see to it that the expenditure of this money is placed in the hands of those qualified to expend it, not only honestly, but efficiently, and this method of attack must not come as the result of a spurt, but be as much the settled policy of municipal administration as it is in private undertakings.

Yours very sincerely,

M. L. COOKE.

Director.

ANNUAL REPORT

OF THE

BUREAU OF WATER

FOR THE

YEAR ENDING DECEMBER 31, 1912

ANNUAL REPORT
OF THE
BUREAU OF WATER
FOR THE YEAR 1912

TWENTY-SIXTH ANNUAL REPORT
OF THE
BUREAU OF WATER

ONE HUNDRED AND ELEVENTH ANNUAL REPORT
OF THE
**OPERATIONS CONNECTED WITH THE CITY
WATER SUPPLY**

Philadelphia, February 13, 1913.

MR. MORRIS L. COOKE, Director,
Department of Public Works.

SIR:—I present herewith the annual report of the Bureau of Water for the year ending December 31, 1912.

The Bureau of Water, under the Director of the Department of Public Works, is charged with the function of supplying and distributing water to the City, and assessing rates and administering the operation of the works as directed by ordinances of Councils.

Under your directions, it has been the aim of the Bureau to curtail expense where feasible, but not to lose sight of

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the fact that efficient service is the fundamental consideration in a matter so vitally affecting the health and comfort of every citizen as the water supply. Not only is practically every resident interested as an individual in the water supply, but all commercial enterprises, all factories and manufacturing industries, and the commerce of the City, through the railroads and shipping, are dependent upon an uninterrupted and satisfactory supply of water.

The Water Bureau must not be satisfied with meeting present needs, but must forecast future necessities. The distribution system is being constantly enlarged and the number of consumers is growing rapidly.

It is sound business policy to look ahead and adjust present work to harmonize with a definite policy commensurate with the anticipated requirements of the Philadelphia of the future. To adapt an old saying, it is not the part of wisdom to let the well run dry before missing the water.

While it is expedient to plan now for future wants, there should be no diminution of the efforts to decrease waste and diminish the demands upon the present system, thereby prolonging its time of effective usefulness. A careful study of the draft made upon the City's supply leads to the conclusion that a large amount of the water pumped into the mains is put to no useful purpose but is wasted.

Unless a radical response is made to your appeal to decrease this waste, the time is near at hand when the capacity of the present works must be enlarged, and such increase must be upon a scale to correspond with the prevalent extravagant demand.

A vigorous effort has been made during the past year to bring the matter of waste to the attention of the public

and secure co-operation in reducing it. More than 300,000 buildings were inspected, in 25 per cent. of which leaking fixtures were found, aggregating over a quarter of a million fixtures.

The effectiveness of such work depends upon the co-operation of the householders, upon their willingness to keep fixtures in permanent repair, and to shut the water entirely off after using a fixture.

In addition to the householder, the Water Bureau has a function to perform in detecting and repairing leaks in the mains. A corps has been organized for this purpose and is now at work. Incidentally to this street work leaks in service pipes are discovered for which the property owner is responsible.

Doubtless, the house inspections and resulting notices to repair leaks are annoying, but the magnitude of the total leakage from all the fixtures in the City makes this supervision an essential feature of the effort to bring the draft upon the works down to a more moderate standard.

The curtailment of waste will permit a readjustment of rates upon a more equitable basis. At the present time, the wasteful user of water is placing upon his more economical neighbor a portion of the enhanced cost of the supply due to careless use.

The Bureau is self-supporting; but a readjustment of rates based more nearly upon service rendered should be given careful consideration. In making any revision there should be available a reasonable knowledge of the amount of water which will be required, in order that the cost of production may be estimated with sufficient accuracy.

Revenues.

The revenues from the Water Bureau were \$4,947,-648.64, an increase of \$99,432.84, or 2 per cent. over those of last year.

The Water Bureau is called upon to render a large amount of services for which no return appears upon a financial statement. Water was furnished to 420 institutions or societies on a charitable rating, at a total decrease of \$104,321.39 from full schedule charges, and for numerous public purposes from which no revenue was received, such as: Public schools, City buildings, Alms-houses, extinguishing fires, street cleaning and sprinkling, City contracts, fountains, etc.

Expenditures.

The total expenditures for the Water Bureau, not including interest or sinking fund charges, but including material furnished through the Department of Supplies, were \$2,758,726.21, an increase of \$157,965.71 over those of last year.

These expenditures include improvements and operation and maintenance. From some of the improvements, additional revenue may be expected, or decreased cost of operation. Certain other expenditures, while improving the service, or increasing the area served, will bring in no immediate revenue.

The division of expenditures between improvements, and operation and maintenance, is given in the following table:

	1911	1912	Increase
Improvements	\$331,560 18	\$487,068 59	\$155,508 41
Operation and maintenance.....	2,269,200 32	2,271,657 62	2,457 30
Totals.....	\$2,600,760 50	\$2,758,726 21	

The division of the operation and maintenance expenses between labor and materials is given in the following table:

	1911	1912	Decrease	Increase
Supervision and labor-----	\$1,362,416 71	\$1,312,942 69	\$49,474 02	
Materials and supplies-----	906,783 61	958,714 93	—	\$51,931 32
Totals-----	\$2,269,200 32	\$2,271,657 62		

The largest single item of expense is coal, for which \$616,601.90 was paid in 1912, and \$570,483.08 in 1911, an increase of \$46,118.82.

The total coal consumption in 1912 was 284 tons less than in 1911. The average price paid per ton was 19 cents more in 1912 than in 1911, this increased expenditure being incurred at the time of the threatened strike and in subsequent contracts.

Consumption.

The total water delivered into the distribution system, as estimated by the pumping station records, was 116,781 million gallons, which is equivalent to a per capita daily rate of 198.6 gallons based upon a population of 1,606,000.

The means available for measuring the pumpage are not altogether reliable or satisfactory. Steps were taken to improve this condition by providing additional Venturi meters. The pumpage from each station, as measured by displacement, should be checked by an independent method. Likewise, the flow into the distribution system should be measured by districts of reasonable size, in so far as such districts can be segregated. Ability to thus measure water by wholesale will prove of great value in keeping track of the water furnished to the City, and aid materially in locating the cause of any unexplained increase in the demand.

The total pumpage, including water pumped at the filters, and repumped for high service, was 200.974 million

gallons. This total pumpage is the equivalent of 333.410 million gallons pumped 100 feet high. The similar equivalent for 1911 was 323,417 million gallons pumped 100 feet high.

A comparison of the water pumped and coal consumed in 1912 and 1911 is given in the following table:

	Tons anthracite	Tons bituminous	Total coal	Million gallons 100 feet high
1911.....	77,143	117,463	194,606	323.417
1912.....	80,946	112,900	193,846	333.410

Pumping Equipment.

The pumping equipment remained as in 1911, and is scheduled according to the functions performed in the following tables:

Pumping Stations Delivering Raw Water to Filters.

Station.	Source of supply.	Districts furnished with water.	Capacity million gallons per day.
Torresdale -----	Delaware river -----	Northeast, central and southern sections of City-----	330
Shawmont -----	Schuylkill river -----	Roxborough, Manayunk, Chestnut Hill, Germantown-----	51.5
Queen Lane -----	Schuylkill river -----	Tioga and vicinity -----	80
Belmont -----	Schuylkill river -----	West Philadelphia -----	67
Roxborough Auxiliary -----	Repumps to Upper Roxbo	rough Filters, raw water delivered to Upper Roxborough Reservoir from Shawmont-----	30

Pumping Stations Repumping Filtered Water.

Lardner's Point No. 2-----	Filtered water from Torresdale -----	Northeast, central and southern sections of City-----	{ 120 120
Lardner's Point No. 3-----			
Wentz Farm, High Service..	Wentz Farm Reservoir, supplied by filtered water from Lardner's Point No. 3 -----	High districts in Olney and Foxchase-----	7
George's Hill, High Service..	Filtered water from Belmont -----	High districts of West Philadelphia-----	11
Roxborough, High Service..	Filtered water from Lower Roxborough, supplied from Shawmont -----	High districts in Germantown, Chestnut Hill and Roxborough--	10

Pumping Station Held in Reserve.

Lardner's Point No. 1-----	Raw water, Delaware river, or Torresdale filtered water -----	Northeast, central and southern sections of City in case of accident to Torresdale or Lardner's Point No. 2 and No. 3-----	57
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Filters.

The entire City is supplied with filtered water. The quality of the water has been maintained and improved, as evidenced by the decrease in the typhoid fever rate given in the table below:

Year.	Number cases.	Cases per 100,000.	Number deaths.	Deaths per 100,000.
1901.....	3,369	278.5	444	33.7
1902.....	5,006	373.3	588	43.8
1903.....	8,701	637.2	957	70.1
1904.....	6,587	473.8	744	53.5
1905.....	6,450	455.6	684	48.3
1906.....	9,721	674.4	1,063	73.8
1907.....	6,762	460.8	890	60.6
1908.....	3,502	234.4	533	35.7
1909.....	2,336	153.5	331	21.8
1910.....	1,745	112.7	270	17.4
1911.....	1,382	87.7	223	14.1
1912.....	1,528	95.2	203	12.6

The filter plants remain as at the close of 1911, and are scheduled below:

Plant.	Pre-filters, square feet.	Sand filters, acres.	Maximum quantity filtered in one day, million gallons, 1912.
Torresdale.....	137,160	49.75	230.7
Queen Lane.....	44,080	16.10	71.1
Belmont.....	28,215	13.53	43.8
Upper Roxborough.....	—	5.60	17.9
Lower Roxborough.....	11,264	2.65	11.6

The results of the work of the filters for the year, in reduction of turbidity and bacteria, are given in the following table:

	Torrestale.	Queen Lane.	Belmont.	Upper Roxborough.	Lower Roxborough.
Average reduction turbidity per cent. -----	96.98	97.91	99.44	99.67	99.54
Average reduction bacteria, per cent. -----	99.61	99.50	99.62	99.96	99.85
Maximum reduction turbidity, per cent. -----	100.00	99.64	100.00	100.00	100.00
Maximum reduction bacteria, per cent. -----	99.97	99.98	99.99	99.99	99.99
Minimum reduction turbidity, per cent. -----	93.33	68.75	97.22	91.89	97.30
Minimum reduction bacteria, per cent. -----	98.47	91.54	90.26	98.91	93.82

Distribution System and Service Pipe Connections.

During the year 120,115 feet of distribution mains were laid, ranging in size from 6 inches to 12 inches. The total length of such mains in the City's water system is approximately 1,728 miles.

There were 7,697 new service connections made, ranging in size from $\frac{1}{2}$ inch to 6 inches. The total number of service connections in use is approximately 350,000.

Two hundred and twenty-seven (227) additional fire hydrants were placed, not including those installed on the high pressure system. The total number of fire hydrants connected with the ordinary water service is 16,102.

Meters.

On July 13, 1912, City Councils passed an ordinance giving any water consumer in the City the privilege of

installing a meter, provided said consumer furnished such meter at his own cost. The Bureau of Water was authorized to test and place such meters at the cost of the City.

As a result of this ordinance, 2,839 meters were set, making the total number in service, 4,850.

Important New Work and Improvements.

Queen Lane Filters: Certain superficial features of the Queen Lane Filters not completed in 1911, such as grading, coping and granolithic walk, are practically finished.

Queen Lane Boilers: An ordinance of June 4, 1912, appropriated \$45,000 for replacing boilers condemned at Queen Lane Pumping Station. Progress has been made on this work under the following contracts:

H. E. Trotman, feed pump (completed).....	\$2,780 00
American Blower Co., blast fans (completed).....	2,618 00
Geo. A. Sinn, bricks, sand, etc. (partly completed).....	4,850 00
Knickerbocker Lime Co., cement, lime, etc. (partly completed)	2,850 00
Theo. Smith & Sons, boilers	30,000 00

Office Building, First Purvey District: The office building for the First Purvey District provided for by an item of \$10,000 in the general appropriation was practically completed.

Reconstruction of One Queen Lane Pump: An ordinance of June 4, 1912, appropriated \$40,000 for the reconstruction of one Queen Lane pump. This station contains four 20,000,000-gallon Southwark Vertical Triple Expansion pumps, installed in 1897. Three of the pumps have recently been rebuilt. A contract for rebuilding No. 4 was let to the Bethlehem Steel Company under the above ordinance on August 28, 1912, for \$38,000. Substantial progress has been made.

Improvement of West Philadelphia Water Supply: An ordinance of June 4, 1912, appropriated \$300,000 for the

improvement of the West Philadelphia water supply. The work contemplated under this appropriation provides for an additional force main of 48-inch cast-iron pipe from Belmont Pumping Station to Belmont Filters; an additional distribution main of 48-inch cast-iron pipe from the filters toward the central portion of the general distribution system of West Philadelphia, together with certain incidental improvements.

Progress has been made on this work under the following principal contracts:

Simplex Valve and Meter Company, Venturi meters...	\$3,000 00
Kennedy Valve Manufacturing Company, valves (completed)	5,000 00
Blaisdell Filtration Co., filter cleaning apparatus.....	14,800 00
John McMenamy, laying pipe	135,000 00
Walter Wood, furnishing pipe	140,000 00

Extending Water Mains on Penrose Ferry Road and Tinicum Island road: Under an ordinance of March 12, 1912, appropriating \$28,000 for extending the water mains on Penrose Ferry road and Tinicum Island road, the Bureau laid about 20,000 feet of 12-inch cast-iron pipe.

General Comments.

A contract was made with Sloan & Co. for \$15,000, for repairing damage done to real estate near Shawmont avenue, Roxborough, by the break in the water main on Eva street, on November 28, 1911. Substantial progress was made on this contract.

A similar break in the same main at the same place in October, 1912, was repaired without damage to property. Owing to this break it was necessary to pump unfiltered Schuylkill water into certain districts of Germantown, Chestnut Hill and Roxborough for about twenty-four hours. The raw water was heavily dosed with hypochlorite

of lime and the affected districts were widely notified of the facts. The Department of Health reports no increased typhoid following this experience.

An unusual degree of turbidity prevailed in the Delaware and Schuylkill rivers during the latter part of February and the 1st of March. The capacity of the filter plants to remove this turbidity was overtaxed, except in the case of the Upper Roxborough filters, where a ten days' storage and sedimentation is provided by the Upper Roxborough Reservoir.

In this exceptional instance the work of the filters should be judged, not so much by what they failed to do as by what they actually accomplished.

The following table gives the tons of sediment removed by the filters from the water supplied to the City during this period of high turbidity in the spring:

*Tons of Sediment Removed by Filters from Water
Furnished City During Three Weeks Ending
March 30, 1912.*

	Amount filtered, million gallons.	Average turbidity.	Average per cent. removed.	Tons removed.
Torresdale -----	4,220	204	94.6	3,394
Queen Lane -----	1,267	768	98.4	3,992
Belmont -----	116	494	99.6	1,674

*Tons of Sediment Removed by Filters from Water
Furnished City During Single Day of
March 16, 1912.*

	Amount filtered, million gallons.	Average turbidity.	Average per cent. removed.	Tons removed.
Torresdale -----	207	1,050	95.2	800
Queen Lane -----	60	4,800	99.3	1,199
Behmont -----	40	2,400	99.5	396

Appendix.

As an Appendix, are annexed the detailed operations of this Bureau as contained in reports of the various officials having charge of the several functions of the Bureau as follows:

APPENDIX A—Report of the Chief Clerk, submitting statement of the expenditures of the Bureau.

APPENDIX B—Report of the General Superintendent, submitting Tables pertaining to the operation of the Pumping Stations.

APPENDIX C—Report of the Assistant Engineer in Charge of Distribution, submitting details of the distribution system.

APPENDIX D—Report of the Engineer in Charge of Filtration, submitting details of the operation of the Filter Plants.

APPENDIX E—Report of the Registrar, submitting details of the operations of that office.

APPENDIX F—Report of Hydrographic work.

Respectfully,

CARLETON E. DAVIS,
Chief of Bureau.

APPENDIX A



REPORT OF THE CHIEF CLERK



Philadelphia, January 1, 1913.

MR. CARLETON E. DAVIS,
Chief, Bureau of Water.

SIR: I respectfully submit herewith statement of the expenditures of this Bureau for the year 1912.

Respectfully,

J. T. HICKMAN,
Chief Clerk.

Expenditures of the Bureau of Water for the Year 1912.

General appropriation.	Amount appropriated.	Amount expended.	Amount merging.	Amount not merging.
An ordinance to make an appropriation to the Bureau of Water, approved December 29, 1911.....	\$1,098,671 00			
Balance from books of 1911.....	569,255 07			
Increased by additional appropriations and transfer.....	977,961 75			
Net appropriation		\$2,645,887 82		
Item 1. Salaries	\$606,575 00			
Increased by additional appropriation	750 00			
	\$607,325 00			
Diminished by transfer	2,000 00			
Net appropriation to item		605,325 00		
Office works and shop and districts roll.....	—		\$135,483 33	
Pumping stations:				
Fairmount	—		772 73	
Spring Garden	—		13,967 74	
Belmont	—		50,055 10	
George's Hill	—		7,532 94	
Queen Lane	—		28,806 19	
Shawmont	—		37,209 75	
Roxborough High Service	—		13,160 69	
Mt. Airy	—		1,059 68	
Lardner's Point	—		86,432 42	
Wentz Farm	—		9,311 20	
Torresdale	—		34,514 52	
Belmont Filters	—		18,311 75	
Queen Lane Filters	—		13,579 15	
Lower Roxborough Filters	—		5,940 48	
Upper Roxborough Filters	—		5,094 58	
Torresdale Filters	—		25,981 85	
Uniforms for policemen, watchmen, inspectors.....	—		2,480 00	
			\$490,624 15	\$114,700 85

Expenditures of the Bureau of Water for the Year 1912—Continued.

General appropriation.	Amount appropriated.	Amount expended.	Amount merging.	Amount not merging.
Item 1½. To pay deficiencies of 1911, ordinance March 29, 1912.....	\$3,491 05	\$3,491 05		
Item 2. For wages of mechanics, laborers and other workmen employed upon repairs to machinery and the maintenance of and repairs to buildings, grounds and reservoirs, and the transportation of workmen incident thereto: Provided, That the union rate of wages be paid to all employees.....	\$175,000 00			
Wages:				
Boilermakers	--	\$6,273 73		
Bricklayers	--	6,352 62		
Carpenters	--	8,768 87		
Crane runner	--	642 19		
Diver	--	710 71		
Helpers	--	10,419 21		
Horses, carts and men	--	2,501 37		
Laborers	--	107,811 28		
Machinists	--	23,669 30		
Painters	--	2,910 48		
Pump erector	--	754 93		
Tinsmiths	--	1,597 09		
Transportation	--	2,489 70		
Item 2-E. Same purposes as Item 2, ordinance June 4, 1912.....	\$125,000 00	\$174,901 48	\$98 52	
Wages:				
Boilermakers	--	\$4,058 74		
Bricklayers	--	2,896 09		
Blacksmiths	--	187 50		
Carpenters	--	7,896 16		
Clerks	--	390 37		
Crane runner	--	391 50		
Diver	--	423 93		
Foreman of laborers	--	321 00		
Helpers	--	8,540 00		

Expenditures of the Bureau of Water for the Year 1912—Continued.

4 W	General appropriation.	Amount appropriated.	Amount expended.	Amount merging.	Amount not merging.
	Item 2-E.—Continued:				
	Wages:				
	Hired horses -----	—	\$198 00		
	Horses, carts and men -----	—	1,875 62		
	Laborers -----	—	71,214 43		
	Machinists -----	—	13,122 50		
	Painters -----	—	2,836 89		
	Pump erector -----	—	548 32		
	Tinsmiths -----	—	1,265 12		
			\$116,166 58	—	\$8,833 42
	Item 3. For the wages of mechanics, drillers, laborers and other workmen connected with repairs to and improvement of the distribution and the laying of service mains, the transportation of workmen engaged in repairs and the traveling expenses of Pipe Inspectors.-----	\$175,000 00			
	Wages:				
	Improvement -----	—	\$54,709 35		
	First District -----	—	15,197 56		
	Second District -----	—	16,306 77		
	Third District -----	—	20,200 61		
	Fourth District -----	—	11,010 41		
	Fifth District -----	—	11,150 25		
	Sixth District -----	—	13,906 18		
	Seventh District -----	—	28,219 57		
	Transportation -----	—	3,598 87		
	Traveling expenses -----	—	501 49		
	Item 3-E. Same purposes as Item 3, ordinance June 4, 1912.-----	\$125,000 00	\$174,803 06	\$196 94	
	Wages:				
	Improvement -----	—	\$42,823 07		
	First District -----	—	9,806 32		

Expenditures of the Bureau of Water for the Year 1912—Continued.

General appropriation.	Amount appropriated.	Amount expended.	Amount merging.	Amount not merging.
Item 3-E—Continued.				
Wages:				
Second District	—	\$7,701 05		
Third District	—	18,324 00		
Fourth District	—	9,481 77		
Fifth District	—	6,841 28		
Sixth District	—	8,948 25		
Seventh District	—	15,277 86		
		\$119,203 60	—	\$5,796 40
Item 4. For wages of mechanics, helpers and other workmen at the City Repair and Construction Shop	\$25,000 00			
Wages:				
Blacksmiths	—	\$2,757 21		
Blacksmiths' helpers	—	2,174 90		
Drivers	—	498 39		
Engineer	—	633 57		
Laborers	—	1,682 88		
Machinists, first class	—	10,565 00		
Machinists, second class	—	661 50		
Machinists' helpers	—	2,871 09		
Patternmakers	—	2,968 00		
		\$24,812 54	\$187 46	
Item 4-E. Same purposes as Item 4, ordinance June 4, 1912.....	\$15,000 00			
Wages:				
Blacksmiths	—	\$1,497 31		
Blacksmiths' helpers	—	1,068 37		
Chauffeur	—	39 00		
Engineer	—	358 60		
Laborers	—	1,134 75		
Machinists, first class	—	6,400 23		

Expenditures of the Bureau of Water for the Year 1912—Continued.

General appropriation.	Amount appropriated.	Amount expended.	Amount merging.	Amount not merging.
Wages:				
Machinists, second class -----	—	\$378 00		
Machinists' helpers -----	—	2,117 42		
Pattermakers -----	—	1,732 50		
		\$14,746 18	—	\$253 82
Item 5. For wages of the Hydrographic Corps-----	\$1,596 00	1,596 00		
Item 6. For repairs to boilers and machinery-----	12,000 00	7,475 66	\$24 34	4,500 00
Item 6-E. For same purposes as Item 6, ordinance June 4, 1912-----	3,000 00	1,721 87	—	1,278 13
Item 7. For hauling water pipe and machinery-----	2,500 00	1,200 97	1,299 03	
Item 7-E. Same purposes as Item 7, balance January 1, 1912-----	2,961 50	2,888 79	—	72 71
Item 8. Repairs to roofs -----	500 00	—	500 00	
Item 9. For clerk hire in writing up duplicates-----	\$3,000 00			
Increased by additional appropriation-----	716 08			
Net appropriation -----	3,716 08	3,716 08		
Item 10. For keep of horse for General Superintendent and Assistant, and keep of automobile for Chief -----	2,000 00	1,976 56	23 44	
Item 11. For advertising, postage, horseshoeing, miscellaneous expenses, repairs to wagons, carts, harness, tools, pipe pavements and incidentals, ground rent of 918 Cherry street and electric current-----	\$2,000 00			
Increased by transfer -----	2,000 00			
Net appropriation to item-----	4,000 00	3,987 34	12 66	

Expenditures of the Bureau of Water for the Year 1912--Continued.

General appropriation.	Amount appropriated.	Amount expended.	Amount merging.	Amount not merging.
Item 11-E. Same purposes as Item 11, ordinance June 4, 1912.....	\$5,000 00			
Increased by transfer.....	750 00			
Net appropriation to item.....	\$5,750 00	\$5,454 95	—	\$295 05
Item 12. For hauling ashes from pumping stations.....	3,000 00	2,098 15	\$1 85	
Item 12-E. Same purposes as Item 12, ordinance June 4, 1912.....	7,000 00	6,023 13	—	976 87
Item 13. For purchase of materials connected with and repairs to machinery, mains, buildings, sidings and reservoirs.....	2,500 00	2,493 41	6 59	
Item 13-E. Same purposes as Item 13, ordinance June 4, 1912.....	2,500 00	1,500 58	—	999 42
Item 14. For the wages of mechanics, laborers and other workmen employed in the maintenance and operations of the Upper Roxborough, Lower Roxborough, Belmont, Queen Lane and Torresdale Filter Stations, the Belmont and Torresdale Laboratory and the Torresdale Pumping Station.....	\$75,000 00			
Increased by transfer.....	33,000 00			
Net appropriation to item.....	108,000 00			
Wages:				
Belmont Filters.....	—	16,650 31		
Queen Lane Filters.....	—	7,218 37		
Lower Roxborough Filters.....	—	4,094 74		
Upper Roxborough Filters.....	—	3,328 00		
Torresdale Filters.....	—	76,684 08		
Item 14-E. Same purposes as Item 14, ordinance June 4, 1912.....	\$125,000 00	\$107,975 50	24 50	

Expenditures of the Bureau of Water for the Year 1912—Continued.

General appropriation.	Amount appropriated.	Amount expended.	Amount merging.	Amount not merging.
Wages:				
Belmont Filters.....	—	\$13,756 18		
Queen Lane Filters.....	—	11,098 25		
Lower Roxborough Filters.....	—	3,516 90		
Upper Roxborough Filters.....	—	3,586 10		
Torresdale Filters.....	—	63,907 73		
		\$96,765 16		
Item 15. For resanding the filters, painting and incidental expenses for operating the filters.....	\$3,000 00			
Balance January 1, 1912.....	2,000 00			
Net appropriation to item.....	\$5,000 00	4,992 49	\$7 51	\$28,234 84
Item 15-E. Same purposes as Item 15, ordinance June 4, 1912.....	7,000 00	3,952 11	—	3,047 89
Item 16. For erection of on office building and store-house for the First Pur- vey District.....	10,000 00	8,755 98	—	1,244 02
Item 17. Sand for filtration purposes, Torresdale beds, balance January 1, 1912	2,603 62	—	—	2,603 62
Item 18. For the purchase of and repairs to boilers and machinery, balance January 1, 1912.....	10,000 00	4,964 15	—	5,035 85
Item 19. Extension of fire main system, balance January 1, 1912.....	370 81	117 50	—	253 31
Item 20. For the improvement, extension and filtration of the water supply, balance January 1, 1912.....	7,053 46	3,061 50	—	3,991 96
Item 21. For the improvement, extension and filtration of the water supply, balance January 1, 1912.....	2,971 55	2,311 11	—	660 44

Expenditures of the Bureau of Water for the Year 1912—Continued.

General appropriation.	Amount appropriated.	Amount expended.	Amount merging.	Amount not merging.
Item 22. For the construction of a filter plant at Queen Lane Reservoir, balance January 1, 1912.....	\$142,038 85	\$139,542 67	—	\$2,496 18
Item 23-C. For the completion of Queen Lane Filters, balance January 1, 1912.....	343,177 32	231,465 58	—	111,711 74
Item 24. To authorize the Department of Public Works to draw, and the City Controller to countersign, a warrant in favor of Cunningham & Murray for additional work on filtration pipe distribution system contract, and authorizing a transfer from the annual appropriation to the Bureau of Highways to the Bureau of Water, balance January 1, 1912.....	56,077 96	—	—	56,077 96
Item 25. For extending water main on Penrose Ferry Road, from Twentieth street southwestward, thirteen thousand (13,000) dollars, and for the purchase of water pipe and accessories, to be laid in Tinicum Island Road, from Buist street to south of Ninetieth street, Fortieth Ward, fifteen thousand (15,000) dollars, ordinance March 12, 1912.....	28,000 00	24,821 80	—	3,178 20
Item 26. Authorizing the settlement of claims for damages to real and personal property occasioned by a break in water mains in Eva street, near Shawmont avenue, Roxborough, on November 28, 1911, and authorizing a transfer in the annual appropriations to the Department of Public Works and City Treasurer, for the payment of such damages, and authorizing the drawing and countersigning and delivery of warrants in satisfaction thereof.....	26,254 62	13,073 56	—	13,181 06
Item 26-E. For the reconstruction of one Queen Lane pump, ordinance June 4, 1912.....	40,000 00	—	—	40,000 00
Item 27-E. For replacing boilers condemned at Queen Lane Pumping Station, ordinance June 4, 1912.....	45,000 00	3,870 92	—	41,129 08
Item 28-E. For the purchase of uniforms for employees at the various pumping stations, to be worn while in the performance of their duties, ordinance June 4, 1912.....	3,000 00	—	—	3,000 00

Expenditures of the Bureau of Water for the Year 1912—Continued.

General appropriation.	Amount appropriated.	Amount expended.	Amount merging.	Amount not merging.
Item 29-E. For the purchase of materials, gate valves, and making connection to the 36-inch main to isolate the filtered and unfiltered water mains at the Roxborough Filters, ordinance June 4, 1912-----	\$2,500 00	\$2,064 00	—	\$436 00
Item 30-E. For the improvement of West Philadelphia water supply, ordinance June 4, 1912-----	300,000 00	72,568 56	—	227,431 44
Item 31-E. For hypochloride of lime treatment of plants at filter stations, ordinance June 4, 1912-----	25,000 00	272 56	—	24,727 44
Item 32. To provide for the extension of water system from Bustleton to Somerton, ordinance November 22, 1912-----	30,000 00	—	—	30,000 00
Item 33. For repairs to East Park Reservoir, ordinance November 22, 1912-----	25,000 00	—	—	25,000 00

Summary.

Balance from books of 1911-----	\$569,255 47
Additional appropriations and transfers-----	977,961 75
Annual appropriation -----	1,008,671 00
	<hr/>
	\$2,645,887 82
Expended for improvements-----	\$482,527 20
Expended for current expenses-----	1,399,830 08
Amount merging -----	117,083 69
Amount not merging -----	646,446 85
	<hr/>
	\$2,645,887 82

APPENDIX B



REPORT

OF THE

GENERAL SUPERINTENDENT

SUBMITTING

TABLES OF EXPENSES, PUMPAGE AND CONSUMPTION
OF WATER DURING 1912*Philadelphia, January, 1913.*

C. E. DAVIS, Esq.,
Chief, Bureau of Water.

SIR: The following tables show the operation and expenses in connection with the work performed at the several pumping stations during 1912.

The construction of a concrete building for storing coal at the Georges Hill Pumping Station was begun on November 9th, and the building is 85 per cent. completed. It will have a capacity for storing seven hundred (700) tons of coal, or sufficient to supply that station for a period of six (6) months.

A concrete and steel girder siding, two hundred and forty-four (244) feet long, within the coal shed at the Shawmont Pumping Station, is under construction, and is eighty (80) per cent. completed. This work, when

finished, will facilitate the unloading of coal at this station, and will, in the future, reduce the price correspondingly on such deliveries.

The rebuilding of the pump end of No. 4 engine, Queen Lane Pumping Station, and the thorough overhauling of the steam engine are in progress. This work was begun on November 18, 1912, and is about fifteen (15) per cent. completed.

The twenty-four (24) steam boilers at this station were condemned in 1911, and are being replaced with eight (8) of the Badenhausen Company's water-tube boilers equipped with forced draught for burning rice or buckwheat coal. The work on four of these boilers is about fifty (50) per cent. completed.

The overhauling of No. 4, High Duty Worthington pump, Shawmont Pumping Station, was begun on August 21, 1911, and completed January 1, 1913.

Very respectfully yours,

A. J. F.,

General Superintendent.

1. Coal Purchased and Coal Consumed.
2. Coal Consumed for Pumpage.
3. Comparison of Pumpage for 1911 and 1912.
- 4a. Volume and Cost of Direct Pumpage for the years 1902 to 1912, inclusive.
- 4b. Volume and Cost of High Service Pumpage for the years 1902 to 1912, inclusive.
- 4c. Volume and Cost of Low Service Pumpage for the years 1902 to 1912, inclusive.
5. Cost of Raising 1,000,000 gallons 100 feet during 1911 and 1912.
6. Pumpage and Itemized Cost for 1912.
7. Total Gallons Pumped and Consumed during the year 1912.
8. Annual Pumpage, Coal, Lubricants, etc., 1912.
9. Description of Boilers, Bureau of Water, Philadelphia, 1911.
10. Description of Pumping Machinery of the Bureau of Water, Philadelphia, 1911.

Coal Purchased and Coal Consumed, 1912.

STATION	Classification	Price per ton	Tons	Purchased		Consumed		
				Cost	Total	Tons	Cost	Total
Spring Garden	Pea	3 18	1,967.95	\$6,258 08	\$6,258 08	908	\$2,887 44	\$2,887 44
Belmont	Pea	3 18	21,173.15	67,330 62	—	23,255	73,950 90	—
Belmont	Pea	3 68	5,772.45	21,242 62	—	4,472	16,456 96	—
Belmont	Buckwheat	2 53	6,558.35	16,592 38	—	6,558	16,591 74	—
Belmont	Buckwheat	2 47	4,512.35	11,146 74	116,312 36	4,473	11,048 31	118,047 91
Queen Lane	Pea	3 35	10,524.05	35,456 58	—	11,143	37,329 05	—
Queen Lane	Pea	3 45	6,631.60	22,879 02	—	6,632	22,880 40	—
Queen Lane	Pea	3 85	4,598.90	17,705 77	—	4,036	15,538 60	—
Queen Lane	Buckwheat	2 80	1,792.95	5,020 26	—	1,793	5,020 40	—
Queen Lane	Buckwheat	2 70	3,217.20	8,687 66	—	3,217	8,685 90	—
Queen Lane	Buckwheat	2 75	3,603.25	9,908 95	59,658 24	4,036	11,099 00	100,533 35
Shawmont	Pea	3 18	1,707.55	5,430 01	—	1,956	6,220 08	—
Shawmont	Pea	3 68	1,022.15	3,761 52	—	792	2,914 56	—
Shawmont	Buckwheat	2 53	341.45	863 86	—	342	865 26	—
Shawmont	Bituminous	2 61	14,641.59	38,215 72	—	15,168	39,588 48	—
Shawmont	Bituminous	2 77	1,848.35	5,235 92	—	1,848	5,118 96	—
Shawmont	Bituminous	3 63	4,807.84	17,465 83	70,972 86	4,808	17,453 04	72,160 38

Coal Purchased and Coal Consumed, 1912—Continued.

STATION	Classification	Price per ton	Purchased			Consumed		
			Tons	Cost	Total	Tons	Cost	Total
Lardner's Point	Bituminous	\$2 59	31,969.97	\$82,808 27	—	31,953	\$82,738 27	—
Lardner's Point	Bituminous	2 45	1,024.00	2,502 18	—	1,024	2,502 18	—
Lardner's Point	Bituminous	2 63	785.85	2,066 78	—	786	2,067 18	—
Lardner's Point	Bituminous	2 74	8,194.15	22,785 98	—	8,194	22,451 56	—
Lardner's Point	Bituminous	3 78	20,402.76	77,291 45	—	20,403	77,037 03	—
Lardner's Point	Bituminous	4 21	1,447.25	6,086 84	\$193,535 50	1,447	6,086 84	\$192,903 06
Totals and averages.		\$3 07	158,605.51	\$486,737 04	\$486,737 04	159,244	\$486,552 14	\$486,552 14
High Service Stations.								
George's Hill	Bituminous	\$2 59	46.96	\$121 62	—	47	\$121 73	—
George's Hill	Pea	3 84	716.90	2,752 50	—	771	2,960 64	—
George's Hill	Pea	4 07	434.85	1,769 84	—	525	2,136 75	—
George's Hill	Buckwheat	3 04	220.57	670 47	—	221	671 84	—
George's Hill	Buckwheat	3 14	91.10	286 06	\$5,600 49	—	—	\$5,890 96
Roxborough	Pea	3 70	1,081.20	4,000 46	—	1,183	4,377 10	—
Roxborough	Pea	4 20	342.70	1,439 34	—	222	932 40	—
Roxborough	Buckwheat	3 05	457.70	1,395 99	6,835 79	338	1,030 90	6,340 40

Coal Purchased and Coal Consumed, 1912—Continued.

STATION	Classification	Price per ton	Purchased			Consumed		
			Tons	Cost	Total	Tons	Cost	Total
Wentz Farm	Pea	\$3 65	511.32	\$1,868 08	—	640	\$2,360 00	—
Wentz Farm	Pea	4 15	171.30	710 90	—	141	585 15	—
Wentz Farm	Buckwheat	3 00	173.45	520 35	\$3,069 33	142	426 00	\$3,344 15
Totals and averages			4,248.05	\$15,535 61	\$15,535 61	4,230	\$15,578 51	\$15,578 51
Low Service Stations.								
Roxborough	Pea	\$3 70	2,174.00	\$8,043 80	—	2,174	\$8,043 80	—
Roxborough	Pea	4 20	292.00	1,226 40	—	292	1,226 40	—
Roxborough	Buckwheat	3 05	680.00	2,074 00	\$11,344 20	680	2,074 00	\$11,344 20
Torresdale	Bituminous	2 44	3,377.00	8,239 88	—	2,935	7,161 40	—
Torresdale	Bituminous	2 45	4,052.61	9,928 91	—	4,053	9,929 85	—
Torresdale	Bituminous	2 59	1,739.00	4,504 01	—	1,739	4,504 01	—
Torresdale	Bituminous	2 63	2,453.17	6,451 84	—	82	215 66	—
Torresdale	Bituminous	2 64	3,375.35	8,910 92	—	8,566	22,614 24	—
Torresdale	Bituminous	2 76	5,622.79	15,501 34	—	5,623	15,501 34	—
Torresdale	Bituminous	3 76	8,388.76	31,569 81	\$5,106 71	8,389	31,569 78	91,496 28
Totals and Averages			32,154.68	\$96,450 91	\$96,450 91	34,533	\$102,840 48	\$102,840 48

Coal Purchased and Coal Consumed, 1912—Continued.

STATION	Classification	Price per ton	Purchased			Consumed		
			Tons	Cost	Total	Tons	Cost	Total
<i>Filters.</i>								
Upper Roxborough	Pea	\$3 75	28.00	\$105 00	—	59	\$221 25	—
Upper Roxborough	Pea	4 20	47.40	199 08	\$304 08	—	—	\$221 25
Lower Roxborough	Pea	3 75	71.70	268 88	—	105	383 75	—
Lower Roxborough	Pea	4 20	79.65	334 53	603 41	—	—	303 75
Belmont	Pea	3 84	619.30	2,373 11	—	763	2,929 92	—
Belmont	Pea	4 31	315.25	1,358 74	—	291	1,254 21	—
Belmont	Buckwheat	3 04	225.85	686 58	—	226	687 04	—
Belmont	Buckwheat	3 24	135.80	439 99	4,863 42	292	946 08	5,817 25
Queen Lane	Bituminous	2 59	45.54	117 95	—	46	119 14	—
Queen Lane	Pea	4 12	342.30	1,410 28	—	217	894 04	—
Queen Lane	Pea	3 78	678.10	2,563 22	—	660	2,494 80	—
Queen Lane	Buckwheat	2 85	133.20	379 63	—	218	621 30	—
Queen Lane	Buckwheat	3 14	170.80	536 82	5,007 40	226	709 64	4,838 92
Torresdale	Egg	6 20	25.00	155 00	—	58	359 60	—
Torresdale	Stove	6 55	35.00	229 25	384 25	—	—	359 60
Totals and averages			2,952.89	\$11,162 56	\$11,162 56	3,161	\$11,630 77	\$11,630 77
Grant totals			197,961.13	\$609,886 12	\$609,886 12	201,163	\$616,601 90	\$616,601 90
Increase				\$36,936 96	\$36,936 96	—	\$46,118 82	\$46,118 82
Decrease			4,311.43			284		

Coal Consumed for Pumpage.

Stations.	Coal, tons.		Pumpage, gallons.	
	Increase.	Decrease.	Increase.	Decrease.
Belmont -----	3,677	—	556,803,265	—
Queen Lane -----	6,491	—	2,109,880,000	—
Shawmont -----	—	4,944	—	877,703,522
Lardner's Point -----	—	7,081	—	1,263,619,730
Totals-----	10,168	12,025	2,666,683,265	2,141,323,252

HIGH SERVICE STATIONS.

George's Hill -----	—	70	98,698,140	—
Roxborough -----	—	255	73,356,820	—
Mt. Airy -----	—	—	—	—
Wentz Farm -----	27	—	12,820,490	—
Totals-----	27	325	184,875,450	—

LOW SERVICE STATIONS.

Roxborough -----	96	—	—	144,309,000
Torresdale -----	1,167	—	—	1,263,619,730
Totals-----	1,263	—	—	1,408,018,730
Grand totals -----	11,458	12,350	2,851,558,715	3,549,341,982

Comparison of Pumpage of 1911 and 1912.

	Gallons.			
	1911.	1912.	Increase.	Decrease.
Annual pumpage from rivers -----	116,076,669,254	116,570,226,260	493,557,006	—
Average daily pumpage from rivers -----	318,018,272	318,497,886	479,614	—
Pumpage per capita per day -----	201.6	198.3	—	3.3
Maximum daily pumpage from rivers during month of greatest consumption -----	347,634,436	367,626,790	19,992,354	—
Pumpage per capita during month of greatest consumption -----	209.6	212.0	2.4	—
Total supplementary pumpage at high service stations -----	7,713,686,220	7,754,162,670	40,476,450	—
Torresdale station, low service pumpage from Delaware river -----	77,913,508,130	76,649,888,400	—	1,263,619,730

* Meters at Roxborough, Belmont and Queen Lane Stations. Plunger displacements at other stations.

Volume and Cost of Direct Pumpage for the Years 1902 to 1912 Inclusive.

Years.	Number of gallons pumped.	Number of gallons pumped 100 feet high.	Cost per million gallons pumped 100 feet high.	Gallons pumped per capita per day.	Population, estimated.
1902.....	114,460,161,379	236,842,612,454	3.99	232.0	1,349,500
1903.....	119,600,619,200	244,097,189,170	4.61	238.0	1,378,298
1904.....	120,386,160,615	247,368,530,965	5.04	234.0	1,407,690
1905.....	119,483,641,811	257,447,392,820	4.93	227.7	1,437,730
1906.....	116,732,205,859	253,264,725,466	4.42	217.8	1,468,411
1907.....	110,406,858,007	238,268,051,129	4.86	201.7	1,499,747
1908.....	117,885,662,022	256,334,927,765	5.44	210.2	1,531,752
1909.....	111,129,767,510	277,020,429,051	4.12	196.2	1,552,000
1910.....	*114,938,585,836	284,227,631,428	3.93	203.2	†1,549,000
1911.....	*116,076,669,254	285,932,295,175	3.65	201.6	1,577,000
1912.....	*116,570,226,260	296,213,419,687	3.36	198.3	1,606,000

* Meters used at Belmont, Queen Lane and Roxborough. † U. S. Census.

Stations included in this table during years 1910, 1911 and 1912: Lardner's Point Nos. 1, 2 and 3, Belmont, Queen Lane and Shawmont.

*Volume and Cost of High Service Pumpage for the Years
1902 to 1912 Inclusive.*

Years.	Number of gal- lons pumped.	Number of gal- lons pumped 100 feet high.	Cost per mil- lion gallons pumped 100 feet high.
1902.....	2,338,260,121	2,855,932,559	18.02
1903.....	2,434,635,469	3,119,047,084	17.01
1904.....	2,309,693,874	2,904,640,639	18.07
1905.....	2,231,646,920	2,847,970,023	18.04
1906.....	2,195,711,849	2,821,442,386	25.58
1907.....	2,681,156,615	3,307,403,147	18.88
1908.....	3,008,496,156	3,781,371,423	27.76
1909.....	3,202,300,942	4,017,996,696	18.74
1910.....	2,901,832,140	3,678,944,116	19.80
1911.....	2,974,246,220	3,788,556,376	18.78
1912.....	3,159,121,670	4,040,849,132	16.64

Stations included in this table during years 1910, 1911 and 1912: Wentz Farm, Roxborough (High Service) and George's Hill.

*Volume and Cost of Low Service Pumpage for the Years
1902 to 1912 Inclusive.*

Years.	Number of gal- lons pumped.	Number of gal- lons pumped 100 feet high.	Cost per mil- lion gallons pumped 100 feet high.
1902.....	—	—	—
1903.....	1,930,680,000	652,569,840	8.63
1904.....	3,485,172,000	940,996,440	13.71
1905.....	3,652,158,445	986,082,780	14.95
1906.....	4,380,947,000	1,182,855,690	13.02
1907.....	*12,534,198,000	2,895,132,432	17.16
1908.....	39,370,537,000	8,306,843,417	14.02
1909.....	†80,171,636,350	32,865,400,640	5.27
1910.....	†83,597,208,650	34,090,119,574	5.62
1911.....	82,652,948,130	33,696,370,153	5.65
1912.....	81,244,929,400	33,156,588,838	5.48

Stations included in this table during years 1910, 1911 and 1912: Torresdale and Roxborough (Low Service).

*Cost of Raising 1,000,000 Gallons 100 Feet During 1911
and 1912.*

Pumping stations.	1911.	1912.	Increase.	Decrease.
Belmont -----	\$4 53	\$4 33	—	\$0 20
Queen Lane -----	4 23	4 05	—	23
Shawmont -----	4 90	4 76	—	14
Lardner's Point No. 1-----	19 07	—	—	—
Lardner's Point No. 2-----	2 97	2 83	—	14
Lardner's Point No. 3-----	2 19	2 00	—	19
Average-----	\$3 65	\$3 27	—	\$0 38

HIGH SERVICE STATIONS.

George's Hill -----	\$13 83	\$15 54	\$1 71	—
Roxborough -----	18 58	14 19	—	\$4 39
Wentz Farm -----	27 22	25 48	—	1 74
Average-----	\$18 78	\$16 40	—	\$2 38

LOW SERVICE STATIONS.

Roxborough -----	\$21 14	\$19 85	—	\$1 29
Torresdale -----	5 04	5 05	01	
Total averages. ---	\$4 03	\$3 73	—	\$ 30

Pumpage and Itemized Cost for 1912.

Stations.	Pumpage.	Average lift.	Labor.		Coal.		Oil, grease and waste.		Packing, rubber valves, etc.		Sundries.		Total cost of station.	Cost per M. G. 100 feet high.	Averages, 1911.
			Cost.	Per M. G. 100 feet high.	Cost.	Per M. G. 100 feet high.	Cost.	Per M. G. 100 feet high.	Cost.	Per M. G. 100 feet high.	Cost.	Per M. G. 100 feet high.			
† Spring Garden.....	—	—	\$12,225 72	—	\$2,887 41	—	\$51 99	—	\$4 44	—	\$811 67	—	\$15,981 17	—	—
Belmont.....	*16,550,489,110	320	93,694 43	\$1 77	118,047 91	\$2 23	3,072 55	\$0 06	1,073 22	\$0 08	13,113 79	\$0 24	232,001 90	\$4 38	\$4 58
Queen Lane.....	*17,652,542,500	259	73,310 91	1 60	100,553 35	2 20	2,450 01	05	2,877 72	06	6,399 55	14	185,591 54	4 05	4 38
Shawmont.....	* 9,017,306,250	398	84,604 94	2 36	72,160 38	2 01	2,042 68	06	3,023 60	08	9,246 77	25	171,078 37	4 76	4 90
Lardner's Point No. 1.....	—	—	7,566 62	—	147 95	—	18 99	—	33 86	—	447 72	—	8,215 14	—	19 07
Lardner's Point No. 2.....	36,241,874,100	193	86,662 34	1 24	96,683 17	1 39	3,436 20	05	2,377 69	03	8,877 77	12	198,037 17	2 83	2 97
Lardner's Point No. 3.....	37,108,014,300	247	71,763 11	78	96,071 94	1 05	3,356 29	03	2,290 93	03	9,386 58	11	182,868 85	2 00	2 19
George's Hill.....	1,164,639,080	126	16,089 55	10 16	5,890 96	3 72	266 55	17	234 45	15	2,126 88	1 34	24,608 39	15 54	13 83
Roxborough High Service.	1,564,898,999	119	18,111 52	9 76	6,340 40	3 42	163 86	09	135 09	07	1,571 53	85	26,322 40	14 19	18 58
Mt. Airy.....	—	—	1,914 58	—	14 66	—	—	—	—	—	8 66	—	1,938 20	—	—
Wentz Farm.....	429,583,690	140	10,981 47	18 21	3,347 15	5 55	183 79	31	298 31	49	554 69	92	15,364 81	25 48	27 22
Roxborough Low Service.	4,595,041,000	21	7,057 02	7 32	11,344 20	11 77	399 81	41	51 28	05	281 64	30	19,136 95	19 85	21 14
Torresdale.....	176,649,888,400	42	80,784 02	2 51	71,866 08	2 23	1,866 07	06	655 96	02	7,442 73	23	162,614 86	5 05	5 04
Totals and averages..	209,974,277,330	166	\$564,766 23	\$1 69	\$585,355 89	\$1 76	\$17,308 70	\$0 05	\$16,056 55	\$0 05	\$60,272 38	\$0 18	\$1,243,759 71	\$3 73	\$4 03

* Meters.

† Spring Garden shut down February 15, 1909. Kept in reserve.

‡ Frankford plus 275,000,000 gallons per month.

Annual Pumpage, Coal, Lubricants, etc., 1912.

Stations.	Pumpage.				Coal.		Lubricants.		
	Total million gallons.	Average daily million gallons.	Million gallons raised 100 feet per ton of coal.	Mean head, feet.	Total tons.	Average daily tons.	Grease, pounds.	Engine oil, gallons.	Cylinder oil, gallons.
Belmont.....	16,550	45	1.34	320	39,666	108	2,254	7,871	6,194
Queen Lane.....	17,653	48	1.48	259	30,857	84	8,609	2,979	3,701
Shawmont.....	9,017	25	1.44	398	24,914	68	2,040	3,322	4,680
Lardner's Point.....	73,350	200	2.54	221	63,807	174	7,075	15,043	14,609
George's Hill.....	1,165	3	1.01	136	1,564	4	318	298	627
Roxborough High Service.....	1,565	4	1.07	119	1,743	5	326	76	373
Wentz Farm.....	430	1	.65	140	923	3	24	337	414
Roxborough Low Service.....	4,595	13	.31	21	3,146	9	17	1,183	711
Torresdale.....	76,650	209	1.03	42	31,387	86	201	5,410	3,290
Totals and averages.....	200,975	548	1.65	.67	198,007	541	20,864	36,519	34,599

Total Gallons Pumped and Consumed During the Year 1912.

Months.	Main pumping stations.						Consumption.			High service stations.					Low service stations.				Total pumpage and auxiliary pumpage.	Average per day.	Percentage of pumpage.	Total steam pumpage.					
	Belmont (Meters).	Queen Lane (Meters).	Shawmont (Meters).	Lardner's Point.	Total.	Average per day.	Stored in reservoirs at end of month.	Total.	Average per day.	George's Hill.	Roxborough.	Wentz Farm.	Total.	Average per day.	Roxborough.	Torresdale.	Total.	Average per day.									
December, 1911-----	—	—	—	—	—	—	1,185,879,972	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
January, 1912-----	1,463,035,373	1,466,137,500	812,685,000	6,817,032,450	10,568,890,323	340,609,365	1,018,160,522	10,726,609,773	346,019,670	98,257,560	129,640,580	34,359,190	262,257,330	8,459,914	429,478,000	7,092,032,450	7,521,510,450	242,629,369	18,342,658,103	591,698,648	9.13	18,342,658,103					
February-----	1,402,084,777	1,549,535,000	710,130,000	6,291,660,330	9,953,410,107	343,221,038	946,515,723	10,025,054,906	345,691,548	90,544,880	128,625,100	35,763,480	254,933,460	8,790,809	413,918,000	6,566,660,330	6,950,578,330	240,709,597	17,188,921,897	592,721,444	8.55	17,188,921,897					
March-----	1,408,334,876	1,494,360,000	856,005,000	6,177,018,690	9,935,718,566	320,507,050	913,937,567	9,968,296,722	321,557,955	98,258,380	135,857,720	31,946,730	266,062,830	8,582,672	460,712,000	6,452,018,690	6,912,730,690	222,991,313	17,114,512,086	552,081,035	8.52	17,114,512,086					
April-----	1,473,343,024	1,471,525,000	763,402,500	6,048,221,940	9,756,491,564	325,216,385	1,010,586,290	9,659,842,841	321,994,761	98,631,800	128,253,380	31,878,880	258,764,060	8,625,469	379,127,000	6,323,221,040	6,702,348,040	223,411,601	16,717,603,664	557,253,455	8.32	16,717,603,664					
May-----	1,403,852,212	1,462,315,000	709,226,250	6,284,173,500	9,859,566,962	318,050,547	1,003,997,987	9,866,155,265	318,263,073	103,177,140	135,850,100	36,312,700	275,339,940	8,881,933	363,425,000	6,559,173,500	6,922,598,500	223,309,629	17,057,505,402	550,242,109	8.49	17,057,505,402					
June-----	1,369,849,640	1,434,382,500	748,886,250	6,167,868,120	9,720,896,510	324,032,884	1,009,164,751	9,715,819,746	323,860,658	98,547,000	141,605,340	38,323,100	278,475,440	9,282,514	381,955,000	6,442,868,120	6,824,823,120	227,494,104	16,824,285,070	560,809,502	8.37	16,824,285,070					
July-----	1,368,874,084	1,473,255,000	817,927,500	6,420,863,250	10,080,919,834	325,190,962	1,016,426,222	10,073,658,363	324,956,721	105,443,400	153,329,980	40,547,120	299,320,500	9,655,500	427,280,000	6,695,863,250	7,123,143,250	229,778,814	17,503,383,584	564,625,276	8.71	17,503,383,584					
August-----	1,387,550,024	1,473,847,500	753,810,000	6,198,313,140	9,813,520,664	316,565,183	1,038,107,114	9,791,839,772	315,865,799	105,520,720	136,115,160	39,480,120	281,116,000	9,068,258	372,540,000	6,473,313,140	6,845,853,140	220,833,972	16,940,489,804	546,467,413	8.43	16,940,489,804					
September-----	1,323,899,100	1,441,467,500	725,610,000	5,956,231,860	9,447,208,460	314,906,949	1,097,479,661	9,387,835,913	312,927,863	97,157,200	137,100,260	37,924,610	272,182,070	9,072,735	359,560,000	6,231,231,860	6,590,791,860	219,693,062	16,310,182,390	543,672,746	8.11	16,310,182,390					
October-----	1,359,760,644	1,540,032,500	752,870,250	5,953,423,410	9,606,086,804	309,873,768	1,162,484,324	9,541,082,141	307,776,843	93,142,140	123,477,860	38,790,360	256,410,360	8,400,334	348,398,000	6,228,423,410	6,576,821,410	212,155,529	16,438,318,574	530,268,341	8.18	16,438,318,574					
November-----	1,293,739,312	1,390,275,000	687,126,000	5,427,660,240	8,798,800,552	293,293,352	1,010,882,836	8,950,402,040	298,346,734	93,198,120	107,164,900	33,495,390	233,858,410	7,795,280	317,796,000	5,702,660,240	6,020,456,240	200,681,874	15,053,115,202	501,770,506	7.49	15,053,115,202					
December-----	1,296,166,044	1,455,410,000	679,627,500	5,607,422,370	9,038,625,914	291,568,578	975,059,627	9,074,449,123	292,724,165	82,760,740	107,878,520	30,762,010	221,401,270	7,141,976	340,852,000	5,882,422,370	6,223,274,370	200,750,786	15,483,301,554	499,461,340	7.70	15,483,301,554					
Totals-----	16,550,489,110	17,652,542,500	9,017,306,250	73,349,888,400	116,570,226,260	318,497,886	—	116,781,046,605	319,073,897	1,164,639,080	1,564,898,000	429,583,690	3,159,121,670	8,631,479	4,595,041,000	76,649,888,400	81,244,929,400	221,980,681	200,974,277,330	549,110,047	100.00	200,974,277,330					
Increase during 1912-----	556,803,265	2,109,880,000	—	—	493,557,006	1,348,516	—	785,740,448	1,278,588	98,698,140	73,356,820	12,820,490	184,875,450	505,124	—	—	—	—	—	—	—	—	—	—	—	—	—
Decrease during 1912-----	—	—	877,703,522	1,263,619,730	—	—	—	—	—	—	—	—	—	—	144,399,000	1,263,619,730	1,408,018,730	3,847,046	719,586,274	1,979,743	—	—	719,586,274				

DESCRIPTION OF STEAM BOILERS, BUREAU OF WATER, PHILADELPHIA, 1912.

STEAM BOILERS.

PUMPING STATION.	TYPE OF BOILERS.	STEAM BOILERS.																		
		Number of Boilers.	Diameter of Shell (inches).	Length of Shell (feet).	Thickness of Shell (inches).	Number of Flues.	Diameter of Flues (inches).	Thickness of Flues (inches).	Length of Flues (feet).	Number of Tubes.	Length of Tubes (feet).	Diameter of Tubes (inches).	Diameter of Steam Drum (inches).	Length of Steam Drum (feet).	Length of Grate (feet).	Area of Grate (square feet).	Area of Heating Surface (square feet).	Estimated Horse-power, at 10 square feet for Shell and Fire Flues, 15 square feet for Tubes and 12 square feet for Drums.	Height of Stack (feet).	Section of Stack (square feet).
Belmont	Furnace Flue, Tubular	5	102	20	$\frac{5}{8}$	2	42	$\frac{3}{8}$	8	90	10	4			$6\frac{1}{2}$	42	1,116	100	150	$38\frac{1}{2}$
	Furnace Flue, Tubular	11	102	20	$\frac{7}{8}$	2	42	$\frac{1}{2}$	8	90	9.4	4			$6\frac{1}{2}$	42	1,116	100	150	$38\frac{1}{2}$
	Furnace Flue, Tubular	10	102	20	$\frac{7}{8}$	2	42	$\frac{1}{2}$	8	90	9.4	4			$8\frac{1}{2}$	42	1,116	100	150	$38\frac{1}{2}$
George's Hill High Service	Furnace Flue	4	102	20	$\frac{5}{8}$	2	42	$\frac{3}{8}$	$7\frac{1}{2}$	90	10	4			$6\frac{1}{2}$	42	1,116	80	125	20
Belmont Filters	Furnace Flue, Tubular	4	114	$15\frac{3}{4}$	$\frac{3}{4}$	2	38	$\frac{5}{8}$	12	108	12.5	$3\frac{1}{2}$				41	1,302			150
Queen Lane	Furnace Flue, Tubular	24	102	20	$\frac{5}{8}$	2	42	$\frac{3}{8}$	8	90	10	4			$6\frac{1}{2}$	42	1,116	100	202	113
Queen Lane Filters	Return Tubular	4	72	18	$\frac{1}{2}$					76	18	4			$6\frac{1}{2}$	39	1,600	150	125	28
Shawmont	Water Tube	4								254	18	4	3-36	21	$8\frac{1}{2}$	102	5,090	500	175	$38\frac{1}{2}$
	Furnace Flue, Tubular	8	102	20	$\frac{7}{8}$	2	42	$\frac{1}{2}$	8	90	9.4	4			$6\frac{1}{2}$	42	1,116	100	175	$38\frac{1}{2}$
Roxborough High Service	Furnace Flue	4	102	20	$\frac{5}{8}$	2	42	$\frac{3}{8}$	$7\frac{1}{2}$	90	10	4			$6\frac{1}{2}$	42	1,116	80	125	20
		2	102	20	$\frac{5}{8}$	2	37	$\frac{3}{8}$	8	90	10	4			$6\frac{1}{2}$	42	1,116	100	125	20
Lardner's Point	Marine, Steel	12	138	$10\frac{3}{4}$	$\frac{1}{2}$	2	43	$\frac{3}{8}$	8	188	8	3	42	$12\frac{1}{2}$		42	1,551	113	$\frac{150}{100}$	$\frac{38}{33}$
	Furnace Flue, Tubular	12	108	20	$\frac{1}{2}$	2	41	$\frac{1}{2}$	8	195	9.25	$3\frac{1}{2}$			$5\frac{3}{4}$	$40\frac{1}{4}$	1,811.5	110	150	$38\frac{1}{2}$
	Water Tube—Wetzel Stoker	6								254	18	4	2-36	21	$8\frac{1}{2}$	102	5,090	500	150	$38\frac{1}{2}$
	Water Tube—Wetzel Stoker	8								252	18	4	2-36	21	$8\frac{1}{2}$	102	5,080	500	150	$38\frac{1}{2}$
Wentz Farm High Service	Furnace Flue, Tubular	3	102	20	$\frac{7}{8}$	2	42	$\frac{1}{2}$	8	90	9.4	4			$6\frac{1}{2}$	$37\frac{1}{2}$	1,116	100	125	12
Torresdale Filters	Water Tube—Murphy Stoker	9								189	18	$3\frac{1}{2}$	1-48	23	$7\frac{1}{2}$	66	3,280	325	250	

APPENDIX C



REPORT

OF THE

ASSISTANT ENGINEER IN CHARGE OF DISTRIBUTION

Philadelphia, January 1, 1913.

MR. CARLETON E. DAVIS,
Chief, Bureau of Water.

SIR: I respectfully submit the following report on the distribution system for the year 1912:

Mains.

The following is a statement of the mains laid, relaid, taken up, etc.:

New Work.

Service mains laid.....	120,115 feet.
Connections, etc.	5,845 "
Total	<u>125,960 feet.</u>

*Comparison of Conditions Relative to the Distribution,
1911-1912.*

	1911	1912	Increase	Decrease
Service main, 6 inches to 12 inches.....	136,286	120,115	—	16,171
Connections and miscellaneous work.....	5,830	5,845	15	—
Totals in feet.....	142,116	125,960	15	16,171

Of the 120,115 feet of service mains laid, 82,274 feet were laid by the City, for which \$1 per foot was charged against each property owner fronting thereon, and 37,841 feet were laid by private contract under ordinance of Councils, approved April 12, 1909, which requires no payment to the City by those paying their pro-rata share of the cost of laying the pipe, but against those not joining in the expense of laying the pipe the usual charge of \$1 per foot front is made.

	1911	1912	Increase	Decrease
Relaid, 6 inches to 12 inches.....	5,805	1,375	—	4,430
Miscellaneous repairs, 3 inches to 48 inches	6,018	6,905	887	—
Taken up, 4 inches to 10 inches.....	3,031	805	—	2,226
Lowered, raised and shifted, 4 inches to 30 inches	3,578	3,627	49	—
Totals in feet.....	18,432	12,712	936	6,656
Pipe cut off and abandoned.....	4,291	2,557	—	1,734

Repairs.

Mains relaid	1,375	feet.
Repairs and connections	6,905	"
	—	8,280 feet.
Old pipe taken up.....	805	"
Pipe lowered, raised and shifted.....	3,627	"
	—	4,432 "
Total		12,712 feet.

Abandoned.

Three inch	231 feet.
Four inch	805 "
Six inch	752 "
Eight inch	734 "
Ten inch	35 "
	<hr/>
Total	2,557 feet.

The total quantity of pipe handled for all purposes throughout the year was 138,672 feet, weighing 6,648,901 pounds.

During 1912 there was added 127,507 feet, or 24.15 miles of pipe, making a total of 9,128,511 feet, or 1,728.88 miles now in use.

Fire Hydrants, Including High Pressure.

New fire hydrants in new locations	410
New fire hydrants in place of old fire hydrants.....	393
	<hr/>
Total	803
New style fire hydrants taken out	33
Old style fire hydrants taken out	4
	<hr/>
Total	37

The total number of new style fire hydrants added to the distribution system was 373, and the total number in use December 31, 1912, was 16,942, of which 343 are of the old style, and 16,599, or 97.9 per cent., of the new pattern. Of the latter number, 840 are installed on the High Pressure Fire Service System.

Drills for Attachments.

	Number of openings
One-half inch	6,801
Five-eighths inch	437
Three-quarter inch	136
One inch	123
One and one-quarter inch.....	43
One and one-half inch	43
Two inches	77
Three inches	13
Four inches	13
Six inches	10
Twelve inches	1
	<hr/>
Total	7,697

Tabulation of work performed is also submitted herewith, together with various other tables.

In closing, I desire to give full credit to the assistance rendered this Bureau by Dr. William C. Robinson, Chemist, Bureau of Health. From time to time during the year Doctor Robinson made chemical analyses of samples of water submitted to him, thus enabling us to determine the source of leaks reported to the Bureau of Water by various property owners throughout the City.

Respectfully submitted,

W. WHITBY,

Assistant in Charge of Distribution.

Total Feet of Pipe in Use December 31, 1912.

Size in inches	Total in use, December 31, 1911	Extensions and relays during 1912			Deductions during 1912			Total in use, December 31, 1912
		Laid	Relaid	Total	Taken up	Abandoned	Total	
1	175	—	—	—	—	—	—	175
1½	3,566	—	—	—	—	—	—	3,566
2	3,655	—	—	—	—	—	—	3,655
3	77,536	309	—	309	—	231	231	77,614
4	160,334	438	—	438	324	805	1,129	159,643
6	5,890,885	55,345	854	56,199	464	752	1,216	5,945,868
8	460,169	34,249	97	34,346	3	734	737	493,778
10	546,919	9,607	77	9,684	14	35	49	556,554
12	557,129	26,012	347	26,359	—	—	—	583,483
16	198,786	—	—	—	—	—	—	198,786
18	16,044	—	—	—	—	—	—	16,044
20	286,107	—	—	—	—	—	—	286,107
22	1,084	—	—	—	—	—	—	1,084
23	27	—	—	—	—	—	—	27
24	23,360	—	—	—	—	—	—	23,360
30	298,782	—	—	—	—	—	—	298,782
36	106,381	—	—	—	—	—	—	106,381
42	564	—	—	—	—	—	—	564
48	325,700	3,534	—	3,534	—	—	—	329,234
60	43,801	—	—	—	—	—	—	43,801
Totals	9,001,004	129,494	1,375	130,869	805	2,557	3,362	9,128,511

Attachments, etc., Made in Accordance with Permits Issued by the Bureau of Water.

	New attachments											Shut off by permit						Work done without permit							
	Size											Reamed for larger attachments	Repairs					Drawn			Drawn and re-driven				
	½-inch	⅝-inch	¾-inch	1-inch	1¼-inch	1½-inch	2-inch	3-inch	4-inch	6-inch	12-inch		Total	Redriven	Discontinued	Transfer	Not drawn	Drawn and redriven	Total	Discontinued and abandoned		Delinquent	Leak	Transfer	Total
Totals.....	6,801	437	136	123	43	43	77	13	13	10	1	7,697	164	761	334	13	97	1,036	2,405	193	111	1,513	3	1,820	12

Number of Complaints and Examinations During 1911 and 1912.

Months	Hydrants		Service pipes		Wash paves		Spigots		Water closets		Horse troughs		Number leaks		1911	1912
	1911	1912	1911	1912	1911	1912	1911	1912	1911	1912	1911	1912	1911	1912	Total	Total
	January -----	124	97	186	235	8	10	12	24	75	43	7	3	9	11	421
February -----	83	96	107	230	—	6	17	18	58	65	1	1	10	10	276	426
March -----	95	88	95	218	2	11	41	7	69	66	—	8	2	4	304	402
April -----	68	100	62	204	3	14	33	15	48	70	3	8	5	—	222	411
May -----	98	122	89	153	2	7	30	29	71	100	5	—	8	9	303	420
June -----	118	115	115	149	5	15	23	36	69	84	1	1	3	7	334	407
July -----	121	118	104	116	2	5	30	44	42	102	4	4	13	11	316	400
August -----	128	105	98	107	4	5	36	73	81	120	1	3	14	4	362	417
September -----	123	96	81	131	—	2	49	47	82	79	4	2	11	1	355	358
October -----	131	190	102	233	2	13	30	149	86	200	1	9	5	7	357	806
November -----	79	145	115	158	7	5	27	96	58	144	1	—	14	6	301	554
December -----	76	120	100	150	8	9	26	50	37	75	4	3	10	1	261	408
Totals -----	1,249	1,392	1,254	2,089	43	102	354	588	776	1,148	32	42	104	71	3,812	5,432

Work on Water Pipes.

Purposes for which used	Size in inches														Total in feet and pounds	
	3	4	6	8	10	12	16	18	20	22	24	30	36	48		60
New pipe or feet added	Service mains	—	—	50,723	34,203	9,509	25,680	—	—	—	—	—	—	—	—	120,115
	Service main connections	—	—	31	6	53	6	—	—	—	—	—	—	—	—	96
	Supply main connections	—	—	—	—	20	29	—	—	—	—	—	—	—	—	49
	Fire hydrant connections	—	60	4,239	—	—	—	—	—	—	—	—	—	—	—	4,299
	Fire connections (private).....	15	123	294	40	25	—	—	—	—	—	—	—	—	—	497
	Supply connections (private).....	294	233	39	—	—	297	—	—	—	—	—	—	—	—	863
	Drains	—	22	19	—	—	—	—	—	—	—	—	—	—	—	41
Totals.....	Feet.....	309	438	55,345	34,249	9,607	26,012	—	—	—	—	—	—	—	—	125,960
	Pounds.....	4,635	8,760	1,826,385	1,438,458	523,385	1,950,900	—	—	—	—	—	—	—	—	5,757,523

Work on Water Pipes—Continued.

Purposes for which used	Size in inches														Totals in feet and pounds		
	3	4	6	8	10	12	16	18	20	22	24	30	36	48		60	
Pipe relaid	—	—	854	97	77	347	—	—	—	—	—	—	—	—	—	1,375	
Repairs, general	25	79	4,203	64	1,400	107	33	—	23	—	—	943	2	26	—	6,905	
Pipe taken up	—	324	464	3	14	—	—	—	—	—	—	—	—	—	—	805	
Pipe lowered	—	300	1,254	63	208	347	—	—	365	—	—	207	—	—	—	2,744	
Pipe raised	—	—	142	—	—	—	—	—	—	—	—	—	—	—	—	142	
Pipe shifted	—	—	741	—	—	—	—	—	—	—	—	—	—	—	—	741	
Totals.....	Feet.....	25	703	7,658	227	1,699	801	33	—	388	—	—	1,150	2	26	—	12,712
	Pounds.....	375	14,060	252,714	9,534	93,445	60,075	3,795	—	60,140	—	—	379,500	840	16,900	—	891,378
Total handled.....	Feet.....	334	1,081	63,003	34,476	11,286	26,833	33	—	388	—	—	1,150	2	26	—	138,672
	Pounds.....	5,010	21,620	2,079,099	1,447,992	620,730	2,012,475	3,795	—	60,140	—	—	379,500	840	16,900	—	6,648,901
Pipe cut off and abandoned.....	231	805	752	734	35	—	—	—	—	—	—	—	—	—	—	2,557	

Pipe used but adding nothing to feet in ground

Fire Hydrants by Wards.

Wards	Style						High pressure	Set during 1912	Total
	O. S.	No. 1	No. 2	No. 3	No. 4	No. 5			
First	1	202	67	8	—	—	—	2	278
Second	1	135	90	15	—	—	—	1	241
Third	3	82	44	6	—	—	—	—	135
Fourth	1	67	36	14	—	—	—	—	118
Fifth	14	117	66	2	—	—	29	—	218
Sixth	8	104	37	5	—	—	81	2	235
Seventh	5	160	73	4	—	—	—	—	242
Eighth	9	146	79	3	—	1	35	—	273
Ninth	—	154	59	2	—	1	60	3	276
Tenth	—	121	57	—	—	4	43	—	225
Eleventh	4	81	21	1	—	—	10	6	117
Twelfth	7	76	17	2	—	—	—	1	102
Thirteenth	23	93	46	5	—	—	—	—	167
Fourteenth	—	106	72	—	—	—	21	—	199
Fifteenth	—	245	196	4	1	2	13	—	461
Sixteenth	2	92	30	3	1	—	26	5	154
Seventeenth	11	98	20	1	—	—	38	5	168
Eighteenth	11	218	58	7	—	—	32	33	326
Nineteenth	31	349	111	7	—	—	198	9	696
Twentieth	16	159	120	—	—	—	27	1	322
Twenty-first	34	450	36	7	—	—	—	2	527
Twenty-second	47	1,329	139	16	—	—	—	17	1,531
Twenty-third	37	409	30	5	—	—	—	9	531
Twenty-fourth	13	357	144	8	—	—	—	1	522
Twenty-fifth	—	311	57	2	—	—	15	9	385
Twenty-sixth	—	250	125	14	—	—	—	2	389
Twenty-seventh	2	202	62	6	—	1	—	2	273
Twenty-eighth	—	182	129	26	—	—	—	1	337
Twenty-ninth	—	122	104	3	—	1	—	—	230

Fire Hydrants by Wards—Continued.

Wards	Style							Set during 1912	Total
	O. S.	No. 1	No. 2	No. 3	No. 4	No. 5	High pressure		
Thirtieth	5	130	110	6	—	—	—	1	251
Thirty-first	—	264	62	5	—	—	38	37	369
Thirty-second	5	141	94	7	—	1	13	—	261
Thirty-third	15	511	116	9	1	—	110	50	762
Thirty-fourth	5	499	35	4	—	1	—	26	544
Thirty-fifth	—	199	22	5	—	—	—	3	226
Thirty-sixth	3	425	104	28	—	—	—	32	560
Thirty-seventh	2	118	73	4	—	—	22	—	219
Thirty-eighth	8	584	105	12	—	—	—	22	709
Thirty-ninth	—	271	90	7	—	—	—	2	368
Fortieth	7	427	58	2	—	—	—	36	494
Forty-first	—	64	9	10	—	—	—	1	83
Forty-second	—	392	22	9	—	—	—	34	423
Forty-third	6	396	54	6	—	—	15	15	477
Forty-fourth	3	256	61	8	—	—	—	5	328
Forty-fifth	—	357	71	3	—	—	10	6	441
Forty-sixth	—	445	66	14	—	—	—	28	525
Forty-seventh	4	114	101	1	—	—	4	1	224
Totals	343	12,010	3,418	216	3	12	840	410	16,942

APPENDIX D



REPORT

OF THE

ASSISTANT ENGINEER IN CHARGE OF FILTRATION

Philadelphia, January 1, 1913.

MR. CARLETON E. DAVIS,
Chief, Bureau of Water.

SIR:—I respectfully submit the following report on the filtration system for the year 1912:

The operation of the filter plants developed a number of interesting experiences. A long period of low temperatures at the beginning of the year produced frozen rivers and allowed no "run off" of surface pollution, during which time the filter beds were charged with a water of abnormally low turbidities and of continued low temperature.

Following with a sudden change in the weather came the spring rains in a series of unusual intensity, each down-pour following its predecessor with but a few days intervening. The application of such highly charged water to the filters over so extended a period forced the beds to work under an exceptional load. At two of the plants an extra force of workmen were employed, and the cleaning operations were continued day and night for several weeks.

No unusual demand was made upon the filter stations by consumption throughout the City following the spring season, and for the remainder of the year a highly satisfactory water was produced at all the plants. The judicious application of hypochlorite produced a safe water to consumers, which assumption is clearly proven by the material decreases in typhoid deaths.

Experimental work in the application of liquid chlorine as a sterilizing agent to take the place of hypochlorite has been carried on for several months, and analyses of treated water point to an influence highly effective and satisfactory. The reduced expense and plant area for chemical introduction advances a strong argument for this sterilizing equipment. The section of the City served by water from the filter station using liquid chlorine has reported remarkably few deaths from typhoid fever.

The new Queen Lane filter plant has completed its initial year under normal service and results have indicated a high standard of efficiency. Well-designed wash piping and drains have reduced the labor and expense of sand washing, and operating difficulties have been materially lessened on account of the convenient control of both prefilters and final beds.

The operation of the filters was in no way affected by the incompleting construction work, and during the year the completion of this outside work was accomplished.

On account of the location of this plant in a residential district, it is the intention to have the appearance of the buildings and grounds conform to that of the surrounding properties.

Attached herewith are several tables which show operation and cost results at the various plants.

Respectfully yours,

SETH M. VAN LOAN,
First Assistant to Chief.

Operation of Final Filters—Philadelphia, 1912.

STATION.	Total quantity filtered. Million gallons.	Daily average. Million gallons.	Average rate per acre per day. Entire area.	Maximum rate per acre per day for area in service.	Average number cleanings per filter.	Average number days in service between cleanings.	Average number cleanings by Nichols method per filter.	Average number cleanings by Brooklyn method per filter.	Average number cleanings by ejecting per filter.	Average number rakings between cleanings.
Torresdale	73,938.025	202.016	4.061	4.904	6.0	58.52	4.7	—	1.3	1.2
Queen Lane	18,361.457	50.168	3.116	4.414	2.2	160.29	2.2	—	—	0.8
Belmont	14,006.822	38.270	2.828	3.475	12.3	26.78	1.	11.1	—	—
Upper Roxborough	4,595.041	12.555	2.242	3.187	8.1	44.26	.4	7.7	—	—
Lower Roxborough	3,322.029	9.077	3.425	5.450	10.8	31.20	.6	10.2	—	—

Note—"Rakings" include spading, scraping and piling.

Cost of Operation of Filters for 1912.

	Upper Roxboro.	Lower Roxboro.	Belmont	Torresdale	Queen Lane	Total
Office -----	\$1,583 36	\$1,555 07	\$2,321 27	\$5,883 71	\$2,967 92	\$14,286 33
Filter attendants -----	2,563 78	1,262 85	2,632 51	9,453 09	3,085 61	18,997 84
Cleaning filters -----	6,582 33	3,281 61	24,950 31	73,910 21	13,234 28	121,958 74
Labor on grounds -----	356 34	252 90	662 14	3,140 26	61 05	4,772 69
Janitors and watchmen -----	1,179 12	1,146 80	1,420 95	1,818 00	2,876 89	8,441 76
Maintenance and repairs -----	1,305 55	1,563 38	6,380 75	7,494 12	7,794 36	24,538 16
Laboratory -----	1,679 48	1,679 48	2,583 19	11,819 27	6,699 23	24,460 65
Lighting -----	96 85	47 55	5,947 57	3,361 52	6,060 08	15,513 57
Treatment -----	1,204 49	916 13	1,134 75	6,849 22	8 00	10,112 59
Total of final filters-----	\$16,526 30	\$11,705 77	\$18,333 44	\$123,729 40	\$42,787 42	\$243,082 33

Cost of Operation of Filters for 1912—Continued.

PRE-FILTERS.

	Upper Roxboro.	Lower Roxboro.	Belmont	Torresdale	Queen Lane	Total
Filter attendants -----	—	\$1,265 87	\$2,485 86	\$10,221 53	\$2,448 72	\$16,421 98
Labor -----	—	—	—	1,267 01	—	1,267 01
Maintenance and repairs -----	—	5,716 03	3,636 49	6,326 84	1,577 52	17,256 88
Total for pre-filters -----	—	\$6,981 90	\$6,122 35	\$17,815 38	\$4,026 24	\$34,945 87
Low service station -----	\$20,232 75	—	—	—	—	\$20,232 75
Total cost of plant -----	36,759 05	\$18,687 67	\$54,455 79	\$141,544 78	\$46,813 66	\$298,260 95
Million gallons filtered -----	4,595 04	3,322 02	14,006 82	73,938 02	18,361 45	114,223 35
Cost per million gallons:						
Final filters -----	\$3 59	\$3 52	\$3 45	\$1 67	\$2 31	\$2 13
Pre-filters -----	—	2 10	43	24	22	30
Pumping station -----	4 40	—	—	—	—	18
Total cost per M. G. -----	\$7 99	\$5 62	\$3 88	\$1 91	\$2 53	\$2 61

1912—comparing the filtered water with the water applied to the slow sand filters, the reductions in turbidities and bacteria in per cent. were as follows:

	Schuylkill River				Delaware River
	Lower Roxborough	Upper Roxborough	Belmont	Queen Lane	Torresdale
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Average reduction turbidity----	98.85	99.15	98.95	91.25	93.74
Average reduction bacteria-----	99.49	99.63	98.96	96.42	99.03
Maximum reduction turbidity---	100.	100.	100.	97.50	100.
Maximum reduction bacteria----	99.97	99.96	99.95	99.69	99.50
Minimum reduction turbidity----	97.37	90.00	95.45	*	88.35
Minimum reduction bacteria-----	96.91	97.50	95.05	75.00	96.90

*Applied—0.5 and effluent—0.5.

The total quantity filtered during the year was 114,223,374,000 gallons, divided as follows:

Lower Roxborough	3,322,029,000	gallons.
Upper Roxborough	4,595,041,000	“
Belmont	14,006,822,000	“
Torresdale	73,938,025,000	“
Queen Lane	18,361,457,000	“

APPENDIX E

REPORT OF THE REGISTRAR

Philadelphia, February 1, 1913.

MR. CARLETON E. DAVIS,
Chief, Bureau of Water.

SIR:—I submit herewith the Annual Report of the operations of this Division for year ending December 31, 1912:

The Registrar's Division having business with all consumers of water in the City, a brief outline of the business organization might be of interest.

The organization of this Division is divided into five sections, viz.: Inspection, Accounting, Permit, Adjustment and Frontage.

The Inspection section consists of a Chief Inspector and a corps of assistants, whose duty it is to report all water fixtures, take a statement of all water meters, report all leaks and waste of water, boilers, gas engines, new buildings, etc., serve leak and waste notices, frontage bills and notices for all violations within their prescribed districts.

The Accounting section is divided into two classes, viz.: Meter accounts and fixtures accounts. There are approximately 5,000 meter accounts and 350,000 fixtures accounts. The meters are read at least once every three

months, the larger ones more frequently; and it is our desire to have every property on fixture ratings inspected at least once a year.

The Permit section is intrusted with the making and issuing of all permits for the introduction of water, new appliances, additional water rent bills and bills for the use of water in the construction of new buildings, etc.

The Adjustment section answers all inquiries for information as to rates, method, etc., and all adjustment of differences between consumers and Bureau relative to charges, the declining of fixtures and notifying and shutting off of the water where consumers are delinquent in payments.

On November 1, 1912, the Frontage section was consolidated with that of the Registrar's Office. This permits the applicant to make application for the introduction of water and secure permit in the same office. This section makes all assessment for new pipe laid, making searches as to payment of same, and is responsible for the issuance of applications where water is to be introduced. An application must be taken out in this section before a highway order or ferrule permit is issued.

Each year it is necessary for the Registrar to furnish to the Receiver of Taxes and Controller a list of Water Rents Receivable for the ensuing year. These lists are known as "Water Rent Duplicates." The Water Rent Duplicates are made in three and four copies, depending upon the ward. For wards having Branch Tax Offices four copies are made, and for wards not having Branch Tax Offices three copies are made. In all cases, one copy is made for the Receiver of Taxes, Main Office and Branch Tax Office, Controller's Office and this office. Heretofore the duplicates, consisting of one hundred and sixty-seven books, twenty-one wards having three books

and twenty-six wards having four books, were written in long hand, and as the books were bound, it was necessary to write each one separately, thus entailing a long time and great expense. Arrangements have been made for the year 1913 to do this on adding typewriters, writing the required number at one time, which should prove a more efficient method of performing this work.

The consumer and prospective consumer should know that it is necessary to pay all frontage assessments, and that a permit will not be issued for the introduction of water to any premises for which said assessment has not been paid, except charitable and other institutions, as provided for in Act of Assembly, June 4, 1901. It is necessary that a permit be taken out in all cases where water is to be introduced, indicating thereon the size of ferrule, the uses to which the water may be applied, the fixtures and attachments, and that a fixture or appliance must not be attached to any service before securing a permit from this Department, except on metered properties.

Not more than one house shall be supplied with water from one ferrule, and it is the duty of all persons, who may be supplied with water from any of the City's Water Works, that they shall keep their own service pipe, stop-cocks and apparatus in good order and repair, and protected from frost at their risk and expense, and shall prevent unnecessary waste of water.

A schedule of all rates, as provided by ordinance of Councils, will be mailed upon request.

Bills for water rent are available on and after February 1st of each year, and it would facilitate matters for this Department and consumers if bills were requested at this time, so that adjustment could be made before penalty time. It has been the practice in the past for consumers to neglect requesting and paying their bills until just before penalty time, in which instance they find that their

bills are higher than previously. If it is expected by them that this adjustment should be fixed before penalty is added, it will be necessary to request the bill in February and take up adjustments immediately, thus allowing plenty of time for this Division to investigate and settle before the penalty is added.

All bills for water rent should be requested from and paid to Receiver of Taxes.

The total receipts of the Bureau from all sources for the year amounted to \$4,947,648.64, which is an increase of \$99,432.84, or 2 per cent. over 1911, as follows:

	1911	1912	Increase	Decrease
Collected by the Bureau of Water Rents, Receiver of Taxes -----	\$4,805,640 28	\$4,893,052 06	\$87,411 78	—
Collected fees for searches, Miscellaneous Tax Office, Receiver of Taxes-----	2,638 75	2,505 25	—	\$133 50
Collected by City Solicitor for water pipe frontage..	28,398 69	34,222 41	5,823 72	—
Collected by Highway Bureau for ferrules delivered by Bureau of Water----	7,844 00	7,836 00	—	8 00
Collected by Department of Supplies for Bureau of Water -----	3,694 08	10,032 92	6,338 84	—
Total-----	\$4,848,215 80	\$4,947,648 64	\$99,574 34	\$141 50
	—	—	141 50	—
Total increase-----	—	—	\$99,432 84	—

I have also attached hereto certain details of this revenue, together with other tables showing the number of shut-off orders issued by this Division for the non-payment of water rents, new attachments made by Purveyors on authority of this Division, and the number and kind of meters set during the year.

Respectfully submitted,

JOSEPH A. CARLIN,

Registrar.

The following is a comparative statement of the receipts of the Bureau of Water collected by the Water Rent Tax Office, Receiver of Taxes, up to and including December 31, 1912:

	1911	1912	Increase	Decrease
Rents	\$3,975,904 96	\$4,146,789 58	\$170,884 62	—
Penalties	38,966 62	44,605 15	5,638 53	—
Delinquent	47,114 93	70,901 51	23,786 58	—
Penalties	6,934 59	10,429 87	3,495 28	—
Liens	105 00	84 00	—	\$21 00
Interest on liens.....	249 60	193 09	—	56 51
Permits	146,760 64	141,109 23	—	5,651 41
Meters	432,812 59	407,362 86	—	25,449 73
Pipe	136,842 35	63,939 46	—	67,902 89
Special	19,949 00	2,637 31	—	17,311 69
Totals.....	\$4,805,640 28	\$4,893,052 06	\$203,805 01	\$116,393 23
			116,393 23	
Total increase for 1912			\$87,411 78	

A Detailed Statement of All Revenues by Months.

	Direct Revenue									Indirect Revenue					Totals
	Rents.				Fees for searches	Miscellaneous	Water pipe frontage collected by Receiver of Taxes	Water pipe frontage collected by the City Solicitor	Ferrules delivered to Highway Department	Penalties, current	Penalties delinquent	Liens	Interest on liens	Collected by Department of Supplies	
	Current	Delinquent	Paid by meter rates, current and delinquent	Permits and fractional rents											
January -----	—	\$9,443 65	\$6,052 32	\$4,831 77	\$189 00	\$59 55	\$2,827 38	\$2,971 88	\$233 00	—	\$1,353 89	\$2 00	\$4 86	\$47 50	\$28,016 80
February -----	\$215,937 85	18,989 26	57,355 93	4,667 84	168 75	96 65	6,236 23	2,158 00	136 00	—	2,864 08	5 00	9 99	9 20	308,634 78
March -----	185,571 02	16,377 50	33,664 22	11,417 78	226 25	82 47	15,779 57	3,177 76	553 00	—	2,459 16	3 00	5 62	93 00	269,410 55
April -----	348,331 77	6,931 60	6,382 74	12,026 75	227 00	177 54	10,914 20	4,833 35	1,064 00	—	997 83	6 00	12 10	329 04	392,233 92
May -----	2,879,828 04	5,731 35	55,032 92	21,979 93	240 00	60 06	4,848 08	3,222 53	848 00	—	791 13	—	—	570 88	2,973,152 92
June -----	96,247 46	2,885 35	45,417 23	15,892 38	248 75	22 88	2,012 69	1,442 28	873 00	3,488 57	442 89	17 00	31 63	819 62	169,841 68
July -----	58,709 90	4,340 70	2,916 41	12,736 57	219 00	31 25	2,376 92	1,799 43	810 00	2,951 03	611 53	11 00	27 12	2,277 80	89,818 66
August -----	155,180 25	2,212 50	44,963 11	14,706 99	172 50	195 23	4,245 80	1,277 25	848 00	7,773 00	329 30	12 00	29 50	2,529 59	234,475 02
September -----	28,363 10	786 30	53,269 16	13,895 85	187 75	98 43	4,983 15	3,501 88	827 00	3,580 68	123 22	11 00	17 71	892 11	110,637 34
October -----	95,366 42	653 20	10,381 50	11,859 53	238 76	1,385 07	5,109 67	2,451 15	610 00	14,360 59	111 45	11 00	28 03	1,429 18	143,995 54
November -----	64,851 07	1,570 75	59,830 77	8,148 65	197 50	191 17	6,257 65	3,681 50	588 00	9,609 47	191 10	3 00	15 93	817 93	155,964 49
December -----	18,402 70	979 35	32,096 55	8,945 19	190 00	237 06	3,348 12	3,705 40	446 00	2,741 81	154 09	3 00	10 60	217 07	71,476 94
Totals, 1912-----	\$4,146,789 58	\$70,901 51	\$407,362 86	\$141,109 23	\$2,505 25	\$2,637 31	\$68,939 46	\$34,222 41	\$7,836 00	\$44,605 15	\$10,429 87	\$84 00	\$193 09	\$10,032 92	\$4,947,648 64
Totals, 1911-----	3,975,964 96	47,114 93	432,812 59	146,760 64	2,638 75	19,949 06	136,842 35	28,398 69	7,844 00	38,966 62	6,934 59	105 00	249 60	3,694 08	4,848,215 80
Increase-----	\$170,824 62	\$23,786 58	—	—	—	—	—	\$5,823 72	—	\$5,638 53	\$3,495 28	—	—	\$6,338 84	\$99,432 84
Decrease-----	—	—	\$25,449 73	\$5,651 41	\$133 50	\$17,311 69	\$67,902 89	—	\$8 00	—	—	\$21 00	\$56 51	—	—

Miscellaneous column includes bill for labor and material issued to the public by Bureau of Water; also, any overdrawn warrants.

*A Comparative Statement of Permits Issued by this
Division.*

	1911		1912		Increase	Decrease
	Number	Amount	Number	Amount		
Additional fixtures ---	7,712	\$12,376 45	8,084	\$9,887 80	—	\$2,488 65
Building permits -----	2,111	21,738 61	1,617	17,719 85	—	4,018 76
Additional water rents	2,196	18,661 66	2,391	35,388 90	\$16,727 24	—
Department ferrules --	1,094	15,816 00	336	9,988 00	—	5,878 00
Special permits -----	175	1,981 29	61	1,375 55	—	605 74
New houses -----	13,600	75,820 63	9,031	65,352 63	—	10,468 00
Ferrules drawn -----	473	366 00	761	1,466 50	1,080 50	—
Totals-----	27,361	\$146,760 64	22,281	\$141,109 23	\$17,807 74	\$23,459 15
						17,807 74
Total increase for 1912	—	—	—	—	—	\$5,651 41

Note:—Special permits include privilege of light pumps, use of fire hydrants for building purposes, shifting engine or cellar digger, also any special permission given for use of water.

Statement of Unpaid Permits to December 31, 1912.

Additional	\$2,943 88
New houses	3,846 48
Building permits	1,823 15
Fractional rent	943 45
Department ferrules	224 00
Special permits	3,586 60
Total	<u>\$13,367 56</u>

Statement of Shut-Off Orders Issued for Non-Payment of Water Rents.

First District	2,503
Second District	923
Third District	1,806
Fourth District	1,521
Fifth District	383
Sixth District	1,315
Seventh District	2,546
Total	<u>10,997</u>

Following is a List of New Attachments Made by the Purveyors on Authority from this Division:

$\frac{1}{2}$ inch	6,801
$\frac{5}{8}$ inch	437
$\frac{3}{4}$ inch	136
1 inch	123
$1\frac{1}{4}$ inches	43
$1\frac{1}{2}$ inches	43
2 inches	77
3 inches	13
4 inches	13
6 inches	10
Total	<u>7,696</u>

A Statement of the Operating Cost of this Division.

Salaries	\$35,155 38
Per diem wages	23,862 09
Per diem wages, miscellaneous labor	61 46
Extra clerk hire for the writing of water rent duplicates	3,716 08
Postage, transportation, stationery and supplies.....	6,964 42
Total	<u>\$69,759 43</u>

Statement of Meters Installed During 1912.

Wards	Sizes										Total
	$\frac{5}{8}$ inch	$\frac{3}{4}$ inch	1 inch	1 $\frac{1}{4}$ inch	1 $\frac{1}{2}$ inch	2 inch	3 inch	4 inch	6 inch	12 inch	
First	33	1	2	—	—	—	2	—	—	—	38
Second	1	—	—	—	—	2	—	—	—	—	3
Third	5	—	—	—	—	—	—	—	—	—	5
Fourth	8	3	1	—	—	—	—	1	—	—	13
Fifth	10	3	2	—	1	—	3	1	—	—	20
Sixth	24	3	8	—	3	4	4	—	—	—	46
Seventh	16	1	1	1	—	1	—	—	—	—	20
Eighth	19	3	4	—	1	4	1	3	—	—	35
Ninth	29	4	6	—	4	3	1	2	—	—	49
Tenth	16	1	2	—	1	1	—	—	—	—	21
Eleventh	3	—	1	—	—	—	—	1	—	—	5
Twelfth	2	1	1	—	—	4	—	—	—	—	8
Thirteenth	4	—	1	—	—	—	—	—	—	—	5
Fourteenth	4	2	2	—	1	1	—	—	—	—	10
Fifteenth	23	4	6	—	1	—	1	—	—	—	35
Sixteenth	1	—	1	—	1	1	—	1	—	—	5
Seventeenth	1	1	2	—	—	—	—	—	—	—	4
Eighteenth	2	1	3	—	1	—	2	2	—	—	11
Nineteenth	17	3	4	2	—	1	2	1	—	—	30
Twentieth	15	—	1	—	—	—	1	—	—	—	17
Twenty-first	36	5	5	—	—	—	1	—	—	—	47
Twenty-second	130	7	10	—	3	—	1	1	—	—	152
Twenty-third	21	8	3	—	3	6	1	—	—	—	42
Twenty-fourth	157	8	9	—	—	—	—	—	—	—	174
Twenty-fifth	11	1	—	—	—	2	—	—	—	—	14
Twenty-sixth	7	1	3	—	—	1	—	—	—	—	12
Twenty-seventh	35	2	2	—	—	—	—	—	—	—	39
Twenty-eighth	111	4	1	—	1	1	—	—	—	—	118
Twenty-ninth	40	—	2	—	—	—	—	1	—	—	43
Thirtieth	7	3	1	—	—	—	—	1	—	1	13
Thirty-first	8	1	2	—	3	1	2	1	—	—	18

Statement of Meters Installed During 1912—Continued.

Wards	Sizes										Total
	$\frac{1}{8}$ inch	$\frac{1}{4}$ inch	1 inch	$1\frac{1}{4}$ inch	$1\frac{1}{2}$ inch	2 inch	3 inch	4 inch	6 inch	12 inch	
Thirty-second	51	—	2	—	—	—	—	—	—	—	53
Thirty-third	18	3	4	—	—	1	1	—	—	—	27
Thirty-fourth	408	4	5	1	—	1	1	2	—	—	422
Thirty-fifth	—	—	—	—	—	1	—	—	—	—	1
Thirty-sixth	20	1	3	—	—	2	—	—	—	—	26
Thirty-seventh	60	1	—	—	—	—	—	—	—	—	61
Thirty-eighth	262	6	1	—	—	1	—	—	—	—	270
Thirty-ninth	2	—	2	—	—	—	—	—	—	—	4
Fortieth	28	3	3	—	1	—	1	1	1	—	38
Forty-first	1	—	—	—	—	—	—	—	—	—	1
Forty-second	81	—	1	—	—	—	—	—	—	—	82
Forty-third	149	4	3	—	—	1	1	—	—	—	158
Forty-fourth	74	1	1	—	—	—	—	—	—	—	76
Forty-fifth	2	1	4	—	—	6	2	—	—	—	15
Forty-sixth	510	5	4	1	—	—	1	1	—	—	522
Forty-seventh	28	—	3	—	—	—	—	—	—	—	31
Total											2,839

METERS IN USE.

1912	4,850
1911	2,011
Increase	2,839

Statement of Meters Installed During 1912.

Name	Make and Size.										Total
	5/8 inch	3/4 inch	1 inch	1 1/4 inch	1 1/2 inch	2 inch	3 inch	4 inch	6 inch	12 inch	
Hersey	635	38	37	2	9	18	12	4	1	—	756
Trident	712	21	44	—	7	5	—	—	—	—	789
Lambert	228	—	3	—	—	3	1	—	—	—	235
Gamon	179	4	2	—	—	—	1	—	—	—	186
King	32	1	—	—	—	—	—	—	—	—	33
National	161	—	—	—	—	—	—	—	—	—	161
Buffalo	59	3	4	—	—	1	—	—	—	—	67
Worthington	156	11	20	2	4	5	5	3	—	—	246
American	1	—	—	—	—	—	—	—	—	—	1
Keystone	80	11	1	1	2	1	—	—	—	—	96
Standard	34	2	1	—	—	2	2	1	—	—	42
Thomson	135	9	8	—	3	5	2	1	—	—	163
Enare	18	—	—	—	—	—	—	—	—	—	18
Crest	—	—	—	—	—	3	2	2	—	—	7
Crown	—	—	1	—	—	1	1	—	—	—	3
Empire	—	—	1	—	—	—	1	—	—	—	2
Union	20	—	—	—	—	—	—	—	—	—	20
Eureka	—	—	—	—	—	1	—	—	—	—	1
Gem	—	—	—	—	—	1	2	9	—	1	13
Totals.....	2,490	100	122	5	25	46	29	20	1	1	2,839

APPENDIX F

REPORT OF

HYDROGRAPHIC WORK

FOR THE YEAR 1912

Hydrographic work was continued as for a number of years past. Tables of rainfall and stream flow in substantially the same form in which they have appeared in recent years are annexed hereto.

The Bureau maintains four stream-gauging stations and ten rainfall stations as follows:

Stream-Gauging Stations.

Location	Tributary Drainage Area	Date Established
Schuylkill river, at Philadelphia.....	1,915 sq. mi.	1897
Perkiomen creek, at Spring Mount.....	152 sq. mi.	1883
Neshaminy creek, at Forks of Neshaminy.....	139 sq. mi.	1883
Tohickon creek, at Point Pleasant.....	102 sq. mi.	1883

Rainfall Stations.

Location	Eleva- tion	Type of gauge	Date estab- lished
Philadelphia, at Fairmount Dam..	49	Weather Bureau	1874
Philadelphia, at Fairmount Dam..	66	Automatic	1883
Pottsville, Pa	150	Weather Bureau	1883
Seisholtzville, Pa	870	Weather Bureau	1883
Spring Mount, Pa	300	Weather Bureau	1883
Spring Mount, Pa	300	Automatic	1883
Ottsville, Pa	390	Weather Bureau	1883
Smith's Corner, Pa	480	Weather Bureau	1883
Point Pleasant, Pa	119	Weather Bureau	1883
Lansdale, Pa	350	Weather Bureau	1883
Forks of Neshaminy, Pa	143	Weather Bureau	1883
Forks of Neshaminy, Pa	143	Automatic	1883
Doylestown Pa	405	Weather Bureau	1883

The locations of these various stations are given on the annexed map, Fig. I.

The Schuylkill Gauging Station is established at the Fairmount Dam, where an automatic register is maintained. The flow is deduced by computation of the amount of water passing over the dam, the known pumpage from the river, and an estimated leakage and lockage past the dam.

The Perkiomen, Neshaminy and Tohickon Gauging Stations are practically current-meter stations, equipped with automatic registers. The stream beds are reasonably constant at the gauging station sites, and the flow is computed from rating curves established by numerous measurements in past years. These curves should be checked at intervals and under various conditions of both summer and winter flow.

All stream-flow and rainfall gauges are in charge of local observers, who receive a small monthly compensation.

The following maps and tables accompany this report:

- Fig. I. Map of Delaware river and Schuylkill river.
- Table I. Monthly precipitation on sundry water sheds.
- Table II. Rainstorms exceeding $\frac{1}{4}$ inch per hour, Philadelphia.
- Table III. Rainstorms exceeding $\frac{1}{4}$ inch per hour, Forks of Neshaminy.
- Table IV. Rainstorms exceeding $\frac{1}{4}$ inch per hour, Spring Mount.
- Table V. Rainfall flowing off in Perkiomen, Neshaminy and Tohickon.
- Table VI. Comparative flow of Perkiomen, Neshaminy, Tohickon and Schuylkill.
- Table VII. Monthly yield of Perkiomen, Neshaminy, Tohickon and Schuylkill.
- Table VIII. Daily flow Schuylkill river at Fairmount Dam.

The hydrographic work and calculations were in charge of Mr. John E. Codman.



- LEGEND —
- STREAM GAUGE (S)
 - RAIN GAUGE (R)
 - STREAM GAUGE (S)

AREA OF WATER SHEDS.

DELAWARE RIVER	7438 SQ. MI.
SCHUYLKILL RIVER ABOVE STREAM FLOW GAUGE AT FAIRMOUNT DAM, PHILA.	1915 SQ. MI.
PERKIOKEN CREEK " " " " " SPRING MOUNT	152 SQ. MI.
TOHICKON CREEK " " " " " POINT PLEASANT	102 SQ. MI.
NESHAMINY CREEK " " " " " FORKS OF NESHAMINY	139 SQ. MI.

FAIRMOUNT DAM

MAP
SHOWING THE
WATERSHEDS
OF THE
DELAWARE AND SCHUYLKILL RIVERS

FIG. 1.

TABLE I—Monthly Precipitation on Sundry Watersheds Compared with U. S. Weather Bureau Observations at Philadelphia.

	Philadelphia Series					Schuylkill Series					Perkiomen Series		Delaware Series	Tohickon Series			Neshaminy Series		
	U. S. Weather Bureau	Water Bureau Auto.	Water Bureau Ground Gauge	Pennsylvania Hospital	Shawmont	Lebanon	Reading	Pottsville	Browers	Hamburg	Seisholtzville	Spring Mount	West Chester	Ottsville	Smith's Corner	Point Pleasant	Lansdale	Forks of Neshaminy	Doylestown
Elevations are in Feet Above Sea Level	207	66	49	25	363	480	207	150	86	65	370	300	455	390	480	119	350	143	405
1912	Precipitation in inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches
January	2.57	—	2.08	0.826	1.95	2.15	1.50	1.88	2.18	2.94	1.91	1.60	2.31	1.83	1.69	2.06	3.18	2.01	2.28
February	3.30	—	3.30	3.074	3.48	2.10	2.54	2.73	2.54	1.13	2.17	2.58	2.70	2.02	2.29	2.29	2.09	1.97	3.36
March	9.10	—	9.12	8.801	8.72	5.53	6.24	6.46	7.70	7.72	6.94	7.24	8.12	7.86	8.42	7.93	8.94	8.02	9.71
April	2.89	—	3.13	1.943	3.30	4.03	3.39	5.89	3.24	7.31	4.06	3.39	3.52	3.24	4.15	3.64	3.93	4.12	4.77
May	5.38	—	3.79	6.280	3.40	2.19	2.39	2.53	3.26	3.77	3.95	3.32	3.48	2.52	3.14	3.07	2.73	3.16	2.69
June	1.91	—	1.72	1.906	1.41	2.69	2.01	2.95	2.35	4.84	2.42	2.75	3.15	2.70	2.41	2.26	0.89	1.85	1.72
July	4.15	—	3.37	4.722	3.60	6.50	8.34	5.70	4.00	3.70	5.47	6.31	4.11	3.23	4.63	4.31	3.29	4.20	2.84
August	1.71	—	2.06	3.666	4.03	2.12	4.33	4.23	5.69	5.19	3.98	4.64	4.73	4.48	5.12	4.89	6.54	2.59	6.76
September	5.62	—	6.17	6.194	5.39	4.74	6.02	7.83	3.97	6.05	7.04	6.08	4.20	5.20	5.91	5.02	3.54	3.89	5.62
October	2.42	2.64	2.75	2.511	4.00	2.19	3.31	3.05	4.28	4.05	2.91	3.57	4.25	3.53	4.77	5.07	5.09	3.42	5.27
November	3.21	4.57	4.59	3.581	4.83	—	2.80	2.90	3.86	3.34	3.26	3.29	4.08	4.21	3.95	3.83	3.90	3.86	3.90
December	4.74	4.76	4.79	4.557	4.78	4.03	4.56	4.80	4.81	4.97	5.21	4.67	5.50	4.42	5.08	5.07	4.17	5.14	5.88
Totals	47.00	—	46.87	48.061	48.89	—	47.63	50.95	47.88	55.01	49.32	49.44	50.15	45.24	51.61	49.44	48.29	44.23	54.75
Percentage	100	—	97	103	104	—	101	108	101	117	105	106	106	96	101	106	103	94	116
30 years' yearly average	Inches	—	43.76	44.96	44.00	—	43.17	49.48	44.56	49.73	48.61	44.78	50.86	47.00	50.20	48.60	44.83	46.45	48.14
	Percentages	—	105	112	106	—	104	117	107	118	117	108	123	113	121	117	108	112	116
Average deficiency or increase	+5.72	—	+3.11	+3.10	+4.89	—	+4.46	+1.47	+3.32	+5.28	+0.71	+4.66	-0.71	-1.76	+1.41	+0.84	+3.46	-2.22	+6.61
Percentage deficiency or increase	14	—	7	7	11	—	4	3	7	10	1	10	-1	-3	3	1	8	-5	14

TABLE II.

Rain Storms Exceeding in Rate 0.25 Inches per Hour as Recorded by the Automatic Rain Gauge at Philadelphia for the Year 1912.

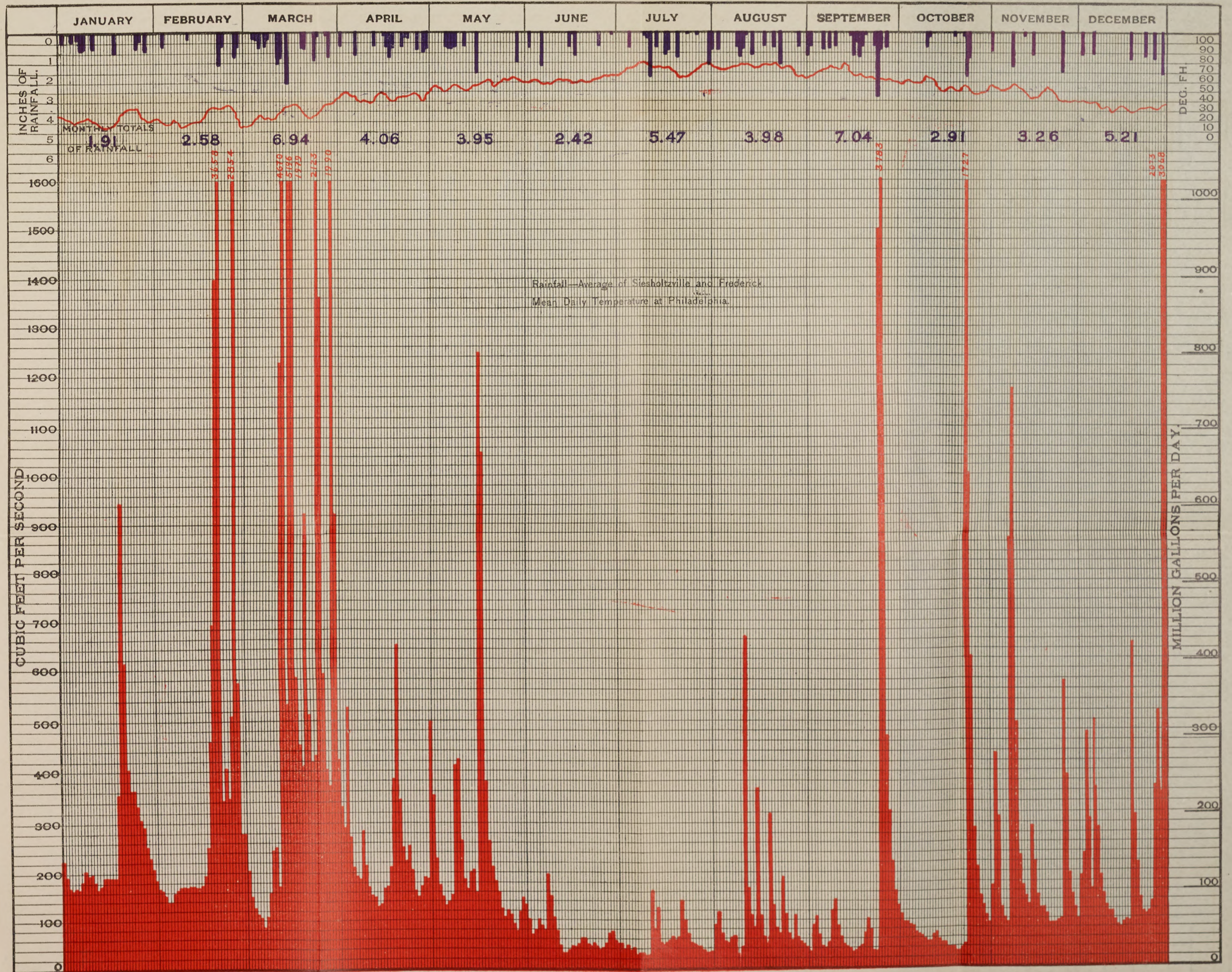
Date of observation	Automatic rain gauge				
	Total fall		Maximum fall		
	Amount in inches	Duration, hours, minutes	Amount in inches	Duration in minutes	Rate per hour during maximum fall
March 12-13.....	2.64	15-45	.35	60	.35
March 15.....	2.64	13-40	.40	60	.40
March 29.....	1.34	6-55	.65	40	.98
September 22-23, rain storm.....	3.07	33-30	.45	60	.45
October 22-24, rain storm.....	2.75	33-40	.30	60	.50
November 1, rain storm.....	.86	8-25	.40	30	.80
November 7, rain storm.....	2.41	6-35	.30	25	.72
November 24, rain storm.....	.58	0-45	.58	45	.77
December 30, rain storm.....	1.93	14-00	1.18	40	1.77

TABLE III.

Rain Storms Exceeding in Rate 0.25 Inches per Hour as Recorded by the Automatic Rain Gauge at Forks of Neshaminy for the Year 1912.

Date of observation	Automatic rain gauge				
	Total fall		Maximum fall		
	Amount in inches	Duration, hours, minutes	Amount in inches	Duration in minutes	Rate per hour during maximum fall
March 12-13.....	2.41	17—35	0.44	25	1.06
March 13.....	1.85	12—10	0.25	15	1.00
March 29.....	1.06	7— 0	0.40	45	0.53
March 29, shower.....	.25	0—15	.25	15	1.00
April 18, rain storm.....	1.27	33—45	.20	15	.80
May 29, shower.....	1.23	8—25	.93	20	2.79
June 6, shower.....	.70	5—10	.25	60	.25
June 17, shower.....	.53	3—00	.43	15	1.72
June 24, shower.....	.25	5—20	.24	12	1.20
July 11, shower.....	.73	3—40	.40	40	.60
July 14, shower.....	.99	7— 5	.80	25	1.92
July 22, rain storm.....	1.09	10— 5	.40	20	1.20
July 29, shower.....	.23	1—30	.23	30	.46
August 2, shower.....	.37	1—00	.37	60	.37
August 14, shower.....	.33	1—10	.30	45	.40
September 1, shower.....	.57	11—15	.17	20	.51
September 22-23 rain storm.....	2.65	24—30	.45	60	.45
October 22-25, rain storm.....	3.25	52—30	.35	60	.35
November 1, rain storm.....	.83	6—25	.40	60	.40
November 7, rain storm.....	1.68	6—45	.35	35	.60
November 24, rain storm.....	.93	3—20	.50	35	.86
December 30, rain storm.....	1.74	14—25	.40	10	2.40

STREAM FLOW—PERKIOMEN CREEK AT FREDERICK—1912



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STREAM FLOW—NESHAMINY CREEK BELOW FORKS—1912

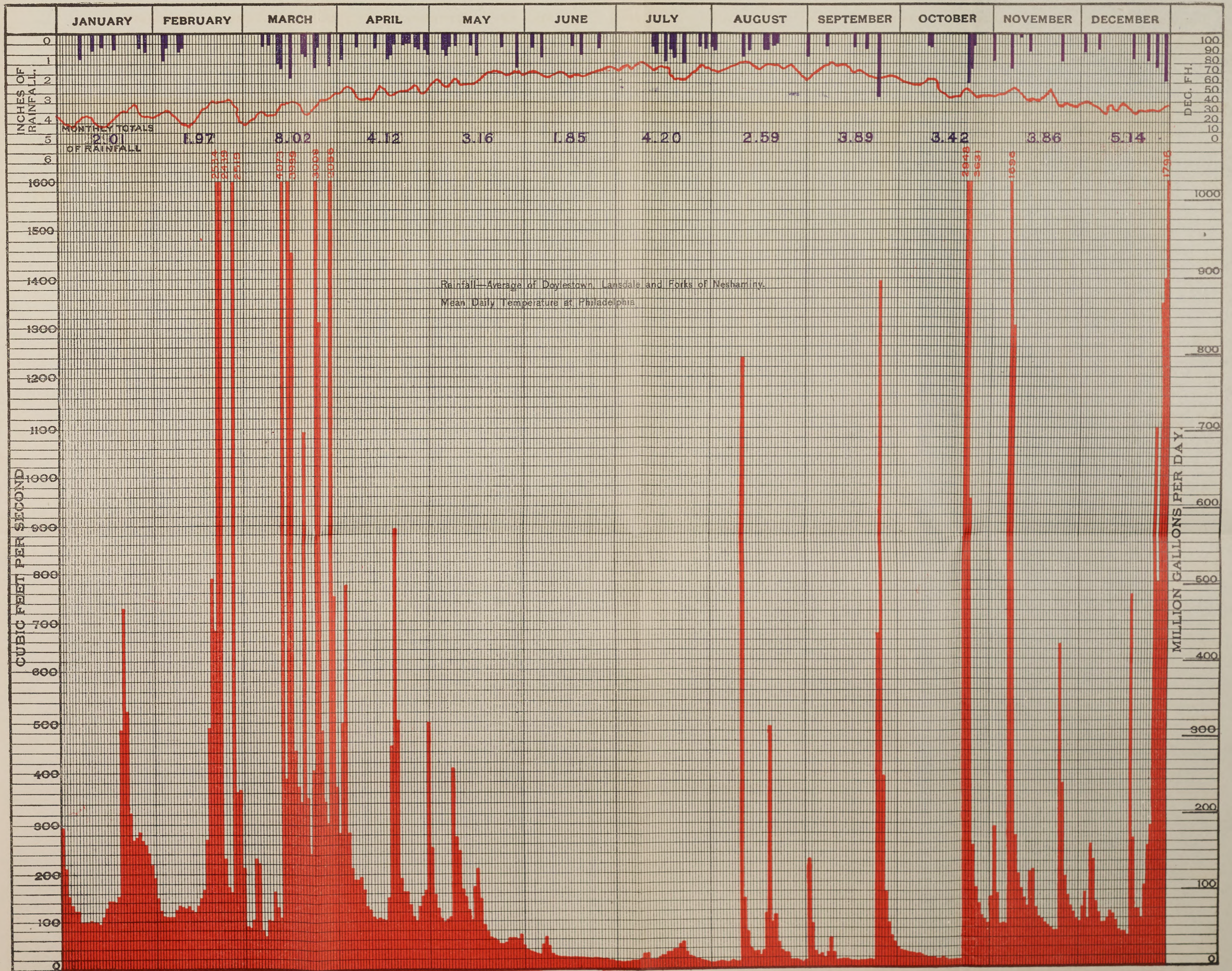




TABLE IV.

Rain Storms Exceeding in Rate 0.25 Inches per Hour as Recorded by the Automatic Rain Gauge at Spring Mount for the Year 1912.

Date of observation	Automatic rain gauge				
	Total fall		Maximum fall		
	Amount in inches	Duration, hours, minutes	Amount in inches	Duration in minutes	Rate per hour during maximum fall
March 12-13.....	1.86	16—30	.35	60	.35
March 15.....	1.95	14—15	.40	60	.40
March 29.....	.82	9—00	.35	40	.52
April 18, rain storm.....	.94	50—15	.20	15	.80
April 27, shower.....	.34	2—15	.25	45	.33
May 16, shower.....	1.30	19—00	.35	20	.80
June 7, shower.....	0.81	5—00	.35	60	.35
June 29, shower.....	1.06	2—30	.66	30	1.32
July 14, shower.....	3.30	3—30	2.60	55	2.84
July 21, rain storm.....	.92	10—30	.20	20	.60
July 29, shower.....	.49	1—15	.45	50	.54
August 2, shower.....	.33	1—5	.30	60	.30
August 10, shower.....	1.63	22—20	.98	60	.98
August 11, shower.....	.37	1—40	.27	30	.54
August 14, shower.....	.60	0—45	.60	30	1.20
August 18, rainstorm.....	.78	15—45	.48	40	.72
August 19, shower.....	.35	1—00	.35	30	.70
August 21, shower.....	.41	1—00	.35	45	.48
September 8, shower.....	.58	1—40	.58	60	.58
September 22-23, rain storm.....	3.06	34—30	.45	60	.45
October 22-25, rain storm.....	2.96	50—50	.40	60	.40
November 1, rain storm.....	.62	6—20	.27	15	1.08
November 7, rain storm.....	1.42	12—45	.35	60	.35
November 24, rain storm.....	.87	4—30	.50	45	.66
December 30, rain storm.....	1.26	13—10	.35	60	.35

TABLE V.

Inches of Rainfall Flowing in the Perkiomen, Neshaminy and Tohickon Creeks.

Watersheds	Area in miles	Percentage of total area				Average for 29 years—1883-1912													
		Woodland	Cultivated	Flats	Roads	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.		
Perkiomen, at Frederick, 29 years.....	152.	25	71	2	2	2.84	3.52	3.84	2.13	1.36	0.93	1.01	0.96	1.00	1.08	1.53	2.26		
Neshaminy, below Forks, 29 years.....	139.3	6	92	¼	1¾	3.14	3.75	3.79	2.07	1.47	0.86	0.90	1.03	0.84	1.12	1.46	2.32		
Tohickon, 29 years.....	102.2	24	72	2	2	3.75	4.15	4.87	2.47	1.64	0.79	0.95	1.04	1.22	1.17	1.84	2.77		
Perkiomen, at Frederick.....						Maximum, 29 years.....		5.40	9.73	6.68	3.52	6.68	2.65	4.89	2.48	3.65	2.82	6.67	6.45
						Minimum, 29 years.....		0.50	0.30	1.56	0.97	0.46	0.23	0.17	0.18	0.16	0.20	0.24	0.63
Neshaminy, below Forks.....						Maximum, 29 years.....		6.77	10.44	7.41	4.20	7.41	2.93	5.47	3.37	3.81	4.55	6.31	5.55
						Minimum, 29 years.....		1.25	0.34	1.51	1.03	0.35	0.08	0.04	0.14	0.03	0.06	0.11	0.41
Tohickon.....						Maximum, 29 years.....		7.49	10.41	9.00	4.76	8.58	3.43	6.41	3.75	5.49	4.27	7.97	7.58
						Minimum, 29 years.....		0.54	1.19	1.83	0.73	0.10	0.07	0.05	0.04	0.03	0.04	0.12	0.56

TABLE VI.

Comparative Daily Stream Flow, 1911 and 1912.

Watersheds	Area of watershed	Maximum Gallons		Date	Minimum Gallons		Date
		Per day	Per sq. mile		Per day	Per sq. mile	
Perkiomen -----	152.0	3,358,300 000	22,094,000	March 15 -----	14,996,000	96,400	Aug. 9.
Neshaminy -----	139.3	2,632,500,000	18,898,000	March 13 -----	7,109,000	51,000	July 10.
Tohickon -----	102.2	2,400,100,000	23,484,000	March 15 -----	1,800,000	17,700	July 12.
Wissahickon -----	—	—	—	—	—	—	—
Schuykill -----	1,915.0	19,002,000 000	9,969,000	March 13 -----	201,000,000	105,000	July—

TABLE VII.

Precipitation and Stream Flow on Perkiomen, Neshaminy and Tohickon Watersheds.

Date	Perkiomen at Frederick Area of watershed, 152 sq. miles				Neshaminy below Forks Area of watershed, 139.3 sq. miles				Tohickon Area of watershed, 102.2 sq. miles				Schuylkill at Fairmount Area of watershed, 1,915 sq. miles			
	Rainfall in inches	Percentage flowing off	Monthly yield of stream Cubic feet	Average yield in cubic feet per second per square mile.	Rainfall in inches	Percentage flowing off	Monthly yield of stream Cubic feet	Average yield in cubic feet per second per square mile.	Rainfall in inches	Percentage flowing off	Monthly yield of stream Cubic feet	Average yield in cubic feet per second per square mile.	Rainfall in inches	Percentage flowing off	Monthly yield of stream Cubic feet	Average yield in cubic feet per second per square mile.
1911																
October -----	5.445	46	886,960,000	2.1786	5.340	45	780,260,000	2.0914	5.773	63	872,493,000	3.1374	5.406	42	10,094,400,000	1.9681
November -----	4.145	63	922,410,000	2.3413	4.460	76	1,103,930,000	3.0574	4.626	80	875,854,000	3.3064	4.333	47	9,034,930,000	1.8202
December -----	3.395	63	763,655,000	1.8757	3.786	65	798,844,000	2.1411	3.720	81	716,757,000	2.6184	3.550	53	8,474,300,000	1.6522
1912																
January -----	1.755	114	711,370,000	1.7473	2.490	73	583,430,000	1.5771	1.860	118	524,422,000	1.9158	2.051	55	5,041,600,000	0.9329
February -----	2.375	147	1,238,340,000	3.2503	2.106	161	1,194,900,000	3.4234	2.200	133	932,480,000	3.6414	2.540	78	8,784,550,000	1.8307
March -----	7.090	94	2,351,050,000	5.7728	8.890	71	2,032,110,000	5.4466	8.070	98	1,889,860,000	6.9040	7.400	63	20,909,000,000	4.0766
April -----	3.725	49	638,670,000	1.6211	4.273	47	642,470,000	1.7794	3.676	51	448,632,000	1.6936	4.300	49	9,332,900,000	1.8803
May -----	3.635	53	684,460,000	1.6812	2.860	38	348,062,000	0.9309	2.910	46	314,920,000	1.1505	3.311	43	6,337,450,000	1.2356

TABLE VIII.

Table of Computed Daily Flow of the Schuylkill River at Fairmount Dam, Showing Flow Over Flashboards in Cubic Feet per Second, Height of Water Above or Below Top of Flashboards in Inches, and Computed Pumpage, Leakage and Lockage from the Pool.

1912 DATE	January	Inches	February	Inches	March	Inches	April	Inches	May	Inches	June	Inches	July	Inches	August	Inches	September	Inches	October	Inches	November	Inches	December	Inches
1	3,367	11	1,088	5	1,479	6¼	6,583	17¼	3,443	11¼	819	4¼	176	1½	282	2	491	3	1,132	5¼	1,057	5	790	4
2	3,367	11	1,071	5	2,290	8½	5,483	15¼	2,575	9¼	581	3¼	92	1	119	2¼	849	4½	784	4	1,409	6¼	790	4
3	1,958	7¾	821	4½	1,720	7¼	5,293	14¾	2,156	8¼	343	2½	176	1½	319	2¼	802	4	631	3¼	1,409	6¼	1,221	5¾
4	2,543	9¼	717	4	1,346	6	4,635	13¾	2,156	8¼	807	4¼	260	2	319	2¼	2,418	9	557	3¼	1,057	5	1,871	7½
5	2,537	9¼	717	4	1,346	6	3,893	12	1,969	7¾	807	4¼	239	2	319	2¼	1,037	5	630	3½	925	4¾	1,307	6
6	1,421	6¼	821	4½	1,187	5½	3,556	11½	1,605	6¾	653	3¾	176	1½	244	2	900	4½	401	2¾	1,053	5	1,715	7
7	761	4	821	4½	1,026	5	3,173	10½	1,793	7¼	1,196	5½	880	4½	145	1¼	930	4¾	620	3½	3,287	10¾	2,503	9¼
8	761	4	717	4	1,187	5½	2,993	10¼	2,575	9¼	1,352	6	736	4	120	1¼	1,036	5	336	2½	9,102	21½	1,958	7¾
9	912	4¾	717	4	1,720	7¼	2,889	10	3,443	11¼	948	4¾	479	3	120	1¼	330	2½	336	2½	3,460	11¼	1,426	6¼
10	1,328	6	364	2¼	2,073	8	2,672	9½	2,993	10¼	625	3½	366	2½	120	1¼	166	1½	92	1	2,414	9	1,107	5¼
11	1,473	6¼	310	2¼	2,073	8	2,561	9¼	2,387	8¾	565	3¼	176	1½	4,573	13½	95	1	92	1	2,414	9	1,025	5
12	1,473	6¼	364	2¼	1,888	7½	2,561	9¼	1,971	7¾	340	2½	736	4	2,658	9½	95	1	588	3½	2,050	8	1,150	5½
13	1,373	6	310	2¼	29,337	46½	2,373	8½	1,971	7¾	196	1½	963	4¾	1,652	7	95	1	770	4¼	1,607	6¾	947	4¾
14	1,257	5¾	310	2¼	14,070	28¾	2,156	8¼	1,911	7¾	175	1½	1,037	5	1,382	6	95	1	512	3¼	1,784	7¼	801	4¼
15	2,516	9¼	364	2¼	15,220	30¼	2,156	8¼	2,156	8¼	175	1½	1,037	5	1,940	7¾	95	1	111	1¼	1,694	7	744	4
16	2,366	8¾	364	2¼	34,898	52½	2,156	8¼	2,156	8¼	175	1½	1,037	5	1,173	5¼	95	1	333	2½	1,281	5¾	908	4½
17	941	4¾	364	2¼	14,166	28¾	2,156	8¼	5,940	16¼	479	3	248	2	587	3½	95	1	69	¾	1,128	5¼	908	4½
18	941	4¾	420	2¾	7,785	19¼	3,025	10¼	5,568	15½	449	3¾	447	3	1,016	5	138	1¼	69	¾	974	4¾	908	4½
19	1,206	5¾	1,055	5	6,020	16½	5,568	15½	2,156	8¼	260	2	479	3	1,016	5	446	3	296	2	854	4½	2,160	8¼
20	2,221	8½	1,509	6½	6,882	17¾	6,143	16½	2,156	8¼	260	2	152	1½	1,652	7	212	1¾	90	1	790	4	3,192	10½
21	2,743	9½	1,841	7½	6,020	16¼	4,468	13¼	2,156	8¼	92	1	192	1½	1,652	7	212	1¾	196	1¾	790	4	2,012	8
22	2,163	8¼	17,268	32¾	4,920	14¼	3,893	12¼	1,792	7¼	92	1	244	2	1,382	6	170	1½	196	1¾	790	4	1,519	6½
23	1,708	7	19,098	35	6,080	16¼	3,763	12	1,429	6¼	92	1	342	2½	1,382	6	164	1½	4,014	12¾	790	4	1,285	5¾
24	1,708	7	8,584	20½	12,070	26	3,445	11¼	1,429	6¼	92	1	520	3¼	1,652	7	310	2¼	7,652	19	1,588	6½	1,229	5¾
25	1,818	7½	3,003	10¼	9,640	22¼	2,890	9¾	1,352	6	92	1	205	1¾	1,382	6	13,222	27½	7,177	18¼	2,529	9¼	1,229	5¾
26	1,708	7	2,359	8¾	7,990	19¾	2,317	8½	1,270	5¾	92	1	160	1½	830	4¼	6,162	16½	3,840	12	1,721	7¼	1,229	5¾
27	1,088	5	9,625	22¼	6,230	16¾	2,156	8¼	1,233	5¾	92	1	160	1½	491	3	2,832	9¾	2,370	8¾	1,127	5¼	2,028	8½
28	988	4¾	13,408	27¼	4,660	13¾	2,156	8¼	1,109	5½	176	1½	160	1½	491	3	1,780	7¼	1,864	7½	985	4¾	3,198	10½
29	1,088	5	7,113	18	9,995	23	2,265	8½	1,037	5	260	2	92	1	684	3¾	1,179	5½	1,509	6½	854	4½	2,824	9¾
30	1,255	5¾	—	—	11,985	25¼	2,561	9¼	963	4¾	366	2½	92	1	684	3¾	746	4	1,201	5¾	790	4	10,150	23
31	1,088	5	—	—	8,400	20¼	—	—	889	4½	—	—	176	1½	684	3¾	—	—	713	4	—	—	19,147	35¼
Total over flashboards	52,077	—	95,523	—	235,703	—	101,939	—	67,739	—	12,651	—	12,235	—	31,270	—	37,197	—	39,181	—	51,713	—	73,281	—
Total pumpage, leakage and lockage	6,274	—	6,150	—	6,300	—	6,559	—	5,610	—	6,580	—	6,829	—	7,337	—	6,909	—	7,428	—	6,266	—	6,386	—
Grand total	58,351	—	101,673	—	242,003	—	108,498	—	73,349	—	19,231	—	19,164	—	38,607	—	44,106	—	46,609	—	57,979	—	79,667	—

TABLE VII—Continued.

Date	Perikomen at Frederick Area of watershed, 152 sq. miles				Neshaminy below Forks Area of watershed, 139.3 sq. miles			Tohickon Area of watershed, 102.2 sq. miles				Schuylkill at Fairmount Area of watershed, 1,915 sq. miles				
	Rainfall in inches	Percentage flowing off	Monthly yield of stream	Average yield in cubic feet per second per square mile.	Rainfall in inches	Percentage flowing off	Monthly yield of stream	Average yield in cubic feet per second per square mile.	Rainfall in inches	Percentage flowing off	Monthly yield of stream	Average yield in cubic feet per second per square mile.	Rainfall in inches	Percentage flowing off	Monthly yield of stream	Average yield in cubic feet per second per square mile.
			Cubic feet				Cubic feet				Cubic feet				Cubic feet	
June -----	2.585	20	181,840,000	0.4615	1.483	14	68,688,000	0.1902	2.456	5	28,607,000	0.1080	2.400	16	1,660,560,000	0.3348
July -----	5.890	7	157,430,000	0.3869	3.443	4	53,206,000	0.1426	4.073	2	16,658,000	0.0609	4.750	8	1,647,100,000	0.3216
August -----	4.310	20	313,468,000	0.7700	5.296	14	239,545,000	0.6420	4.828	9	100,510,000	0.3672	4.680	16	3,335,640,000	0.4203
September ----	5.560	36	699,615,000	1.7758	4.350	22	304,266,000	0.8427	5.376	24	316,872,000	1.1962	5.680	15	3,310,800,000	0.7677
Totals.....	49.910	54	9,549,288,000	1.9922	48.777	52	8,154,710,000	1.8563	49.568	53	7,038,065,000	2.1837	50.601	40	88,463,230,000	1.4652
October -----	3.240	43	494,614,000	1.2554	4.593	51	761,930,000	2.1102	4.456	51	545,305,000	2.0585	3.630	25	4,027,000,000	0.7851
November ----	3.275	55	638,651,000	1.6210	3.885	52	654,590,000	1.8129	3.996	68	648,078,000	2.4465	3.674	36	5,009,400,000	1.0092
December ----	4.940	56	968,745,000	2.3796	5.050	57	932,810,000	2.5011	4.858	72	830,020,000	3.0323	4.840	32	6,883,200,000	1.3420
Totals for..	48.380	53	9,078,253,000	1.9732	48.719	50	7,821,006,000	2.2350	48.756	57	6,596,364,000	2.0462	49.456	35	76,779,200,000	1.2687

THE HIGH PRESSURE FIRE SERVICE SYSTEM

The high pressure fire service was transferred from the Department of Public Safety to the Department of Public Works on March 21, 1912. In accordance with the policy of the Department of Public Works of combining in one Bureau all pumping stations, the service was placed under the Bureau of Water.

The high pressure system, with the extensions put in service during the year, covers the business portion of the City, between Walnut and Race streets, from Broad street to the Delaware river, and the mill district of the City, lying in general between Allegheny avenue, Girard avenue, Germantown avenue and Front street, with extensions embracing certain outlying sections of this mill district. It comprises forty-nine miles of pipe, ranging in size from 8 inches to 20 inches, and is provided with 877 hydrants. Two stations supply water to the system up to a maximum pressure at the station of 300 pounds.

Station No. 1, located at Front and Race streets, and drawing water from the Delaware river, contains seven 1,200-gallon pumps and two 350-gallon pumps, having a combined capacity of 9,100 gallons per minute. This station serves the business district of the City.

Station No. 2, at Seventh street and Lehigh avenue, drawing water from the Fairhill Reservoir, contains ten 1,200-gallon pumps and one 350-gallon pump, with a combined capacity of 12,350 gallons per minute. This station serves the mill district of the City.

Both stations are equipped with three-cylinder four-cycle gas engines. While each station serves a distinct district, the two districts are tied together, so that in case of an emergency either district can be fed from either station by two separate routes. The manipulation of the valves necessary to make these changes requires but a few minutes.

During the year Station No. 1 was in actual service for periods ranging from 20 minutes to 48 hours for twenty-three fires. There were eighty-one additional calls in which the line pressure was built up and held, but in which the system was not needed.

Station No. 2 was called into service thirty-four times, on four of which the service was used.

Station No. 1 consumed, during the year, 2,175,260 cubic feet of gas for all purposes, including experimental runs.

Station No. 2 consumed 357,600 cubic feet of gas for all purposes, including experimental runs.

Upon the service being taken over by the Department of Public Works, the organization was divided into three parts, having distinct duties:

1. *Maintenance.* Under an Assistant Engineer acting as Assistant Superintendent.
2. *Operation.* Under a Superintendent in direct charge of the operations of the stations.
3. *Construction and Engineering.* Under the First Assistant Engineer as Engineer in Charge. This force concerns itself with engineering and construction work.

Under the maintenance force a repair gang is organized for each distribution district. Each gang is in charge of a foreman, and is provided with a light motor truck for carrying the men to and from their work. The use of these motor trucks has improved the service, decreased

the time necessary for the manipulation of stop valves in case of a leak and in responding to fires.

Each line is put under pressure for one hour weekly, and tested for breaks, unless the line has been in service under working pressure during the preceding seven days.

During the year thirteen broken flanges were found on the lines in the business district. The pipes in this district are cast-iron flange pipes, laid about 1902. On the lines in the mill district there were found one 8-inch, three 12-inch and two 16-inch split and broken pipes. This pipe is Universal cast-iron pipe, laid during the last three years.

Investigation of these split pipes seems to show that the whole movement of the pipe, due either to the working pressure or the expansion in the mains after they were laid, accumulated in one joint, forcing the taper end forward until the pipe split under this additional pressure.

When the high pressure system was taken over by the Department of Public Works, the loss of static head, due to leaks, etc., amounted to about 16 pounds per square inch. By a systematic campaign of going over these lines, testing, retesting, replacing hydrants, valves, etc., this loss has been reduced to five pounds per square inch.

The maintenance work has been in charge of Mr. Arthur Donnelly, Assistant Superintendent, and the improved condition of the pipes is due, in a large measure, to his systematic efforts.

A disputed point between the Fire Bureau and those in control of the high pressure system, as to the maximum limit to be placed upon the pressure in the mains in case of fire, has been definitely settled. A conference, attended by the Director of Public Safety, Assistant Director of Public Works, the Chief Engineer of the Bureau of Fire, Mr. Powell Evans, Chairman of the Fire Prevention Committee, and Mr. Charles A. Hexamer, Secretary of the

Board of Fire Underwriters, decided that 250 pounds was a safe limit to be placed on the pressure at the hydrants, except in case of extraordinary emergency. It was agreed that an increased pressure carried with it serious danger of blowing out the system at several points at once, thereby depriving the Fire Bureau of the entire use of the high pressure.

It was also agreed that this pressure was sufficient to supply all the water that could be controlled or would be required at any fire, except a serious conflagration.

New Work. The Fairhill Station was permanently ordered by the Director into active service on April 16, 1912. Work on Contract 3-B, in continuing the extension of high pressure mains in the northeast mill district, was resumed September 1, 1912, by the Keystone State Construction Company, they being the lowest bidders on this work. Up to the end of the year, approximately five miles of pipe had been laid under this contract. All of this pipe was tested under pressure of 400 pounds per square inch in the trench before being covered.

Recommended Future Extensions. One hundred and fifty thousand dollars was appropriated for the extension of the high pressure system, which is being executed under Contract 3-B. The balance available after the completion of this contract will be approximately \$15,000. It is recommended that such part of this balance as may be necessary be made available by ordinance for the purchase, installation and erection, where required, of such additional equipment, spare parts and outfits as may be necessary for the final completion of the entire system, and for securing proper operation and prompt and efficient repairs.

The next logical extension of the distribution system is the continuation of the line up Thompson street to tie in with the long unsupported line on Allegheny avenue. The work is estimated to cost approximately \$45,000.

