FIRST

ANNUAL REPORT

OF THE

WATER WORKS

OF THE

TOWN OF DOVER,

DELAWARE,

FOR THE YEAR ENDING MARCH 1, 1883.

1883:
JAMES KIRK & SONS, PRINTERS,
DOVER, DELAWARE.

REPORT OF THE WATER COMMITTEE.

DOVER, DEL., March 1st, 1883.

To the Town Council:

We, the undersigned Water Committee, in submitting the first annual report, have thought it desirable to follow the example of other towns and cities, by giving a complete history of the construction of our system of Water Works, and all the circumstances attending it, believing it would be interesting now to the citizens of the town, and valuable hereafter for reference.

As has happened in the history of other towns, so in Dover, during the past quarter of a century, there have been made, from time to time, spasmodic efforts to furnish better protection against fire. These efforts have been made while suffering from the effects of some destructive conflagration, and smarting under a sense of perfect helplessness. Generally the excitement has died away, and nothing come of it. Sometimes practical results have followed. Many years ago a Hook and Ladder Truck was purchased, which furnished a supply of ladders and buckets ready for immediate use, and they have rendered good service upon many occasions.

Afterwards a small hand engine and a short length of hose were procured, by means of which a chemical solution of great extinguishing power could be thrown upon the flames. The stream, however, was small, the hose short, and its efficiency depended upon the supply of chemicals and the water which was furnished to the tank by buckets.

Of late years several fires have occurred of considerable magnitude, inflicting serious loss, which, it was conceded, might have been early extinguished, if there had been at command an abundant supply of water, and the means of applying it.

In view of the great amount of combustible material upon the principal business street of the town, there began to arise a feverish apprehension that our town might, at any moment, be visited with one of those dreadful, wide-spread conflagrations, of which we have read such distressing accounts in other places.

Besides, the revelations of sanitary science led us to entertain doubt of the purity of our wells, from the increase of the town, and

the introduction of what are called modern improvements. The finer the house, the worse for the town. Every house, of any pretension, must have a slop-sink in the kitchen, and a tank of rain water in the roof to supply bath room and water closet. This necessitated cess-pools, and the soil of the town is honey-combed with them, while the springs which supply our wells must be polluted by their deadly infiltrations.

This was the state of the public sentiment when the Capital Hotel, owned by Mr. Thomas O. Culbreth, and kept by Mr. William C. Fountain, took fire on the morning of February 4th, 1881, and was totally destroyed, with the exception of the wing on State street. The cold was intense; the mercury being near zero. There was a needless fear lest the fire might reach the adjoining buildings, and so on around to the State House. Under the influence of this panic Wilmington was telegraphed to for aid, and promptly responded by despatching two steamers and several hose carriages, which came down in little more than an hour after being loaded upon the train. By stretching their hose from one steamer to the other, they were enabled to draw water from the branch below the town, and play upon the burning ruins, thus giving an exhibition to our citizens of what could have been done if we had possessed proper appliances.

The fact of the Legislature being in session, and many of its members put to great inconvenience, the magnitude of the fire and loss entailed, and the excitement produced by such an unusual spectacle as the presence of the firemen, and the operation of the steamers—all combined to inspire the citizens of the town with a determination to do something worthy of themselves, to obtain a supply of water for fire protection and domestic use.

The Town Council acted promptly, appointed a special committee, who corresponded with various places in relation to systems of Water Works, and when they were in possession of sufficient information, they called a meeting of the citizens of the town, to assemble in the Court House Hall, to consider the subject. The meeting was held, presided over by His Honor, Chief Justice Conegys.

A committee was appointed at this meeting, from the citizens of the town, not members of the Council, with instructions to consider and report, at a subsequent meeting, the best means of obtaining an abundant supply of pure water for fire protection and domestic use. The committee consisted of Messrs. A. B. Richardson, H. C. Collison, E. M. Stevenson, John Bockman and Caleb S. Pennewill, thoroughly capable, practical and conservative men, deserving the highest confidence of the town in the wisdom of their determination

They reported at a subsequent meeting well-attended, that they had two plans proposed to them, one by the Holly Company, and

the other by the Gloucester Iron Company. The system of the Holly Manufacturing Company, known as the Holly system, was that of pumping directly into the mains. The plan of the Gloucester Company, was a stand-pipe 100 feet high, 10 feet diameter, with by-pass connections for direct pumping into the mains in case of fire. The committee preferred the stand-pipe system, for the reason, assigned by them, that the stand-pipe would hold 125,000 gallons of water, and would be sufficiently full at night, for the engineer to bank his fire and go home to sleep, and there would be enough water in the morning for immediate use; and, in case of fire, the engineer could in fifteen or twenty minutes be pumping directly into the mains. Their only objection to the Holly system was the increased cost of maintenance, requiring pumping day and night, and hence two engineers instead of one. Their conclusion was that a plan could be put in operation to furnish the town with an abundant supply of water for a sum not exceeding $35,000, and they suggested "that if the town was in favor of having a supply of water, that bonds be issued for an amount not exceeding $35,000, the interest to be paid by water rents and a tax upon real estate."

The report of the committee was approved, the sum of $35,000 was fixed as the limit, and the Town Council was authorized to have a bill prepared to present to the Legislature then in session, said bill, however, to be submitted to another meeting of the citizens for approval. The Town Solicitor, John R. Nicholson, Esq., prepared a bill fixing the interest on the bonds at four per cent. as money was abundant, and seeking investment at that rate.

In the meantime, opposition to the proposed plan and expenditure, was aroused and industriously encouraged. When the meeting was called to hear the bill read and approve it, the opposition got control of the meeting, voted the whole thing down, and appointed a committee of their own to report some other plan.

In about a week this committee reported their plan to a very large meeting, recommending the digging of wells or large cisterns in different parts of the town and the purchase of a steam engine.

The report hardly had a dozen votes in its favor, and the committee themselves did not seem fully to approve of it. The whole subject was then ably discussed, when the opposition agreed to compromise upon $20,000, as a substitute for the $35,000. The bill was accordingly amended to that effect, and was passed by the Legislature, notwithstanding unexpectedly renewed opposition from a few individuals, which produced much excitement. It is a great pity that so small an amount was agreed to, as it was necessary to curtail expenditure upon many points, when a sufficient outlay would have resulted in greater benefit to the town.

Some time in May, 1881, a special committee was appointed by Council to select a site for the well, and invite proposals for the entire work and material necessary to furnish the town with a complete system of water works. The committee was composed of Messrs. John A. Nicholson, Joseph M. Chambers, and Stephen Slaughter, which was subsequently made the standing Water Committee, and superintended the work from its commencement to its completion, except that the term of service of Mr. Chambers expiring March 1st, 1882, Mr. H. A. Richardson was appointed in his place on the committee. An effort was made at this time to have the bonds issued; but the opposition which was manifested against the law pursued the enterprise to the Council room, with the hope of defeating it there. Out of deference to the opposition of a small minority, the printing and issuing of the bonds was postponed till a contract should be made for the work, by which the town has lost nearly a $1,000, owing to the change in the money market, when we tried to sell them later in the year.

The site selected for the well was on a point of land owned by Mr. E. O. Eccles, just across the bridge on the east side of St. Jones' creek, on the road leading to Smyrna.

The advantages of this site were deemed to be, that it was separated from the town by the creek, and there was no probability of the town extending in that direction, and so contaminating the water; there were abundant springs of delicious water along the whole hill-side east of the creek; the earth had been excavated and hauled away by the county, thus leaving a low level spot where not much digging would be required, and though outside the limits of the town, it was only about 2,100 feet from State street, making a comparatively short line for the largest pipe. The lot was purchased at a cost of $300, being 1¼ acre, including some land on the top of the hill.

An experimental well was bored, 16 inches in diameter, at a cost of $8.40, and hard bottom was reached at a depth of 21 feet, and the water stood at 2 feet from the surface of the ground, giving a depth of water of 19 feet.

In view of the necessity of economy in the use of the funds at our disposal, we felt justified by this experiment in limiting the depth of our proposed well at 21 feet, though we found it would have been better to have gone 4 or 5 feet deeper when we came to dig the well, as a difference of 50 feet in the location gave us a bottom not very satisfactory at that depth.

It was our object to distribute the pipe in such a manner as to cover as large a territory as possible for protection from fire, and we accordingly made out a plan of the proposed system of water works,

as full and complete as we supposed the money at our command would justify, and advertised for proposals for the following, viz:

A stand-pipe 8 feet in diameter and 140 feet high.

A well 15 feet in diameter to be dug at the base of the hill, upon which the stand-pipe is to be erected, not very far from a stream of water, so that the depth may not exceed 15 or 20 feet, to be walled with brick laid in cement.

Two steam pumps of a capacity of 260 gallons each per minute.

One horizontal tubular boiler of capacity sufficient to supply both of the above pumps.

A pump house of suitable dimensions divided into engine room and boiler room.

Furnishing and laying 2,500 feet of heavy 8-inch pipe, about 20 feet of which to be laid under a stream, 4,600 feet of 6-inch pipe, and 9,500 feet of 4-inch pipe with all necessary branches, bends, gates, &c.

30 double discharge 4-inch fire hydrants with frost jacket and independent slide or cut off to each nozzle.

There were only two bids received for the whole work, one at $27,000, and the other $24,000. The Holly Company made a bid for the fire hydrants, and steam pumps and boilers. Several other parties had been on the ground investigating the subject, but knowing the amount to which we were limited, made no bid.

The plan we had in view had been the stand-pipe system, according to the preference expressed by the citizens' committee. Under the instruction of Council, we then had correspondence with a civil engineer of great experience in water works, to ascertain if we could reduce the dimensions of the stand-pipe, and make other curtailments, and still preserve a proper degree of efficiency in the works. From this correspondence we were convinced that as it was the water in the upper part of the stand-pipe alone, which was available, especially for fire protection, the pumps could only be allowed to cease working for short intervals, and two engineers and a constant fire would be as necessary as in the Holly system, especially, if we reduced the size and height of the stand-pipe.

We therefore invited a proposal from the Holly Company, and on the 18th of August, 1881, made a contract with them for the following complete system of works, viz:

2,200 feet of 8-inch iron pipe, 540 pounds per length of 12 feet.

4,700 feet of 6-inch iron pipe, 360 pounds per length of 12 feet.

6,125 feet of 4-inch iron pipe, 240 pounds per length of 12 feet.

27 double discharge Holly fire hydrants, seven stop gates, viz: one 8-inch, four 6-inch and two 4-inch.

Engine and boiler house to be built of brick, 39 feet long by 20 feet wide, roof to be of slate or best quality of roofing tin. An iron smoke stack 60 feet high and 2 feet in diameter; a pump well 15 feet in diameter and 21 feet deep, the walls to be 18 inches thick, of brick laid in cement; 2 high pressure steam pumps of Gaskill's patent, with capacity to throw four ¾-inch streams 80 feet high, or three one-inch fire streams 100 feet high; two tubular boilers of sufficient capacity; the

trenches to be of such depth that the pipe would be covered with 3 feet 4 inches of earth; the whole to be of best material and workmanship, and the pipes to be tested after they are laid, by being subjected to a pressure of 150 pounds to the square inch, all defective pipe to be taken out, replaced by other pipe to be tested in like manner; the whole system to be completed and ready for use for the sum of $19,500.

It will be observed that this contract called for 3,575 feet less of pipe than originally designed, and the stand-pipe dispensed with as unnecessary. Allowances were to be made on both sides for short or excessive measurement, and they were to take $5,000 worth of bonds with the accrued interest added. In the prosecution of the work some changes were made, and some extra work not contracted for. The Holly Company found it necessary to make the engine house five feet longer, in order to accommodate the boilers, which was done without extra charge. It was thought that a branch should be put in the suction pipe so as to connect with the creek at some future time, to provide against a failure of water in case of extensive fire. This has been done in such a way that the branch can be extended to the creek, or what would be still better, to another well a little north of the present one. The fire hydrants were too far apart on State street between Division and Loockerman, and an extra one was placed on the corner of State and Budd streets. Three extra stop gates were put in, one 6-inch in Loockerman street near Governors' Avenue, one 4-inch in Division street near New, and one 4-inch in State street near the lower side of the Square. In making the contract no calculation was made of the amount of 4-inch pipe necessary to connect the fire hydrants with the mains. This required a greater quantity of that size of pipe than contracted for. In all other respects, except as above mentioned, the works have been completed according to the terms of the contract.

A portion of the pipe was laid in December, 1881, including the 8-inch from the engine house to State street, and the 6-inch to the lower side of the Square; but the completion of the whole was delayed till September, 1882, first by the difficulty of obtaining the pipe, and then when work was resumed in July, through the difficulty of obtaining hands to dig the trenches.

The line being in complete working order from the well to the Post Office, the pumps were started on July 24th, 1882, to supply the Hotel Richardson and two dwellings, but were run in the daytime only until the 6th of October following.

The last section of pipe was laid on Tuesday, September 5th, 1882, and the whole line was immediately tested under a pressure of 150 pounds, at different times, on the 5th, 6th, 7th and 8th, twice exceeding 150, and once running up to 160 pounds, when, on the last test,

no more leaks appearing, the test was deemed satisfactory, as we had no desire to strain the joints by very long continuance at a pressure so far exceeding what would ever be required for any practical purposes. The test was made under the direction of Mr. W. R. Hinsdale, who had been sent on by the Holly Company to superintend the completion of the work.

On Thursday, the 28th of September, the final test was made of the capacity of the pumps to throw fire streams, for which the following programme was adopted.

FIRST TEST. 1.40 P. M.

One 1-inch stream, 150 feet of hose, at the Conference Academy, corner Fulton and Bradford streets.

One 1-inch stream, 50 feet of hose, corner Division and Bradford.

Two ⅞-inch streams, 50 feet of hose, corner State and Fulton.

Run, 20 minutes.

SECOND TEST. 2.40 P. M.

One ⅞-inch stream, 150 feet hose, corner Water and State streets.

One 1-inch stream, 50 feet hose, near Capital Hotel.

One ⅞-inch stream, 50 feet hose, at State House.

One 1-inch stream, 50 feet hose, at Court House.

Run, 20 minutes.

THIRD TEST. 3.20 P. M.

One 1-inch stream, 300 feet of hose, Water and State streets.

This programme was carried out as well as the circumstances would admit, the high wind at the Academy cutting off the top of the stream and the play pipes, which were of leather, being occasionally blown from their connections with the hose. Upon the Square the display was highly satisfactory; a continuous stream being thrown over the spire of the Court House, until the play pipe was again blown off. The whole display gave ample testimony of the power of the pumps to throw several streams over the highest building in town, and after it was all over, the well was only lowered 6 feet, the top of the well being supplied by the weakest springs. This test was under the superintendence of Mr. C. G. Hildreth, Secretary of the Holly Company.

Since the works came into the possession of the town, a coal shed has been built, a cover put up over the well, and various improvements made in and about the engine house for the better management and working of the boilers and pumps.

The suction pipe was placed at about 3 feet from the bottom of the well, to avoid all danger of pumping sand or mud into the mains, giving an average depth of 13 or 14 feet of water from the surface to the bottom of the suction pipe.

The character of the water equals our highest expectations, being delicious to drink and so soft as to be adapted to all domestic uses.

From the 24th of July to the 6th of October, the pumps were only run in the daytime; but at the latter date we commenced pumping day and night, and have been in successful operation ever since.

Mr. T. F. Cooke was elected by Council, Chief Engineer, and Mr. Patrick Lyons, Assistant, and we cannot refrain from expressing our satisfaction at the faithfulness of their service, and congratulate the town upon their rare good fortune in being enabled to secure for the inauguration of our works so skilled and experienced an engineer as Mr. Cooke.

Through the liberality of the citizens, the banks, Kent County Mutual Insurance Company, and the Levy Court, about $1,400 was collected, with which two hose carriages and 1,000 feet of hose have been purchased and committed to the custody of the Robbins Hose Company. In case of fire two lines of hose can be attached to any one fire hydrant, and instantaneously fire pressure can be applied, which need never exceed 70 pounds, unless it is desired to reach the most elevated part of three or four of the tallest buildings.

DISTRIBUTION OF PIPE.

The street mains have been laid as follows, viz:

Division street, from the engine house to State street	8	inches.
Division street, from State to New	6	"
Division street, from New to Queen	4	"
State street, from Division to lower side of Square	6	"
State street, from Square to south side of Water street	4	"
State street, from Division to Delaware Avenue	4	"
Loockerman street, from State to Queen	6	"
Loockerman street, from Queen to Railroad station	4	"
Bradford street, from Loockerman to Reed	4	"
Bradford street, from Reed 293 feet extension	2	"
Bradford street, from Division to Fulton	4	"
Governors' Avenue, from Division to North street	4	"
Queen street, from Division half way to Loockerman	4	"
On the Square, from State street to State House	4	"
On the Square, from State street, to N. W. corner	4	"
Budd street, from State to King	4	"

LOCATION OF STOP GATES.

8-inch gate at Engine House.
6-inch, State street near south side of Division.
6-inch, State street near south side of Loockerman.
6-inch, Loockerman near the west side of State.
6-inch, Loockerman near west side of Governors' Avenue.
6-inch, Division near west side of State.

4-inch, State street south of Square.
4-inch, State street north of Division.
4-inch, Governors' Avenue near Reed.
4-inch, Division west of New.

LOCATION OF FIRE HYDRANTS.

Corner of Division and Pennsylvania Avenue.
Corner of Division and State street.
Corner of Division and Bradford street.
Corner of Division and Governors' Avenue.
Corner of Division and New street.
Corner of Division and Queen street.
Corner of State street and Delaware Avenue
Corner of State street and Budd.
State street opposite Hotel Richardson.
State street at Post Office.
State street corner of North.
State street, north side of Square.
Square, N. W. corner.
Square, at State House.
State street, at Court House.
State street, corner of Water.
Loockerman street, opposite Bradford street.
Loockerman street, corner of Governors' Avenue.
Loockerman street, corner of New street.
Loockerman street, corner of Queen street.
Loockerman street, between Queen and Railroad Station.
Loockerman street at Railroad station.
Bradford street, corner of Reed.
Bradford street, corner of Fulton.
Governors' Avenue, corner of Reed.
Governors' Avenue, corner of North.
Queen street, between Loockerman and Division.
King street, intersection of Budd and Pryor.
Number of fire hydrants, 28.

COST OF CONSTRUCTION.

We give below the cost of construction by the Holly Company.

For construction as per contract		$19,500.00
332 feet 4-inch pipe, extra, @ 63 cents.....	$209.16	
53 feet 6-inch pipe, extra, @ 90 cents.....	47.70	
	$256.86	
Amount carried forward.....	$256.86	$19,500.00

Amount brought forward	$256.80	$19,500.00
Less 21 feet 8-inch pipe, short, @ $1.25	26.25	
		$230.61
Freight on 2 gates and 1 branch, 1800 lbs., 22 cents cwt.		3.96
1 extra fire hydrant		37.00
2 12-inch stop gates in suction pipe, $50		100.00
1 12×12 branch, 540 lbs., @ 4 cents		21.60
Extra work in placing same, making 4 12-inch joints		9.80
		$19,902.97

CR.

By short weight on 8-inch pipe amounting to 10,036 lbs., $35.50 per gross ton	154.70
	$19,748.27
To this is to be added interest on $2,382, part of first estimate, from Jan. 10th, 1882, to March 25th	29.77
	$19,778.04

CR.

Paid during construction	$12,460.67	
Paid September 29th, 1882	2,900.00	
Paid October 30th, 1882	1,500.00	
		16,860.67
Amount due Holly Company, with interest		$ 2,917.37

To the original cost of construction must be added purchase of site, printing of bonds and other preliminary expenses, building of coal shed, cover over well, 293 feet of 2-inch extension laid in Bradford street, and some other expenses which will be given in detail in a full report of all the receipts and expenditures submitted herewith.

Four of the $1,000 bonds still remain unsold; but they cannot be sold at par, and the sum of $1,500 has been borrowed from the Farmer's Bank, which is to be taken from their proceeds when sold.

Additional legislation is therefore required, to provide for the deficiency, and, at the same time, for authority to lay additional mains, from time to time, so that gradually the whole town may enjoy the full benefits to be derived from our system of water works.

We also submit herewith the reports of the Superintendent and Engineer, and would close our report by the following recommendations, viz:

1st. We recommend, as soon as practicable, the digging of another well a short distance north of the present one. Our present supply of water is sufficient for the ordinary consumption of the town at present, but another well would provide for an increasing demand, and besides, would enable us easily to furnish the Railroad Company with water, one year's revenue from which would very nearly defray the cost of the well.

2d. After another year, when more water is taken, and the pumps have to do more work, and consequently consume more fuel, it would be a matter of economy to lay a 2-inch pipe to the creek, so as to run the vacuum or low pressure condensing engines, as their use would save 30 per cent. of fuel. They cannot be used now because we have not the water to spare to run them.

3d. We recommend the covering of the steam-pipes with asbestos and felt, which can be done at a slight cost, and will be also a saving of fuel, preventing the escape of heat, and condensing of the steam in cold weather, and making it more comfortable to engineers on duty in the summer.

Recognizing the necessity of being able to communicate instantly with the enginner in case of fire, and wishing to save the expense of the annual rent for the Bell telephone, a pair of Holcomb's Amplifying telphones, and wire, was purchased and the line erected between the engine house and the store of the engineer of the Fire Department. It worked very well till the sleet and ice broke the wire. We thought it would be well enough to wait, before putting up new wire, till it could be run into the new hose house when built.

Respectfully submitted.

JOHN A. NICHOLSON,
STEPHEN SLAUGHTER,
H. A. RICHARDSON,
Water Committee.

STATEMENT

Showing Cost of Construction of Water Works.

Land for works	$ 301.00
Sinking trial well	8.40
Recording deed	3.25
Surveying	7.00
Printing bonds	80.00
Advertising, &c., for proposals	54.78
Drawing bill, &c	35.00
Express charges	1.95
Interest on temporary loan	3.25
Expenses of President of Council in negotiating bonds	10.00
Holly Manufacturing Company as per contract	19,500.00
Holly Manufacturing Company, extra work	248.27
Interest on delayed payment	29.77
Valves, &c., extras	63.40
Freight on valves, &c	1.62
Building coal shed, covering well, &c., at works	263.19
Lumber, &c., for out-buildings	49.93
Freight on extra fire hydrant	1.74
Extending main on Bradford street	152.30
Discount on note in Farmers' Bank, temporary loan	47.25
	$20,862.10

STATEMENT

Showing amount Received on account of Construction of Works.

Amount received from sale of bonds previous to March 6th, 1882, Nos. 1, 2, 3, 4, 5, 6 and 7 at par, with coupons attached	$ 7,000.00	
Amount received from sale of bonds to Holly Manufacturing Company, at par and accured interest	5,145.10	
Amount received from sale of bonds to Farmers' Bank, at 95, with coupons attached	1,900.00	
Amount received from sale of bonds to First National Bank, at 95, with coupons attached	1,900.00	
		$15,945.10
Balance due on works*		4,917.00
		$20,862.10

*The town has, as a set off to this amount, four bonds of $1,000 each unsold.

STATEMENT

Showing the Cost of Operating the works and interest paid on bonds.

Paid interest on bonds	$ 860.00
Printing	75.00
Engineers	703.80
Oil	12.12
Supplies	177.93
Coal	505.04
Superintendent's salary, for six months	50.00
Wood	11.25
Water meter	23.50
Telephone	31.25
Sundries	34.00
Total cost of maintenance and interest	$2,483.89

STATEMENT

Showing the Receipts for the Maintenance and Interest Account.

Received from taxes previous to March 6th, 1882	$ 423.87
Received from taxes, dup., 1881	295.40
Received from taxes, dup., 1882	1,816.58
Received from attachment permits	52.00
Received from water rents	266.57
	$ 2,854.42

SUPERINTENDENT'S REPORT.

DOVER, DEL., March 1st, 1883.

To the Water Committee:

I submit to you the following report of the operations of the Water Department under my immediate superintendence.

Up to the present time 27 attachments have been made to supply 26 buildings, 2 attachments having been made for the Hotel Richardson.

Dwellings 19.
Hotels 2.
Drug stores 2.
Shambles 1.
State House 1.
Factory 1.

Amount received for 27 attachment permits.....	$ 54.00
Amount received for water rents—	
To October 1st, 1882.....	69.91
For quarter commencing October 1st, 1882	91.53
For quarter commencing January 1st, 1883	128.23
	$ 343.67

A Crown meter has been put in the factory of Messrs. Richardson & Robbins.

The works were completed so late in the year that many persons have postponed making attachment till the coming Spring and Summer, when the number of takers will be largely increased.

293 feet of 2-inch extension have been laid on Bradford street above Reed.

The only defects that have been observed in the line of pipe were several leaky joints which were easily stopped.

There are about 100 feet of 8-inch pipe on Division street between King street and American Avenue, which have been brought too near the surface of the ground by the grading of the street. This pipe and the fire hydrant at the corner of Division street and Pennsylvania Avenue, should be lowered before another winter.

When the works first went into operation, I received the following list of material from I. S. Cassin & Co., Union Hydraulic Works Philadelphia:

1 drilling machine.
1-inch, ¾-inch and ½-inch drills.
1-inch, ¾-inch and ½-inch taps.
4 1-inch brass ferrules.
2 dozen ¾-inch brass ferrules.
2 dozen ½-inch brass ferrules.

One dozen ½-inch ferrules have since been purchased, and four received in addition, to supply the loss of four defective ones.

The property of the town in my possession consists of

1 drilling machine.
3 drills.
3 taps.
2 1-inch brass ferrules
20 ½-inch brass ferrules.
15 ¾-inch brass ferrules.
1 socket wrench.

There are 6 wrenches for fire hydrants which are distributed—1 to Chairman of Water Committee, 1 to Chief Engineer, 3 to the fire companies, and 1 in my possession.

Respectfully submitted.

GEO. P. JARRELL,
Superintendent.

REPORT OF CHIEF ENGINEER.

To John A. Nicholson, Chairman of Water Committee:

In compliance with your request I herewith submit the following report: Ordinance concerning the Water Works, dated April 3, 1882, ordains that the "Chief Engineer shall have charge of the engine house, boilers, engines or pumps, and well."

Engine house is in good condition, and barring its size, answers very well for the purpose for which it was built. During the coldest weather of the past winter it was quite comfortable without the use of stoves.

The boilers are two in number and are in excellent condition, and are and have been working very satisfactorily, very few leaks appearing. The average steam pressure carried is about 70 pounds. This is much more than is required for the pumps, but on account of the small quantity of fire in the furnaces, it is deemed necessary to have some reserve in case of an emergency. The boilers are the style known as horizontal return tubular, and are, all things considered, the best made for general use and economy in use of fuel. They are 12 feet in length and 56 inches in diameter, with 44 4-inch flues or tubes in each, and have large steam domes or drums. They are set in brick arches thoroughly stayed, and can be used together or separately. So far, only one is kept in use at a time, the other is always in order and ready to fire up. They are supplied with water by a small Gaskill pump having an independent connection to the well.

We are also placing an injector in position, which will be a valuable auxilliary, and insure an abundant supply of hot water to the boilers at all times. I would here remark that the boiler capacity is greatly in excess of that of the engines or pumps—nearly double—a very good feature, and one that will allow the pumping capacity of the works to be greatly increased, should it become necessary, at a reduced cost.

The pumping apparatus is a high and low pressure duplex pumping engine, of a daily capacity of 500,000 gallons, designed by H. F. Gaskill, superintendent of the Holly Manufacturing Company, of Lockport, N. Y. Like the boilers, they can be worked together or separately, and are in good order and working very satisfactorily, maintaining a uniform pressure of forty pounds per square inch water-pressure in the mains, which is ample and will supply any building in

Dover. They are set on brick and marble foundations in a very solid and substantial manner, and exhibit no signs of settling or derangement. They were started and have been successfully operated, until the present time, without any of the usual heating or cutting so often encountered in working new machinery. The plant, with all of the connections, &c., is in good order and working nicely. The well is in good condition and has an abundance of water therein, the best and purest in Dover, we think, without a doubt. The walls are 18 inches thick, made of brick laid in cement, and exclude the surface water. It is tightly and neatly roofed over, and is kept locked. A uniform depth of 16 feet of water has been maintained to this time. Of its capacity or ability to supply for the immediate future, I have but little doubt, especially for domestic use.

The grounds about the works have been cleared of rubbish and some trees have been set out; all has been done to improve them that can well be done without the use of money.

The engines were started July 24, 1882, and run during daylight until October 6th, since which time they have been kept in constant motion day and night.

The following is the list of tools and material on hand at the works:

6 tons coal.	1 gate key.
1½ cords wood.	1 clinker bar.
5 gallons cylinder oil.	1 rake.
5 pounds tallow.	1 hydrant wrench.
5 pounds gum packing.	3 socket wrenches.
1 pound hemp packing.	2 screw wrenches.
1 10 gallon oil can.	5 S wrenches.
1 2 gallon oil can.	1 air pump wrench.
2 ½ gallon oil can.	1 axe.
1 brass-oiler.	1 cold chisel.
50 feet gum hose, ¾ inch.	2 buckets.
5 feet steam hose, 1¼ inch.	1 broom.
7 grate bars.	1 telephone box.
2 wheelbarrows.	1 Sellers' injector.
2 coal shovels.	1 lantern.
1 ladder.	2 lamps.
1 5-feet tin pump.	1 clock. 2 stools.

Our present needs, and to which I would respectfully call your attention and recommend are, that the steam drums and pipes conveying steam, be covered with asbestos and felt, to prevent the condensation of steam and loss of heat, and expansive force. The cost will be small and will soon be repaid in fuel. For this reason and others of importance, I would ask an early consideration of the sub-

ject. The engine house should be provided with troughs or spouts to carry the water from the foundations.

The smoke stack should be painted soon, and more securely stayed. The recent wind storm has demonstrated to me that it is not entirely safe in its present condition.

To you, and to the other members of the Water Committee, the members of the Town Council and the several officers of the town, I desire to express my thanks for kindness and courtesy shown to me, and hope to merit a continuance of the same.

Respectfully submitted.

T. F. COOKE,
Chief Engineer.

DOVER, DEL., March 1st. 1883.

WATER RATES.

SECTION 30. That the prices to be paid per annum for the use of water, furnished from the Water Works of said Town, shall be as follows:

DWELLINGS.	
Hydrant in yard, or kitchen, or one faucet	$ 5.00
Hydrant in both yard and kitchen	6.00
Bath, hot or cold water or both	3.00
Water Closet, self-acting	3.00
Water Closet, pan valve or reservoir	2.00
Urinal	2.00
Bidet or foot bath	1.00
Stationary Wash Stand	1.00
Stationary Wash Tub	1.00
Wash Pave, 20 feet or under of frontage	2.00
Every additional foot	.05
Screw nozzle on Hydrant, where no wash pave is charged	3.00
PUBLIC BUILDINGS.	
Hydrant, or one faucet	6.00
Wash Basin, or Sink	6.00
Water Closet, self-acting	6.00
Water Closet, pan valve or reservoir	3.00
Urinal	4.00
HOTELS AND BOARDING HOUSES.	
Hydrant for family use, or one faucet	6.00

Hotel Bars, with water	10.00
Hotel Bars, without water	5.00
Wash Basin	3.00
Sink	5.00
Bath for use of boarders	6.00
Water Closet, self-acting	6.00
Water Closet, pan valve or reservoir	3.00
Stationary Wash Tub	5.00
Hydrant in yard or kitchen, Hotel use	6.00
Hydrant in both yard and kitchen, Hotel use	7.50
Horse Trough	10.00
Urinal	4.00

MISCELLANEOUS.

Public Bath, each tub	9.00
Bakery, one faucet	6.00
Confectioner, one faucet	6.00
Ice Cream Saloon, one faucet	6.00
Barber Shop, one faucet	5.00
Drug Store, one faucet	6.00
Liquor Store, one faucet	10.00
Restaurant, one faucet	6.00
Slaughter House, one faucet	10.00
Photograph Rooms, one faucet	6.00
Printing Office, one faucet	6.00
Stores and Offices generally one faucet, not less than	5.00
Blacksmith Shop, one fire	5.00
Each additional fire	2.00
Carriage Maker or Wheelwright Shop, one faucet	5.00
Shops generally, one faucet, not less than	5.00
Nursery, one faucet, not less than	10.00
Greenhouse, one faucet, not less than	10.00

Twenty per cent., additional, for each additional faucet.
These rates are exclusive of charge for dwelling.

Public Schools, one faucet	5 00
Each additional faucet	1.00

Boarding Schools, according to attachments and quantity of water used, or at the rate of one dollar per annum for each person, at the option of the Water Committee.

Shops and Manufactories may be rated by the Water Committee for one faucet (and twenty per centum additional for each addional faucet) exclusive of dwelling, as follows:

Five persons or under employed	$ 5.00
Over five persons, for each additional person	1.00

STABLES.

Each horse or cow	1.00
Each carriage	1.00

STEAM ENGINES.

Per Horse Power, for boiler only	3.00

RAILROADS.

For use of depot or station, one faucet	10.00
For each additional faucet	2.50
Locomotives, each	50.00

BUILDING PURPOSES.

Stone wall, per perch	02
Brick, per thousand	05
Plastering lime, per bushel	03

BY METER MEASUREMENT OR ESTIMATED QUANTITY.

Five thousand gallons and under a day, per thousand gallons	20
Over five thousand gallons per day, per thousand gallons	15

Meters will be attached when deemed necessary by the Water Committee, and their use will be charged for at the rate of ten per centum per annum, together with the cost of attaching the same.

FOUNTAINS.

Flowing five hours per day for six months of the year:

Jet of 1-16th inch diameter	7.50
Jet of 1-8 inch diameter	10.00
Jet of 1-4 inch diameter	20.00
Jet of 1-2 inch diameter	40.00

Rates for the use of water, not enumerated above, and for all special purposes, will be fixed and determined by the Water Committee.

MEMBERS OF THE

TOWN COUNCIL OF DOVER,

FOR THE YEAR 1882-3.

CHARLES H. B. DAY, *President.*

1ST DIST.—JOHN A. NICHOLSON,
THOMAS DRAPER.

2D DIST.—STEPHEN SLAUGHTER,
H. A. RICHARDSON.

3D DIST.—JAMES L. WOLCOTT,
HIRAM REEDY.

4TH DIST.—DAVID BICE,
JAMES W. WISE.

WILLIAM FISHER, *Town Treasurer.*