Gen'l G. Clark
Respects of Wm C Brown

B. HOLLY'S SYSTEM

OF

FIRE PROTECTION

AND

WATER SUPPLY

FOR CITIES AND VILLAGES.

MACHINERY MANUFACTURED AND WARRANTED SUPERIOR TO ANY OTHER, BY

HOLLY MANUFACTURING COMPANY,

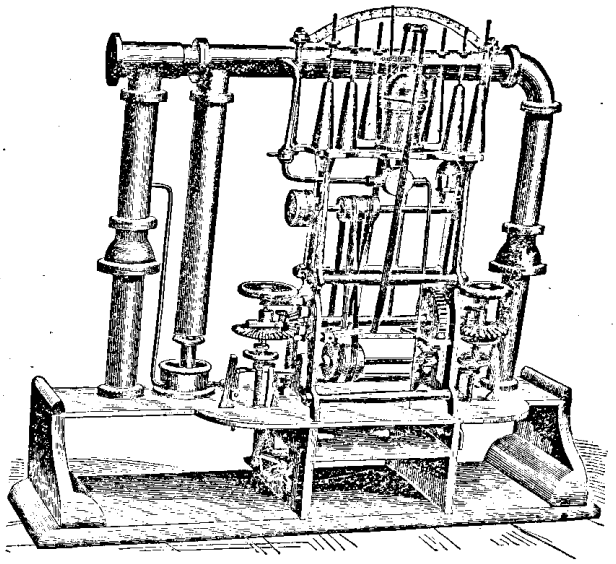
LOCKPORT, N. Y.

THIRD EDITION—FIVE THOUSAND EACH.

LOCKPORT:
M. C. RICHARDSON, BOOK AND JOB PRINTER,
95 Main Street, (Journal Block.)
1869.

VIEW OF

B. Holly's Patent Hydrostatic Regulator,



Controlling Pressure in Street Mains

FOR WATER SUPPLY OR FIRE PROTECTION,

AND CONNECTED WITH

HOLLY WATER WORKS,

IN

LOCKPORT, AUBURN, GOUVERNEUR, MINNEAPOLIS, VERGENNES,
OGDENSBURGH, BINGHAMTON, PEORIA, BATAVIA,
CANTON AND KALAMAZOO.

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Fire Protection and Water Supply

FOR CITIES AND VILLAGES.

Destructive conflagrations are continually occurring; villages and cities are laid waste; multitudes of individuals are pecuniarily ruined; and insurance companies, hitherto safe to the insured and profitable to the stockholders, are being seriously crippled or made hopelessly bankrupt. Underwriters seek a partial remedy for this alarming state of things, by increased and onerous rates of insurance upon property, while the real and urgent want of the times, is increased protection against these disastrous conflagrations.

A full and reliable supply of water for communities—embracing household purposes, watering streets, sprinkling lawns and supplying fountains—is also more than ever felt to be a public necessity, because in this way is the public health and comfort largely promoted, and the beauty and attractiveness of cities and villages greatly augmented.

Happily, these two most important objects of fire protection and water supply, are fully accomplished by the new system of Water Works, invented by Birdsill Holly, and manufactured by the Holly Manufacturing Company, at their extensive machine shops at Lockport, N. Y. The machinery, in its new features and combinations, is covered by patents issued to Mr. Holly, whose inventive and mechanical genius has won for him an enviable and growing reputation, and under his immediate supervision these novel water works have been constructed, and are now in successful operation in various cities and villages throughout the country. The attention of Mr. Holly was first called to the subject, by the frequency of fires in Lockport during the winter of 1862-3, which the fire department of the place, (as is well nigh universally the case everywhere,) was lamentably incompetent to check or control. It resulted in his devising the plan which—overcoming what hitherto seemed to be insurmountable difficulties, and dispensing with costly reservoirs and expensive but inefficient fire engines—gives communities the most perfect fire protection, and cheapest water supply in the world. The practical operations of these stationary water works have more than realized the expectations of the communities who enjoy their benefits and protection, and fully justify the eulogies pronounced upon them.

A description, in general terms, of these water works now in operation, may be of interest. The

LOCKPORT WATER WORKS.

Were constructed in 1863, under a contract with the City Corporation. The wheel house is a circular brick building, located about 20 feet below the State Race, and is 20 feet in diameter. In the lower story is placed one of B. Holly's Patent Improved Turbine Water Wheels, under a head of 19 feet. This wheel drives one of Mr. Holly's Patent Rotary Power Fire Pumps. A 10-inch main leads up an elevation of about 40 feet to Main street, a distance of 30 rods, and the water is thence distributed through smaller pipes of 8, 6 and 4 inches, through the streets protected by the works. Aside from the compactness and efficiency of this machinery, an ingenious invention of Mr. Holly, of indispensable value, secures an uniform pressure of the water in the pipes. This Pressure Gnage, or Register controls the water wheel gate, so as to give just the required pressure from 20 to 200 pounds, AND WHICH MAKES THE WORKS EQUIVALENT TO A RESERVOIR FOUR HUNDRED FEET HIGH. The agreement of the Holly Company, in the contract for the erection of the works, stipulated that, from a hydrant set at a point 50 feet above the pump, a stream of water should be thrown through 100 feet of hose 100 feet high. Upon the trial, the stream was thrown not only over the test pole placed for that purpose, but full 75 feet higher, as near as could be estimated, *when the hose burst!* Next, two streams were thrown at the same time, about the same height, *when the hose again gave way.* Then four streams at one time were thrown over the test pole. Next, in the language of the then Mayor, David M. Mather, Esq., who, with others of the City Corporation was officially present to decide upon the acceptance of the works, "the pump threw at the same time from nine hydrants, a stream from each, through nozzles from $\frac{7}{8}$ to $1\frac{1}{4}$ inches in diameter, over the roofs of any of our buildings." The works were promptly accepted by the city, *the trial being rather a test of the hose than of the power of the machinery.*

In 1863, about 6,000 feet of pipe was laid and 27 hydrants set, the highest of them at an elevation of 72 feet above the stationary power. In 1867, 1,750 feet of additional pipes were put down, with a corresponding increase of hydrants, and ordinances have been passed by the Common Council, under which, the present length of pipe will be nearly doubled. This extension of the district, covered by these works, attest the public estimation in which they are held after nearly six years' trial, and was prompted by the cogent facts, that within the boundaries they protect, the rates of insurance have been reduced nearly 50 per cent.; that they have never failed to drown out, within the building wherein it originated, every fire that has broken out within the hydrant district, and have paid many times their cost in the reduction of insurance rates, and the saving of property which would otherwise have been destroyed.

Indeed, it is universally acknowledged, by the citizens of Lockport, that the prompt suppression of a single one of these fires, under the most unfavorable circumstances, by these water works, saved the business part of the town from destruction. The fire broke out about two o'clock in the morning, in one of

the few wooden buildings remaining on Main street, occupied as a grocery and provision store. The building was 20 feet wide on the street, and 75 feet deep. When discovered, the flames had made formidable headway. The night was intensely cold, and the wind blowing furiously in the direction to sweep nearly the entire extent of Main street. It was so cold that the fire engines and hose would have immediately frozen up. So apparent was this impotency of the fire department to contend, either with the frost or the fire, that the shivering firemen did not withdraw their engines from the engine houses. Within a few minutes after the alarm was sounded, and without the slightest impediment or delay, two streams in front, and two in the rear, of the burning building, were brought to bear from the nearest hydrants of the Holly Water Works, and their powerful and incessant flow covered and protected the adjacent buildings, drowned out the flames, and left a considerable portion of the building standing.

In reference to these pioneer water works, the annexed testimonials from successive Mayors and Chief Engineers, from the day the Works were started to the present time, are conclusive as to their superiority in every particular:

LOCKPORT, *January* 21, 1865.

GENTLEMEN:—I consider it a pleasure to give you my testimony as to the efficiency of the Water Works Pumps erected by you for the purpose of supplying our village with water, for the suppression of fires. As you are aware, this village contracted with you for one of your No. 7 Water Works Pumps in 1863; it was completed and put in successful operation the same year. Upon its trial, it threw from nine hydrants in the Main street, a stream from each, through various nozzles from $\frac{7}{8}$ to $1\frac{1}{4}$ inch diameter, over the roofs of any of our buildings, and it has been in perfect operation ever since. It has reduced the rates of insurance, and has given all within its reach a perfect feeling of protection against fire. One of its great advantages is the self-regulator connected with it, which regulates the power in proportion to the amount of water discharged, without any attendance. I wish all places of importance had the same system of water works; we should then hear of less damage by fires. I think it one of the most beneficial inventions in the country.

D. M. MATHER,
President of Board of Trustees.

MAYOR'S OFFICE, LOCKPORT, N. Y., *March* 20, 1867.

The Water Works, constructed by the Holly Manufacturing Company, for the protection of the business part of this city against fire, have more than fulfilled the promise of the inventor, Mr. Holly, and more than realized the most sanguine expectations of our citizens. The works are of great strength and power, and are marvelously well adapted to extinguish fires promptly and surely. Although designed for only the central and compact part of our city, it is found they have capacity to protect a much larger district, and hence an extension of the pipes, in accordance with the wishes of property holders, will be made at the earliest practicable moment. Cities and villages in need of a supply of water and protection against the calamities of fire, may safely trust the ingenuity and skill of Mr. Holly, for the accomplishment of these increasingly important results.

B. CARPENTER,
Mayor.

FIRE DEPARTMENT, CHIEF ENGINEER'S OFFICE,
LOCKPORT, *March* 21, 1867.

As the head of the fire department of this city, I have had repeated opportunities to test the great value of the Water Works constructed in this city by the Holly Manufacturing Company. In the celerity with which water can be brought to bear upon a fire—in the steady, powerful and *unfailing* flow—in the quiet

application of the water just where it is wanted, without any of the noise, confusion and smoke attendant upon working hand and steam engines, and in the certainty of throwing water in extreme cold weather through these underground pipes, and comparatively short stretches of hose, when increased lengths of hose, through engines, would inevitably freeze: in all these, and other respects, these works are incomparably superior to any arrangement for the suppression of fires I have ever seen.

I concur with Mayor Carpenter in recommending these works to other communities, who desire an economical, judicious and advantageous use of water, either for the daily use of cities or the extinguishment of fires.

H. F. CADY,
Chief Engineer.

MAYOR'S OFFICE, LOCKPORT, N. Y., *Feb.* 25, 1868.

T. T. Flagler, Esq., Pres't Holly Manf'g Co.:

Understanding that you are about to publish a new edition of your pamphlet, on the subject of Holly's System of Water Works, I cheerfully and unreservedly add my testimony to that of my predecessors, Messrs. Mather and Carpenter, in favor of these works, constructed by your Company for our city. They continue to meet every requirement upon them, and are regarded by our citizens as unrivalled and indispensable for fire protection. The process of extending the water pipes is steadily going on from year to year, and I shall count it very fortunate for the place when the whole city is thus brought within the area they protect, and is thus enabled to dispense entirely with the far more expensive but comparatively inefficient mode of fire protection by fire engines.

JAS. JACKSON, JR.,
Mayor.

CHIEF ENGINEER'S OFFICE, LOCKPORT, N. Y., *Feb.* 25, 1868.

In my long experience as fireman, and repeatedly as head of the Fire Department, I have had good opportunities for forming an opinion as to the relative merits of the Holly system, which has been in use here for five years past, in comparison with the *old fogy* mode of hand and steam fire engines. I might perhaps, with greater propriety, say that I am well qualified to judge of the contrast between the Holly plan, which can be relied upon, and other modes which cannot be relied upon, for suppressing fires. There are numerous and obvious advantages of the Holly Works, which I think will speedily cause their introduction into numerous other cities and villages.

L. W. BRISTOL,
Chief Engineer Fire Department of the City of Lockport, N. Y.

MAYOR'S OFFICE, LOCKPORT, *May* 1, 1869.

Upon assuming the office of Mayor, to which I have recently been elected, I find the Water Works constructed by the Holly Mfg. Co., for the city of Lockport, about six years ago, in good and complete working order, and none the worse for these years of invaluable service, in the prompt and sure suppression of fires. I notice what my predecessors in office have said in their praise, and I heartily concur in the opinions they have expressed as to the pre-eminence of Holly's system of water supply and fire protection. I anticipate its general introduction throughout the country at an early day, since its great advantages over the old methods will be appreciated wherever communities become acquainted with its new and important features.

A. F. BROWN,
Mayor.

CHIEF ENGINEER'S OFFICE, LOCKPORT, *May* 1, 1869.

In retiring from the position which I have held during the past year, as head of fire department, I cheerfully add my testimony to that of my predecessors in office, in favor of the Holly Water Works. Six years use of these Works has demonstrated that we have at last a sure method of promptly extinguishing conflagrations.

JOHN HUMPHREY,
Chief Engineer.

In addition to the above from officials, where these Water Works have been longest in use, the following from the Board of Underwriters in Lockport, will attract the attention of communities who are anxiously looking for relief from high rates of insurance, made necessary by the old and imperfect methods of suppressing fires:

To the Holly Mfg. Co., Lockport, N. Y.

GENTLEMEN:—We, the undersigned members of the Board of Underwriters of the city of Lockport, cordially give our testimony in favor of your system of Water Works, as invented by B. Holly, Esq., for the reasons that it is always in order for use, and can be put to work in case of fire with greater facility than any other fire apparatus; that it is more effective than any other means of extinguishing fires we have seen; that in no case during the five years it has been in use in this city has it failed to confine the fire to the building in which it originated; that its effect is to largely reduce the rate of insurance, and to render risks of large conflagrations less hazardous through the district where the Water Works are extended, and we hope that that district will soon embrace the whole city.

May 1, 1869.

H. KILBORN,
GEO. W. BOUGHTON,
R. C. ELLIS & CO.,
HOLT & ATWATER,
C. H. SQUIRES,
GEO. W. HALL,
THOS. SCOVELL.

The obvious advantages and perfect success of the new Water Works at Lockport, attracted the attention of the Auburn Water Works Company, organized to furnish that city with water for culinary purposes and also for protection against fires. After repeated visits to Lockport, and minute and careful examinations of the works in operation there, that Company contracted with the Holly Manufacturing Company to construct the

AUBURN WATER WORKS.

Modeled after those at Lockport, but with additional capacity and power to meet the increased demand upon them. The works were duly constructed and accepted, and have successfully met every requirement, both for the supply of water for daily use throughout the city, and also as a perfect safeguard from conflagrations. The supply of water is drawn from the outlet of the Owasco lake, about two miles from the city. At this point, a wheel house, 30 by 35 feet, has been erected, two stories high. The upper story is arranged for the family residence of the Superintendent in charge of the machinery. In the lower story is placed three of Mr. Holly's celebrated Turbine Water Wheels—one of 60 and two of 100 horse power—under a head of 15 feet. Each of the large wheels drives one of Holly's Rotary Ellipitical Power Pumps, capable of discharging 2,000,000 gallons of water every 24 hours. The smaller pump has a capacity of about 425,000 gallons every 24 hours. The design of three sets of wheels and pumps is to vary the supply of water according to the wants of the city—running one, two, or three of them, as needed. The wheels are so arranged as to apply the power of either wheel to either pump, or the power of one wheel to two pumps, or the power of two wheels to one pump. The water is forced through 12 inch pipe into the main street of the city, and then through reduced sizes of 8, 6, 4 and 3 inches, is distributed to different localities. The farthest

hydrant is fully three miles from the wheel house. The flow of water for the daily supply of the city, is secured with perfect regularity and precision. In case of fire, by combinations of safety valves and a system of telegraphing by water, ingeniously contrived by Mr. Holly, any additional amount can be almost instantly thrown to any required point in the city. By simply opening any one of the hydrants the pressure is reduced in the regulating cylinder at the wheel house—this reduction depresses the piston—starts the regulator which hoists one or more of the gates—rings a bell in the Superintendent's sleeping apartment, and promptly calls him to his duty. *Upon repeated tests, the opening of a hydrant in the city has rung the alarm bell in the Superintendent's room at the wheel house, from two to three miles distant,* WITHIN THREE SECONDS, as near as it was possible to determine by watches set and compared. As soon as a fire is extinguished, the closing of one or more hydrants will so act upon the same regulator, safety valves, piston and cylinder, as to close the gates again, and bring the flow of water in the pipes to the same pressure required for the ordinary supply of the city.

Since the erection of these works, several fires have broke out in Auburn, and there, as well as in Lockport, they have proved themselves equal to any and every emergency, in promptly suppressing what would otherwise have proved to have been wide-spread and desolating conflagrations.

One of these fires broke out in an oil refinery in Auburn, on the ninth of February, 1867, with the following results, as stated by the *Auburn Advertiser and Union*, of that city, in its issue of the next day:

"The engine and retort house of the extensive oil refinery of Messrs. Burgess & Bros., of this city, took fire about seven o'clock last evening. We are happy to state that the progress of the fire was arrested in the building in which it originated, containing the engines, boilers and machinery. The street hydrants of the Water Works Company are about 1,500 feet from the refinery. A sufficient quantity of hose was promptly connected, and a continuous stream of water was poured upon the storehouses, out-buildings, offices, &c. In the storehouse was a large quantity of oil, naptha, &c., which was all saved. The engine, boilers and machinery were also uninjured, and will only interrupt the business of Messrs. Burgess & Bros., a few days. We think no one present, who saw the operations of our Water Works Company upon this fire, at a distance of three miles from the works, and 1,500 feet of hose attached, and then a sufficient power to throw water over the building with great force, will doubt its efficiency in case of fire, and our city and citizens may congratulate themselves on the result of this trial. And we also think the public are largely indebted to Mr. Holly, of Lockport, who invented and also constructed the machinery for this Company."

Another fire in Auburn broke out about two o'clock in the afternoon, in a large wooden building occupied as a Chair and Cabinet Manufactory. The building contained shavings, oils, varnishes and other combustibles incident to carrying on that kind of business. The fire originated from upsetting a pot of varnish, and in a very brief space of time the smoke and flame burst out of the openings in front, nearly to the middle of the street, and within three minutes, by the watch, four full sized and powerful streams were thrown from as many

of the nearest hydrants of the water works, which, by their overwhelming flow, speedily subdued the flames and saved the building and part of the contents, without much injury.

Still another fire occurred there about ten o'clock at night, in a frame barn, caused by breaking of a lantern, which at once set fire to the hay and other combustibles, communicated to the woodwork, thoroughly charred the roof boards, rafters and ceiling, and yet, upon the alarm being given, so prompt and effectual was the application of water from the water works hydrants, that the flames were extinguished without harm to adjacent buildings, and the structure itself left standing, in a condition to repair at a moderate expense.

A fire broke out on Tuesday evening, Nov. 17, 1868, in the dry house of D. M. Osborne & Co.'s large Reaper Manufactory, in Auburn. Three or four streams from the Holly Water Works were promptly applied, and the flames subdued with trifling loss. A gentleman of that city, who witnessed the spectacle, states: "It was a beautiful sight to see those four streams pouring without cessation for some three hours on this combustible material. Any other system of fire protection would have been almost of no account in such a fire as this." The Auburn *News* of next day, in its account of the fire, says: "The firemen, with the efficient aid of the Water Works, did all in their power to extinguish the fire, and after quite a contest, succeeded. All firemen know what an ugly thing a board pile is to put out, and this is just what our firemen had to do, and they did it. The fire was confined to the dry-house and prevented from spreading to the yard, filled with valuable lumber." In connection therewith Messrs. Osborne & Co., published the following:

A CARD.

OFFICE OF D. M. OSBORNE & Co., AUBURN, N. Y., *Nov.* 17.

We wish to thank the firemen of Auburn for their promptness and energy at the fire in our lumber yard this evening. Their exertions saved us from great loss, and confined the fire to the dry house. We cannot speak too highly of the performance of the water works; they gave us a supply of water such as no fire could gain headway upon, and was the admiration and praise of all who saw it. With such a bountiful supply of water, and a well organized fire department, a very large fire in this city is almost an impossibility.

D. M. OSBORNE & CO.

The *Daily Advertiser* of Feb. 17th, 1869, thus describes a fire which occurred the evening previous:

"The Church of the Holy Family (Catholic) was discovered to be on fire at about half-past five o'clock Tuesday evening. The fire originated in the organ loft. Its cause is not known, but is being investigated. It was first discovered on entering the church for the purpose of practice by the choir. The alarm was immediately sounded, and our ever willing Fire Department promptly rallied with their apparatus and got quickly to work. The credit of "the first stream" is between Hose No. 1 and 4. However that may be the boys fought with a will against the usual obstacles of bad location and difficult access to the immediate seat of the fire, and threw water enough to float a small navy. As a result of their prompt work under the experienced direction of Chief Engineer Reynolds, and the overpowering volumes of water from the city mains, the flames were quenched and the edifice saved. The loss is comprised in the total destruction of the fine organ, the largest in the city, originally costing $2,500, on which

there is an insurance of only $1,500; the walls and ceiling are badly damaged by discoloration from smoke, while the gallery floor is somewhat charred. The cornice and corbels are also somewhat damaged, and some of the stained glass windows broken. It is thought that $2,500 to $3,000 will cover the loss on the building, but the organ cannot be replaced at its former cost. The house was insured for $15,000. The church is being cleared of the *debris* and will be ready for the usual services on Sunday next. General sympathy is evinced by citizens of all denominations in this loss to the church, and many assisted generously in clearing away the rubbish occasioned by the fire. But for the efficacy of our water works system, the building must have proved a total loss. A fire timely discovered stands no chance against the volume of water supplied by our glorious Holly system of water works, which have already more than paid their cost in saving property."

Other instances might be cited to prove the incomparable superiority of these Works over any other, for the suppression of fires, but it is deemed superfluous.

The following testimonial, in which the representatives of the Water Company and the officials of the city unite, is entitled to great weight, from the fact that the Water Company entered into contract with the city to supply water for the daily use of the community and furnish means for the suppression of fires, and that those representing the city agree with the Water Company in stating that these stipulations have been satisfactorily fulfilled:

OFFICE OF THE AUBURN WATER WORKS COMPANY,
AUBURN, N. Y., *May* 17, 1869.

Holly Manufacturing Co., Lockport, N. Y.

GENTS:—Our Water Works, constructed with a view of furnishing an abundant supply of water, not only for general city purposes, but also with the design (if practicable) of providing ample protection against fires, have been in successful operation since November, 1865.

The Water Engines and machinery manufactured and put up for us by your Company, as well as the novel plan suggested by your Mr. Holly—dispensing with Reservoirs and Stand-pipes—have fully satisfied our expectations, and enabled us to secure the objects contemplated.

We have now about 16 miles of mains laid in the city, of 12, 10, 8, 6 and 4 inches diameter, to which are attached some 140 fire hydrants, and at all times a constant and abundant supply of water has been furnished.

FOR FIRE PURPOSES WE HAVE NO NEED OF FIRE ENGINES, if there is a sufficient supply of hose to reach from the nearest hydrant. The pumps are of sufficient power to force the water directly from the hydrants, through any reasonable length of hose, far above the highest buildings, and without any perceptible difference whether one or a dozen streams are thrown at the same time.

As a protection against fires, we regard the plan adopted as especially invaluable, being not only less expensive but of greater efficiency than that ordinarily obtained by reservoirs and the force of gravity, or by steam fire engines.

We think four years experience has fully tested the Holly system of Water Works, and proved it superior to any other, not only as a protection against fire, but for all *private uses*, as the pressure can be constantly kept up, and regularly supply the highest points and highest buildings.

In the four years use we have not experienced any difficulty for private uses by the additional pressure in case of fire.

S. WILLARD, *Pres't. Auburn Water Works.*
A. H. GOSS, *Sec'y and Treas.*
J. M. HURD, *Mayor City of Auburn.*
C. H. BATTAMS, *Chief Engineer.*
JOHN S. CLARK, *City Surveyor.*

Attention is directed to the following certificate of the Auburn Board of Underwriters, who, it will be noticed, entirely agree with the Underwriters of Lockport, that the introduction of these Works is a reason for reducing rates of insurance on property.

AUBURN N. Y., *Jan.* 25, 1869.

To the Holly Mfg. Co., Lockport, N. Y.

GENTLEMEN: We, the undersigned, members of the Board of Underwriters of the city of Auburn, cordially give our testimony in favor of your system of Water Works as invented by B. Holly, Esq. For the reasons that it is always in order for use; that the time involved in the event of a conflagration in getting one or more streams of water in action, is less than one-fourth that required with steam or hand fire engines; that a greater volume of water can be thrown and with better effect than by any other means of extinguishing fires within our knowledge: and that it is less liable to become disabled during conflagrations. During the three years it has been in use in this city, it has in no case failed to confine the fire to the building in which it originated.

JOSEPH OSBORN, *Pres't*,
L. C. MANN & CO.,
WM. H. SEWARD, JR. & CO.,
N. PEABODY,
H. V. QUICK, *Sec'y.*
E. H. AVERY,
D. O. BAKER.
JAS. H. HASKINS.

The third set of Water Works, constructed by the Holly Manufacturing Company, was for the small but enterprising and thrifty village of

GOUVERNEUR, N. Y.

The Oswegatchie river runs through it, separating it into two parts. Upon an island in the river, a building was erected, 20 by 24 feet, and two stories high. In the lower, or basement story, two of Holly's 72 inch Patent Turbine Water Wheels, of 75 horse power each, are placed, and in the story above, three of his Patent Elliptical Rotary Power Pumps, of capacity to throw, by their united power, 1,500 gallons per minute, or 2,160,000 gallons every twenty-four hours. The water pipes from the island to the shore banks, on either side, rest upon the bed of the river. The water varies from extreme shallowness to a depth of some fifteen feet, and the bottom quite irregular. The pipes were laid without coffer dams, and by means of ball-joints the lay of the pipe to the unevenness of the beds was provided for, and perfect joint secured. It is believed this is the first instance of laying, successfully, water pipe beneath a deep running stream. The works were completed and ready for operation on the eleventh of December, 1867. About two miles of mains have been laid, giving the town, what it so well deserves, a sense of security against the ravages of fire, which other towns may well envy.

A trial of the works for acceptance, was made on the eleventh of December. It was a most unfavorable time for the test. An unexampled drought had reduced the head of water from 8 feet, as stipulated by the Gouverneur authorities, to 3½ feet, less than one-half the height promised. The performance of

the works, notwithstanding this very material diminution of water power, is correctly set forth by one of the journals of the village, (*Gouverneur Times*, Dec. 12, 1867,) as follows:

GOUVERNEUR WATER WORKS.

"The Gouverneur Water Works Company have put in two of Holly's Patent Turbine Water Wheels, and three of his Rotary Pumps, which are now operating to the entire satisfaction of all. They were tested yesterday, under very unfavorable circumstances, the water in the river being lower than ever before known.

"Still they performed more than could have been expected considering the head—only 42 inches, and continually running down. They held a pressure of 65 lbs. to the square inch, as indicated by the steam guage, throwing through short elbows (another disadvantage, as the hose purchased by the Company did not arrive in time for the trial,) two one-inch streams to the height of 105 feet. The Company's guarantee is, to throw four one inch streams 80 feet high, with a head of 8 feet. That this machinery will perform all that its makers claim for it, there is not a shadow of doubt.

"Mr. W. G. Hamilton, the erecting engineer, was called upon to lay the river pipe, which operation, though not in his direct line, he performed in a skillful manner. It can now safely be said that the Gouverneur Water Works Company is in every respect a perfect success. There is also attached to these wheels and pumps, an improved regulator, which 'takes care' of them in the absence of the engineer or operator, regulating the speed of the wheels and the pressure of the pumps in as accurate a manner as possible, whether there is a large or small amount of water escaping the pipe.

"We would invite the people of our neighboring villages to examine these works, feeling confident that they will have no hesitation in pronouncing them the best protection against fires, and at the same time reducing their rates of insurance. They can also have a supply of ready running water in their dwellings and yards."

A further testimonial, as to the merits of these works, may be quoted from the *Rochester Democrat*, of January 27th, 1868. A correspondent of that paper, on his travels through the Northern part of the State, made a short stay in Gouverneur, and jots down the following paragraph:

"At Gouverneur we found the people rejoicing over some new Water Works, just introduced from Lockport. In this village of three thousand inhabitants, the running stream is made to force the water all through the streets, and supply the houses and to extinguish fires. The Lockport man was here who erected the works, which seem to possess great power. The machinery regulates itself. If the stream is running low, the enginery is so adjusted as to raise the gates and let in more water, so as to send a more powerful current through the town. If the pressure becomes greater than is needed, the same machinery quietly shuts the gate partly down again, and the pressure on the pipes is proportionately reduced. Why is not this much better than a fire engine for any village, where there is a stream of water sufficient to drive the necessary machinery?"

The pertinent inquiry of this unknown but sensible correspondent, is susceptible of but one answer, and that in the affirmative. He might with propriety have raised the same question even where steam power is required, for whether moved by water or steam power, the Holly Water Works are destined to become a conceded necessity for the safety and comfort of communities.

MINNEAPOLIS WATER WORKS.

The fourth set of works completed by the Holly Company, was for the city of Minneapolis, Minnesota. Repeatedly scathed by fires, that community, upon hearing by chance of the new and wonderful water works at Lockport and Auburn, wisely instituted inquiries. These inquiries resulted in sending a committee of intelligent and practical citizens to give these works a careful examination. That examination prompted a report, which resulted in giving that young, but prosperous and growing city, the credit of first planting these works upon the banks of the Mississippi river.

The Minneapolis Water Works are, in their arrangement, somewhat different from either Lockport or Auburn. The pumps, gearing, shafting, valves, and bearing of the wheel shafts, are mounted upon a heavy iron frame, making one compact and massive piece of mechanism. The regulator, pressure guage and telegraph, are in like manner placed upon a suitable frame work of iron. There are two of Holly's Turbine Water Wheels, of 72 inch diameter each, and of 150 horse power each, under a head of 16 feet.

The two pumps have a capacity to throw, for fire purposes, 2,500 gallons of water per minute, or at the rate of 3,600,000 gallons every 24 hours. The works, as placed and in operation, are equivalent to a reservoir of any desired height, from 20 feet to 500 feet high.

The year 1867 was so far advanced when the order for the construction of these works was given, that their final completion was carried into mid-winter of that rigorous climate, with thermometer running down to 40 degrees below zero for days in succession. In February following, in answer to inquiries addressed to them, the following report was made:

MINNEAPOLIS, *February* 12, 1868.

Holly Manufacturing Co., Lockport, N. Y.

DEAR SIRS:—Your esteemed favor of 7th instant, making inquiry as to working of our new pumps, is received.

Mr. Carlos Holly leaves here for home to-morrow morning, having completed the erection of the water wheels, pumping machinery, &c., furnished under your contract with this city.

We are persuaded that you have given us a superior set of machinery, and it is declared by those who have seen both, to be even more excellent than the effective apparatus erected by you for supplying water to the city of Auburn, New York.

The unusual severity of this present winter even here, where we prepare for extreme cold, has prevented our completion of the first division of city mains.

The early summer, however, will enable us to get all in good condition, when, we are convinced, we shall be able to considerably exceed the duty promised by you, for your pumps, in the contract with the city.

It gives us pleasure to add that the appearance of the machinery is not only substantial, but really handsome, and we think highly creditable to your establishment.

We hope, gentlemen, that the opportunity to test this machinery under the trial of a large conflagration, will be for a long time denied us.

We remain, respectfully yours,

DORELUS MORRISON,
Mayor.

S. H. KING,
City Engineer.

GEO. A. BRACKETT,
Chief Engineer.

The hope expressed by these gentlemen, that the city might long be denied the opportunity of testing the capacity of the works to suppress conflagrations, was not realized. In June following, a gang of incendiaries started five conflagrations, at different times in the month, as stated in the annexed communications—the first from the city Engineer, and the other from a prominent citizen of that city. It will be seen that Mr. Lee's summary of the aggregate saving of property foots up nearly one and a half millions of dollars.

[From S. H. King, City Engineer.]

B. HOLLY, Esq.

Dear Sir:—The occurrence of four fires in our city within the last month, and each getting well under way before being discovered, has demonstrated the efficiency of your rotary pumps and machinery to the satisfaction of all, and beyond the expectations of many.

In each case the fire has been LITERALLY DROWNED OUT, and thereby thousands of dollars in valuable property saved, *which could not have been done with any ordinary fire apparatus.*

Last Sunday morning a fire broke out in a large two-story frame boarding house on Helen street, and the entire upper story and roof were in flames before the hose companies got their hose attached and were ready for water: and in less than ten minutes from the time the first stream was thrown, the flames were extinguished, and the building now stands with the upper story and roof burnt off—a prominent advertisement of the Holly Water Works.

Very respectfully, yours,

S. H. KING, *City Engineer.*

Minneapolis, Minn., *July* 22, 1868.

[Extract from a Letter of W. H. Lee, Esq., of Minneapolis, dated July 22d, 1868.]

MR. B. HOLLY, *Holly Mfg. Co., Lockport.*

Dear Sir:—I desire to renew our acquaintance and report how matters stand since I saw you a year ago. You know we have had a great deal of trouble with our pipe distribution, and consequently, public opinion went heavily against the "Water Works." But times are changed. During the past few weeks we have had several fires, and in every instance the Water Works have saved many times their entire cost. One was in the rear of the "Union Block," and but for the bountiful supply of water the loss in buildings and contents would have been from $150,000 to $200,000. Next was the Cataract House, which stands close against a large lumber yard, with three more lumber yards and numerous buildings adjacent. The fire was under considerable headway between the weather boarding and lathing, from bottom to cornice, and bursting through the roof of this big four-story house. Being 3d July night and great noise, the alarm was not at first credited—so much the better for the fire; but when the hose companies arrived the whole thing was drowned out, and I was informed by some

present that water actually stood *knee deep on floors of some apartments* where doors were closed and but little escape under the door existed. Had the building got beyond control, these four lumber yards and the adjacent buildings, which would inevitably have gone, would make an aggregate loss of not less than $100,000. Next came a fire on First street, in the rear of the State Bank, Kelly's Block, Pettit's Block, etc., all splendid stone buildings, with boiler iron fire shutters on rear. The fire was so hot that the iron was red and the glass behind badly cracked, sash and frames blistered, before the hose companies got the water on; then they drowned out the whole thing. Without them the fire would, probably, have included State Bank, one end of the block, and Opera House, the other, all fine buildings, and gone on First street through to Utah. It would have made a loss of $300,000 at least. The fire was arrested, leaving tinder-like wooden structures half consumed. This occurred July 12. July 19, another fire, Helen street, near First, National Hotel, 3 o'clock in the morning. The whole garret story was destroyed of a large frame, two-story building, and all the rafters fallen and consumed; before firemen arrived fire was running up from the ground between sheathing and plastering and the case hopeless; three streams from adjacent hydrants "ruined that fire," in ten minutes after the first hydrant (with its two streams) was opened. This fire of the 19th, if once beyond control, would have destroyed, probably, $500,000, especially had the wind been fresh as it was then blowing. So you see you can point to Minneapolis with some satisfaction.

Yours, respectfully,

W. H. LEE.

[From the Minneapolis Tribune, July 24th, 1868.]

Another Fire—The Work of an Incendiary—Total Loss $14,000—Successful Operations of the Water Works.—For the fifth time within one month, we are called upon to record a fire—the work of an incendiary—this time on First street, and involving the loss of $14,000 worth of property. Thanks to the water works, and the efficiency of the hose companies that the loss was not $100,000 instead.

The fire was first discovered by pound master I.W. Love, a few moments before 2 o'clock yesterday morning. He was starting out upon his daily tour after estray cattle, at that hour, and in passing Rank's saloon noticed a flickering blaze in the yard in the rear of the building, and fearing the worst, made haste to reach the spot. He discovered that the fire had been kindled in a pile of rubbish, lying against the dividing fence between Rank's and Petran's lots, and but a few feet from their buildings. It was burning rapidly, and without attempting the futile task of extinguishing it, Mr. Love at once aroused the inmates of the buildings, and then rushed into the street to alarm the citizens. Ten or fifteen minutes elapsed before the alarm became general, and meanwhile the flames had communicated to the wooden structures, and were spreading with rapidity. Hundreds of citizens rushed to the scene, but too late to be of much assistance in removing goods and merchandise, for the fiery elements held full possession of Rank's, Petran's and Thompson's buildings, and unless water could be procured immediately, bade fair to destroy not only the wooden rows on First street, but to lay the north side of Bridge street in ashes. The heavy iron shutters on the rear windows of the stone building were becoming terribly heated, and as the fire spread towards Second street, windows were entirely unprotected, and would inevitably give an entrance to the flames so rapidly approaching. While the imminent peril of so much of the business portion of the city was nervously and anxiously discussed by the crowds who stood looking on, powerless to prevent it, the members of Hose Co. No. 1, without a carriage, and compelled to carry their hose, section by section, and couple it on the ground, were using their utmost exertions to get in working order, and at about ten minutes past two threw the first stream, followed in a few moments by a second, from the hydrant at the State National Bank. The many who had feared that the cement pipes would refuse to furnish a supply of water, breathed easier as these two splendid streams shot into the midst of the burning mass. A moment later the boys of Hose Co. No. 2 came up on a "dead run," attached

their hose to the hydrant at the Opera House, ran their carriage through an opening in the fence near Hedderly & Vroman's store, unreeled their entire length of hose and were playing upon the fire in the twinkling of an eye. Both companies stood up to the work unflinchingly, directing their streams to the point most requiring them, and literally deluging the localities towards which they were directed. It was evident, in a very few moments, that the conflagration had reached its limits, and the praise of the firemen and the water works were upon every lip.

Sympathizing with the sufferers, our citizens should thank the firemen for their prompt and indispensable aid in subduing the flames (remembering that without the water works they would have been powerless), and each one considered himself a special detective to bring to justice the rascally incendiary.

[From the Minneapolis Tribune of Nov. 5th, 1868.]

SATISFACTORY TRIAL OF THE WATER WORKS.—The weather yesterday was exceedingly unfavorable to the appointed trial of the water works. A very heavy gale was blowing, rendering it impossible to throw a stream any great distance, as the wind would break and scatter it. The fire department was fairly represented, and the "boys" were at the Cataract House promptly at 2½ o'clock. The trial opened by stretching a line of hose from the hydrant at the corner of Cataract street and Washington avenue, up Cataract street to Fourth, and up Fourth street to the Court House, (a distance of *seventeen hundred feet,*) and through a 1¼ inch nozzle, water was thrown "all over" the Court House. Firemen will fully appreciate the above work when informed that the Court House is 100 feet above, and about 3,000 feet distant from the pump house. The machinery was working at a pressure of one hundred and twenty pounds at the pump house, and the stream was a very steady and powerful one.

The Hook and Ladder boys were on hand with their truck, anticipating, we presume, that the Hose Companies, after getting a stream up, would be unable to get it down again without the assistance of hooks and ladders. In this they were disappointed, and their carriage was returned to its proper place.

The entire line of hydrants, from the Cataract House to High street, were then opened and tested by attaching hose. The pressure at the pump house was reduced to and kept at one hundred pounds, and most of the time there were four streams in the air. The mains and hydrants were found to be all right, and the pumps worked beautifully. The high wind prevented a test as to the distance a stream might be thrown, but otherwise the trial was all that could be desired. It was the intention of Chief Engineer Brackett, if the wind had subsided sufficiently, to have attached one line of hose to one of the hydrants up town, and ascertain what could be done with a pressure of one hundred and forty pounds.

MINNEAPOLIS, MINN., *January* 5, 1869.

Holly Mfg. Co., Lockport, N. Y.

GENTS:—The pump wheels and machinery manufactured and put up by you for this city, have been running about a year, and we are happy to state have in all respects met the fullest expectations of our citizens.

The system being comparatively new, was opposed by many as impracticable and too experimental to warrant its adoption for supplying our city with water, and protecting it against fire. But twelve months trial has convinced all that the system is the best in use—dispensing with expensive reservoirs, steam fire engines, &c.

Our pumps being kept always running, are ready for and equal to any emergency, and have saved our city from five imminent conflagrations which, without the water works, must have resulted in losses exceeding several times the cost of the entire works.

We remain, respectfully yours,

H. G. HARRISON, *Mayor.*
S. H. KING, *City Engineer.*

FURTHER AND DECISIVE TESTS AT MINNEAPOLIS.

While this pamphlet is being printed, the following accounts of two more fires come to hand just in time for insertion here:

[From the Minneapolis Tribune, May 15th, 1869.]

ANOTHER FIRE—SPLENDID SUCCESS OF THE WATER WORKS.—Last evening about half-past 6 o'clock a fire broke out in Hunt & Grimshaw's carriage manufactory, corner of Kansas street and Washington avenue. When first discovered it was seen issuing from the roof near the chimney, in the back part of the building. The firemen were promptly on the ground, and in less than ten minutes Mutual Hose Co. No. 2 had a stream on the fire, through about 1,000 feet of hose, from the hydrant at the Nicollet House. Minneapolis No. 1 were on hand in quick time from the Cataract House, and had a stream on the building from the hydrant at the Opera House just as soon as they could get hose enough to reach. Both companies labored under a disadvantage, as their carriages are not large enough to carry more than five or six hundred feet of hose. When Mutual No. 2 got fairly at work it was not twenty minutes before the flames were subdued and the buildings completely flooded. Every one seemed surprised at the force of the stream and the immense volume of water thrown, at so great a distance from the hydrants. It is but another proof of the great success of our water works. The damage by fire to the building was but slight, as only a small portion of the roof and the upper ceiling was burned. The damage to stock and material by breakage, and by interruption of business will perhaps amount to several hundred dollars, but it is probable the whole loss on building and stock will not exceed $600.

STILL ANOTHER FIRE—A DWELLING OWNED BY THE PACIFIC ROAD PARTIALLY BURNED—GREAT TRIUMPH FOR THE WATER WORKS—WATER THROWN THROUGH 2,000 FEET OF HOSE.—At about 10 o'clock last night the alarm of fire was again sounded. This time it came from a small story and half house, corner of Second and Nebraska streets, owned by the St. Paul & Pacific Railroad Company, which was undoubtedly the work of an incendiary, as the house has been unoccupied for some time. When first discovered the fire was burning in one of the lower rooms, between the plastering and the outside wall, and was rapidly extending up to the roof, and before the Hook & Ladder and Hose companies arrived the whole upper part of the house was in flames. The distance was so great that few expected the hose companies would attempt to reach the fire with their hose, but in a few minutes Minneapolis Company No. 1 came up on the double quick, having attached their hose to No. 2, which extended from the hydrant at the Opera House, on Kansas street, and a stream of water was soon thrown upon the fire. A section of the hose on Kansas street bursted, but it was immediately replaced and a powerful stream was continued until the fire was extinguished. This, like all the fires since we have had the water works, was completely flooded, before the building was half destroyed, and this, too, through 2,000 feet of hose. IT IS ANOTHER GRAND TRIUMPH FOR THE WATER WORKS. STEAM FIRE ENGINES ARE NOWHERE.

VERGENNES (Vt.) WATER WORKS.

The fifth set of the Holly Water Works was constructed for the city of Vergennes, Vermont, A sketch of the machinery is deemed unnecessary, since it conforms very generally to what has been already described. The Mayor and Water Commissioners, soon after they were put in operation, and tested in suppressing two formidable conflagrations, made the annexed report:

MAYOR'S OFFICE, VERGENNES, VT., *Jan.* 9, 1869.

Holly Manufacturing Company, Lockport, N. Y.

GENTLEMEN:—Owing to some delay in machinery, and to the completion of our pump-house, we were unable to make a favorable trial of the power of your

pumps from the highest point in our city, until Friday the 8th inst. At that trial we were not fully prepared to do all that the pumps are capable of performing in consequence of fixtures yet incomplete in and about our pump-house, and bulkhead and flume, which defect we cannot remedy until spring. We however, threw two streams with one of the pumps, at least 100 feet above our highest points, and at an elevation of 119 feet above the pumps. We have had a practical test of the work, and of their efficiency in their incomplete state, which I have no doubt you will feel an interest in knowing. On the 30th day of December, Messrs. Hays, Filardo & Parker's Lumber Drying House took fire—in the house at the time was some 10,000 feet of lumber. We attached our hose to the nearest hydrant, and carried our pipes to the two openings in the dry house, and in the course of half an hour we had literally drowned the fire out. An examination of the lumber after being taken out, shows that every piece had been on fire. The owners say that from half to two-thirds can be used by dressing. On Tuesday at half-past two o'clock in the morning of the 5th inst., we were aroused by our fire alarm. The fire proved to be in the extensive Tannery of C. D. Keeler, Esq. The fire had gained great headway before it was discovered, and the entire engine house in the interior was in flames, and the fire had got into the main finishing room, a very large room on the second floor, in which was a large amount of leather in various stages of finishing, together with large quantities of oil, tallow, &c., making the material of the most combustible kind. Before we could get our hose properly attached, the fire had completely filled this room, and was fast getting to the story above. We began to play on the fire with two streams, from 1¼ and 1¾ inch nozzles; in the course of an hour we had the fire subdued, so much so that when we were able to get into the rear of the finishing room, whole pails of water could be taken from the floor. Mr. Keeler's loss is large, some six or eight thousand dollars. Had we not had abundance of water his loss would not have been less than twenty-five or thirty thousand dollars. Directly north and opposite, across the street, about six rods, is situated the largest manufacturing establishment in the city. Had we not been able to put out the fire in the Tannery, we can see no way in which we could have stopped the fire short of the loss of all the buildings on the north side of the Falls, the entire value of which could not have fallen below seventy-five or one hundred thousand dollars. Our citizens are generally satisfied with the performance of the water works, so far as the above tests indicate their efficiency.

Very respectfully, your obedient servant,

JOHN E. ROBERTS,
Mayor City of Vergennes.

C. T. Stevens,
E. C. Everest,
S. P. Hopkins,
Chas. D. Keeler,
} *Water Committee.*

The sixth set of machinery constructed and put in operation, was for the city of Ogdensburgh, N. Y. A brief sketch of the works and their satisfactory performance is copied below from one of the daily newspapers of that city;

From the Ogdensburgh Journal of January 26th, 1867.

OGDENSBURGH WATER WORKS.

"A year ago, from frequent destructive fires, the attention of the citizens of Ogdensburgh was directed to the immediate necessity of water works, which would afford means of defence against the ravages of the devouring element, as well as a supply of water for domestic purposes. A public meeting was called,

and the municipal authorities instructed to make investigations as to the best means of furnishing the supply, and also to obtain the necessary legislation to enable them to raise the money needed to erect the works. The city authorities caused surveys and estimates of the probable expense of works on the plan of a reservoir on Limekiln Hill, a point of 94 feet elevation to be made.

"At the same time, they summoned hither Messrs. Flagler and Holly, of the Holly Manufacturing Company, who explained the new system of water works just being brought into use. These gentlemen met a public meeting, and their statements resulted in the appointment of a committee of inquiry, or water commissioners, who visited Auburn and inspected the Holly Water Works of that city. They came back enthusiastic, and recommended the adoption of the Holly system, which consists of force pumps, driven by water wheels, thus keeping the pipes filled at any desired pressure to the square inch. Their estimate was that $100,000 would be required to purchase pipe, erect building, procure machinery, and dig seven miles of trenches, and set everything in working order.

"On the 7th of July, the tax-payers were called upon to vote upon the proposition to erect water works upon this plan, and it was accepted. Work was commenced at once. The vacant lot at the east end of the dam was selected for the erection of the water works building, and on the 7th of November, just four months from the day of election, the water was running through the pipes.

"The contract with the Holly Company was for three force pumps, driven by three water wheels. The special points of the Holly contract are that either two of their pumps shall be sufficient, when water is applied to two of the wheels under six feet head to force two million gallons of water in twenty-four hours through various parts of the city, and that the pumps shall throw at an elevation of sixty feet above the pumps as follows: Under ten feet head, eight one inch streams eighty feet high; under eight feet head, six one inch streams eighty feet high; under six feet head, five one inch streams eighty feet high; and under four feet head, three one inch streams eighty feet high.

"On Thursday, the President and Secretary of the Holly Company came on to have a trial of the machinery. It was proposed to test one wheel and one pump at a time, with one, two and three streams. The hydrants brought into use were those at the corner of Fayette and Pickering streets; at the junction of Pickering and Water; and at the corner of Green and Water streets, the extremes being about quarter of a mile apart. All three of the pumps were tested with single wheels. Upon the first test, two streams were elevated 106½ feet from the ground, 45 feet above the river; second test, three streams 102 feet high: third test two streams 112 feet. After this, 350 feet of hose were attached to the Green street hydrant, and a 1¼ inch stream elevated 96 feet. The height was taken by T. B. Tate, civil engineer. It is proper to say that Mr. Flagler, of the Holly Company, preferred to have the test demanded by the contract, but as the water pipe company's agent was unwilling to have all the pipes subjected to 100 lbs. pressure to the square inch, it was impossible to do so.

"The trial on Thursday was satisfactory to all who witnessed it, and to those who had taken the trouble to post themselves in relation to the machinery, most interesting.

"Nobody expresses a doubt from what they have seen, that the machinery will do all that is guaranteed, and more too. The great improvement of the Holly system over the old reservoir system, is that it affords full protection against, or means to fight fire in the whole district traversed by the water pipes. Every hydrant has the capacity of a steam fire engine, and the power is ready to act almost instantly. All of the machinery is governed by an automaton regulator and alarm, whose performance is wonderful. This regulator may be set to any required pressure of water in the pipes. For ordinary service, 25 pounds is sufficient, and the automaton is set at that point. One wheel at a low rate of speed will furnish this pressure. In times of fires, 100 pounds may be needed. In the dead hour of the night a fire may occur. A hydrant is opened near the fire, perhaps a mile away. This open hydrant relieves the pressure, or instantly lets it down five, ten or twenty pounds, as the case may be. The pressure guage of the automaton drops, and throws off a guard and a bell in the Superintendent's room rings violently. This signals fire or trouble. The

Superintendent springs to the automaton and sets it to 100 pounds. The automaton hoists the gates to let on the required pressure. If additional hydrants are open, the automaton raises the gates higher, if one is shut, the automaton lowers the gate. And thus the firemen unconsciously act through the hydrants on the regulator, and the regulator on the wheels. All in all, it is the most complete and wonderful contrivance for fighting fires ever invented. The total cost of the machinery and hydrants, purchased of the Holly Company, and expenses of setting up, is about $19,000. It will probably furnish all the water we shall ever demand.

"The Holly works are located at Lockport. It is only three or four years since the system was introduced. The success obtained is attracting attention everywhere water works are demanded. We think they are destined to supercede all other systems."

Certificate of Mayor Brown.

The Mayor of Ogdensburgh, Hon. W. C. BROWN, volunteered the following letter, expressing in strong terms, as will be seen, his favorable opinion of the works:

CITY OF OGDENSBURGH, N. Y.,
MAYOR'S OFFICE, *January* 28, 1869.

Hon. T. T. Flagler, President Holly Mfg. Co., Lockport, N. Y.

DEAR SIR:—We have fortunately had no occasion to test your Water Works machinery in extinguishing any conflagration, but the experimental tests made demonstrate that no fire within reach of hose from hydrants can make much progress, if hose companies do their duty. WE SHALL HAVE NO USE FOR OUR STEAM FIRE ENGINES.

I regret that the Water Pipe Company would not permit eight streams to be thrown in different parts of the city, that we might have now the precise test called for by the contract. But most of their pipe is new, and the joints so lately made, that the cement has not had time to become well set and hardened, and it is probably best for all parties not to put on the pressure too soon. In the experiment made Thursday with the half mile of pipe, which the pipe company permitted to be used under 100 pounds pressure, each of your three pumps threw in succession three powerful fire streams 102 to 106 feet high—demonstrating to my satisfaction that when we run the three pumps they will throw much more than the eight streams you contracted to give us. We have now better provision for applying water to extinguish fires than any city in the State which has not adopted your system, and I believe your works here will eventually prove to be a great improvement, even upon those at Auburn and Lockport.

Yours truly,

W. C. BROWN, *Mayor.*

In his annual message to the Common Council, January 1, 1869, Mayor Brown has the following recommendation in regard to selling the fire engines on hand. The Council subsequently ordered the sale of the hand engines, and will undoubtedly at an early day direct the sale of the two steam fire engines:

"The attention of the citizens is called to the necessity of organizing more hose companies. The city owns three excellent hand fire engines, which will never be used here, and should be sold, and the proceeds invested in hose and hose carts. One of our steam fire engines may also be spared for the same purpose during the coming year; for when the pipes become thoroughly hardened to bear the strain for which they are guaranteed, each double hydrant will be the equivalent of a steam fire engine, located at the same point, fired up and fully supplied with water and fuel. The opening of a hydrant in any part of the city is signalled instantaneously at the works by a diminution of pressure in the cylinder of the regulator, changing its action so that it opens wider the gate to the water wheel, until the increased power applied to the pump restores and maintains the pressure. If one water wheel, when fully open, does not supply the draft, the regulator opens the gate to another water wheel and sets another pump in operation. As the hydrants are closed the regulator closes the gates, and reduces the action of the pumps to correspond with the diminished drain from the pipes. All this is done automatically and requires no attention."

On the 14th of April following, there was occasion to test the Works in suppressing fires. We quote from the *Journal*, of April 16th, the account of its occurrence and its prompt suppression:

From the Ogdensburgh Journal, April 16th, 1869.

FIRE SATURDAY NIGHT.—A fire occurred in the frame dwelling occupied by James McCarthy, three doors south of the Baptist church, at eleven o'clock, on Saturday night. Some little time elapsed before the alarm became general, but Hose company No. 3 came promptly to the work and in *less than one minute after arrival at the hydrant, corner of State and Montgomery streets, had a stream playing upon the fire, which was extinguished in a few minutes.* The fire had got well under way when the Hose company arrived.

In this instance the full benefit of the Water Works was exhibited, for without them, one or two buildings must have been destroyed. The stream of water thrown was one of the very best we have ever seen. The alarm indicator at the Water Works house responded at the first opening of the hydrant, and ran up the pressure to the required amount instantaneously. Everybody praised the Water Works. They proved all that could be desired on this occasion.

In this account three things are eminently worthy of notice: 1st. That upon opening a hydrant the Regulator connected with the machinery *instantly* run the pressure up to the point for throwing effective fire streams. 2d. That in less than a minute after arrival of Hose company at the hydrant a powerful fire stream was brought to bear upon the fire; and 3d, and, as a necessary consequence, that the fire was extinguished in a few minutes!!

As was very natural after such a demonstration that Ogdensburgh had secured in the Holly Water Works the means of protecting that city from the extensive conflagrations, incident to such methods as hand and steam fire engines, the citizens made a call upon the Underwriters for a reduction of insurance rates. The Ogdensburgh *Journal* thus records the results:

WATER WORKS AND INSURANCE.—On Wednesday a water exhibition was made for the purpose of showing to the agents of the Fire Insurance Companies doing business here, our facilities for putting out and preventing fires. The three Hose Companies were out with their apparatus. The exhibition commenced at the Johnson House liberty pole and was continued along the Ford street hydrants to the Bridge. Everything worked in the most satisfactory manner. At the trial near the corner of Ford and Catharine streets three streams were handsomely thrown over the top of the hickory pole. We understand that the Insurance Agents were satisfied that our means of protection against the ravages of fire are as complete as can be, and the rates of insurance will be materially lessened.

BINGHAMTON WATER WORKS.

Thus far the works constructed and put in operation were propelled by water power. In the fall of 1867 the authorities of the city of Binghamton, after examination, by committee, of the Auburn Works, entered into contract with the Holly Company for a set of machinery to be propelled by steam, for water

supply and fire protection of that beautiful and fast growing city. It comprises duplicate boilers, one piston and one rotary engine, two rotary pumps, each with maximum capacity to furnish 2,000,000 gallons of water daily—the indispensable Regulator, a view of which may be had on pamphlet cover—together with boiler feed pump, valves, gearing, shafting, &c., &c., in order to make a complete and effective set of Water Works. The Holly Company also guaranteed that said machinery should be competent to throw six powerful fire streams. This machinery—the first of its kind—was manufactured, set up in its place, and ready for service, early in December of 1868. The first demonstration of the value of the Works in suppressing fires was not long delayed. It occurred on Christmas day, in a cabinet shop, full of combustibles, and threatened for a short time to destroy many buildings. The alarm was sounded, says the Binghamton *Republican*, "and the firemen, along with a great crowd of citizens were promptly on the ground. Lawyer Hose Company attached their hose to a hydrant near by, and succeeded in staying the flames and saving the residence of Mr. Harding, situated a few feet from his barn. This is the first time the water supply by the water works has been brought into use, and but for its convenience the residence of Mr. Harding would have been entirely destroyed. The success of the works was so complete, that the firemen are delighted with having in the future, a sure reliance. It is a great satisfaction to all to know that we are now provided with water, not only for culinary but fire purposes. Already have we reaped one benefit from it."

The second fire and the indispensable service rendered by the Water Works, is thus described by the Binghamton *Republican*, in its issue of January 8th, 1869:

Destructive Fire—Corbett & Owen's Planing Mill Burned.—About two o'clock this morning, a fire was discovered in the upper story of Corbett & Owen's planing mill, situated on the bank of the canal, touching on Hawley street, by Mr. Standley, who, at the time, was running the saw mill attached to the planing mill. Standley immediately placed a weight upon the steam whistle, which caused an alarm, while he ran to Firemen's Hall and rang the alarm. The mill, which was an old frame structure, burned rapidly, and by the time the fire companies got on the ground the upper story was completely enveloped by the flames. The hose companies in a short time attached their hose to hydrants in the vicinity, and had three streams playing upon the fire before any of the engines got into position to work. In course of time the engines were put into use, and between them and the hydrants; as many as five or six streams were brought to bear, and in about two hours the fire was subdued; having burned the upper story only, but so far damaging the building that it will have to be removed. But for the fact that the fire caught in the upper story and had to burn downwards, and the aid rendered by the Water Works, not only the planing mill entire, but several other buildings would have been destroyed. The mill was a rickety old frame, as dry as powder, and filled with shavings. Within a few years, it has been several times on fire, either from accident or otherwise, but the fire was extinguished without damage. The machinery—consisting of lathes, etc.,—in the upper story was destroyed; that in the lower story, as well as the saw mill machinery, was not injured. Property holders in the vicinity had good reason to be thankful for the water works. Had it not been for the supply from the hydrants, much valuable property would doubtless have been destroyed.

The third visitation by fire occurred early in March. It broke out in the frame building occupied as a grocery and produce store of J. W. Sullivan, which was enveloped in flames before the alarm was given. The Binghampton *Democrat* of next day says:

"In a very short time the firemen arrived, and attaching the hose to hydrants, let on the water, but the flames had made such headway that the grocery building and its contents were destroyed, and the dwelling damaged to such an extent that it will require a complete rebuilding. It has been feared by a great many citizens that at remote distances from the wells of the Water Works, sufficient force could not be put upon the water to drive it through the pipes at a fire. It was clearly demonstrated last night that the distance did not make any difference with the force and volume. Two splendid streams were put upon the flames, which soon died down. IT WAS REMARKED LAST NIGHT, THAT BINGHAMTON WOULD NOT SELL HER RIGHT TO THESE WORKS FOR A MILLION DOLLARS, and she would not."

From the Binghamton Republican, Jan 9th, 1868.

The New Water Works of Binghamton.—The Water Works of this city, now fairly in operation, are successful beyond question. Thirteen or fourteen miles of street "mains," with much pipe leading from these to dwelling houses, shops, manufactories, etc., and all of iron lined with cement, bear a pressure which is equal at the wells to thirty pounds to the square inch. The pipe has a capacity three or four times greater; yet this is found quite sufficient for the ordinary water supply of the city. There is a reserve power of the engines, by which an immense volume of water can be sent hither whenever it may be needed. By far the most interesting result of the experiment—it must be so regarded, notwithstanding the fact that the Board of Water Commissioners and the Superintendent believed there was no chance of failure—is, that the supply of water from the great wells is ample, if not positively inexhaustible. They are not only novel, but in a sense exceedingly curious, and by the mode of their employment are entitled to rank among the wonders of art and nature. There are two of them; they measure about eighty feet in circumference; their depth is twenty feet, or a little more: and they are connected by a "cut" running parallel with the Susquehanna river, near which they are situated. Their depth below the water line of the river, when it is lowest, is about eight feet. From this, the plan will be apparent. The wells are fed by the river. The earth intervening, through which the water passes, is not far from a hundred feet in extent, and is composed mainly of pebbles and gravel. It forms a magnificent filter; and by means of it the city, with its fifteen thousand inhabitants, is supplied with clear, soft water, more thoroughly cleansed than though it were passed through fifteen thousand or any other number of separate and particular filters, for the use of each individual of our population.

The plan of the water works of Binghamton is new in still other respects. Having no reservoir, and needing none, the city is supplied by admirably constructed pumping apparatus, that takes the water directly from the wells and sends it into the pipes. In two or three cities of the State—Auburn and Lockport—this process of pumping is employed, but water power is used, we believe. Here, steam power is most available; and the Holly works have applied it with conceded success.

While we are upon this subject we must congratulate our citizens, not only upon having the conveniences described, but particularly that they are not as the people of so many cities are, drinkers of water they know not of. The people of Boston, whose pride of possession is only equalled by their admiration of what they possess, have an unpleasant habit of insisting that the Boston water is the best in the world. But it is only the contents of the Cochituate, that may be as excellent as the Susquehanna water *unfiltered*. New Yorkers like the Croton; but it is river water, for all that, and sometimes it is exceedingly impure. If it were a highly interesting subject of inquiry, we should describe the defunct existences that are sometimes found in the head-waters of the Croton. The Ridgewood water of Brooklyn is collected in ditches from the marshes of Long Island, and thence pumped into a reservoir; and the Jersey suburbs of New York are supplied by the Passaic river, and streams from meadows that are about as prolific of insects—notably of mosquitoes, etc.,—as of water. The people of the West drink river water, for the most part; and when they can take their supplies from the lakes they do it without misgivings or scrutiny, and with very demonstrative rejoicings. We hope our people will appreciate the filtered water. They are favored above ordinary mortals.

From the Owego Times, Feb. 18th, 1869.

BINGHAMTON WATER WORKS.—On Tuesday, Feb. 9th, in company with F. L. Jones, President of this village, F. K. Hull, Trustee of the First Ward, John J. Hooker, Trustee of the Third Ward, and Mr. E. O. Goodrich, editor of the *Bradford Reporter*, and the corporation officers of Towanda, we visited Binghamton. We found the citizens generally in a very exalted state of sublime satisfaction. Their water works are a grand success. The water is the very best. The supply unlimited and the power exceeding that of any steam fire engine. The hydrants are plentifully distributed through the city. The lines of main pipes exceed thirteen miles. Almost all the hydrants are double, to each two lines of hose can be attached. The Superintendent of the Works gave us a trial specimen of what the works could do. About one hundred feet of hose was attached to each of four hydrants extending along the main street of the city, and at the word, the water was let on, and we have never seen finer streams. They rose clear and solid thirty feet over the highest buildings. But the most convincing proof of their inundating power was seen in a planing mill and sash and blind factory, which had caught fire at almost one o'clock at night, some few weeks ago. The fire department turned out, but the Holly Water Works with the hose literally flooded the building and saved it all but the roof and some of the lighter boards of the building, although it was full of shavings and as inflammable as could be. The building as it now stands is the best proof of the power of the works. After having seen the effects we visited the works. They are located about one mile from the Exchange Hotel, on the banks of the Susquehanna river. The steam engine is the most beautiful piece of workmanship we have seen. It is so constructed that the opening of a single hydrant moves a lever and springs an ear-splitting whistle, at the same movement a rapid increase in the motion of the machinery takes place, and by the motion of a single lever additional pumps can be set in operation, sufficient to supply all the hydrants in the city. The Holly Water Works in Binghamton are a grand success. We heard an ex-Chief Engineer of the Fire Department say, "These works have taken all the fun out of the fire department," and it is true. Hose companies are needed, but engines and engine companies are useless.

From the Binghamton Republican, May 5th, 1869.

THE WATER WORKS—TEST OF THE WATER WORKS YESTERDAY—INTERESTING EXPERIMENTS—ENTIRE SUCCESS OF THE MACHINERY.—Yesterday a trial and official inspection was made of the Water Works, to determine whether they answered the specifications of contracts made between the city and the Holly Manufacturing Company of Lockport, which furnished the engines and pumps, and the American Water and Gas Pipe Company, which furnished the pipes. The trial began at two o'clock, when the steam was run up to 60 pounds, and both engines at the reservoir wells were attached to the pumps. Six hydrants were opened —one on the corner of Court and Carroll streets; one on the corner of Court and Exchange streets; one on Collier street, in front of Firemen's Hall; one on the corner of Court and Washington streets; one on the corner of Court and Water streets, and the sixth on the corner of Front and Main streets. Owing to a hard west wind that blew all the afternoon, the length of the streams was greatly interfered with, and at a height of about one hundred feet the columns were broken and scattered. On the corner of Court and Washington streets, however, where the force of the wind was broken by high buildings, a stream was thrown some distance over the top of Bennett's Block, and about one hundred and thirty feet from the pavement. About fifty feet of hose was used at each hydrant, which added to the friction and strain on the machinery. About 3½ o'clock 90 pounds of pressure to the square inch, (the contract test) was put on the pipes, and the steam shut off the rotary engine, leaving the piston engine to run the machinery with the 90 pounds pressure, and the six hydrants open. This it did nicely, and no jar or considerable friction was perceptible in any of the machinery. The Water Commissioners and officers of the Holly Manufacturing Company were at the engine house most of the time, and also a number of prominent citizens of Binghamton, who were delighted with the perfect working of the machinery.

The following table shows the size and length of pipes laid, and the price charged for it:

6,130½	feet of	12	inch pipe at	$2 05	per foot.
4,035	"	8	"	1 45	"
19,622	"	6	"	1 05	"
41,443	"	4	"	80	"

In connection with the pipes are 80 hydrants, 16 double and 64 single, and also 79 section gates of the following sizes: Four 12 inch, three 8 inch, twenty-one 6 inch, and fifty-one 4 inch.

The wells were dug under contract by Peter H. Ter Hune, Esq., of this city, for $4,900, and do credit to all parties concerned. There are two wells, 25 feet in diameter, and 22 feet deep, with a connecting channel, over which the works are erected. The wells and channel are surrounded by substantial walls of large stones laid in cement above the water line, and nicely pointed and finished inside, and faced outside. The walls are two feet in thickness at the bottom of the well, and one foot and a half at the top. This wall excludes all surface water, and nothing runs into the well except what comes through the natural filter in the bottom, which is as pure as where—

"Rubied nectar flows in pearl, in diamond, and in massy gold."

The state of the weather and condition of the river has no effect on the water in the wells, and the supply is inexhaustible. During the trial yesterday the water was lowered about two feet in two hours, but after that the pumps made but very little impression on the wells, although a large volume of water was being constantly forced out for two hours longer.

The cost of the whole works, including the beautiful and substantial buildings, over the wells and machinery, is only about $125,000. The advantages are inestimable. Among the advantages may be enumerated a continuous supply of pure, wholesome and pleasant water for family use, which insures the health, comfort and cleanliness of the city; cheap insurance; security against fires; ornamentation and attraction; convenience for manufacturing and washing; and the consequent increase in the value of property. Like all judicious and necessary public improvements, the water works are worth several times their cost, and people would not now be deprived of them for any amount of money.

The superiority of the Holly system over reservoirs is great. It costs less to pump the water through the pipes, than it would to pump it up into a reservoir. The water comes pure out of the gravel bottom wells, and is received as pure by consumers, there being no possible way for impurities to get in. Then the water is always cold, clear and pleasant, which, with the reservoirs, is seldom the case.

Last evening a meeting of the Water Commissioners was held at the office of Wm. P. Pope, to confer with Hon. T. T. Flagler, President of the Holly Manufacturing Company, and Chas. Keep, Secretary, at which their machinery was formally accepted, and the unpaid balance liquidated.

The fine display that was made during the test, attracted the attention of all our people. The heavy streams thrown into the air by immense pressure, reached the tops of the buildings in the business parts of the city, but no farther; though the power applied was sufficient to carry them to twice that height. At a point opposite the roofs, where the wind in unbroken force met the columns of water, these were deflected and carried away, in masses of vapor. It was in appearance like the explosion of a rocket. The phenomenon was exceedingly curious.

The power applied to the water—ninety pounds to the square inch—will scarcely be appreciated by persons accustomed only to the pressure obtained by the use of hand engines, or of ordinary steam fire engines. The streams turned upon the ground, plowed the earth into deep ruts; and a heavy barrel placed before one of the streams was instantly carried a hundred feet. Our readers will remember an escapade of ex-Mayor Rice, who at a former test of the Works, unluckily placed himself under one of the streams. He was bent forward, his head and body inclining in the direction the stream took. It was unfortunate for his official and personal dignity. He was raised up, and for a moment was suspended in the air, like the marble that dances over a common fountain. When he recovered control of himself, he lay sprawling several feet from the place where he had begun his ludicrous ride on the water. The excellence of

our Water Works system has several times been proved. Fires have been extinguished without aid of the fire engine companies; and the advantage of a graduated pressure, always to be relied on, is too obvious to need more than a reference to the fact. In respect to the sanitary interests of the community, the plan that has been adopted is far superior to the old reservoir system. The water, taken from the reservoir wells, that are fed from the Susquehanna river through the filter of its bank, is as pure as the finest spring water. The possibility of obtaining such water, for any city which has a river, or a lake near it, seems to be demonstrated. This is really the most important and far the most interesting feature of the achievement, which our citizens having charge of the construction of the Water Works, are entitled to the credit of.

During all the winter, when water was scarce, the reservoir wells yielded bountifully; the test of the snow and the frost was borne with entire success. This spring the floods came. These were the only remaining cause of doubt. The rivers rose to an unusual height; and the Susquehanna, only a few rods distant from the wells, was filled to within five feet of the tops of the wells with water almost as muddy and impure as that which ran in the gutters. But while the reservoirs also filled as rapidly as the river rose, (showing conclusively the main source of supply(, there was not otherwise even the slightest indication of the rushing, swelling, turbid tide at their very base. We regard this as far the best evidence yet furnished, not only that the fountain is inexhaustible, but that the purity of the water will be maintained. The fact that the water in the reservoirs rises and falls with the river, which led us in the beginning, when so many doubted, to declare beforehand the complete success of the Commissioners' plan, in this particular, we now commend to the public as absolute proof that the water supply can never fail while the Susquehanna exists. The supply can be increased almost without limit by extension of the reservoirs.

The engines and machinery are working finely. Less than two thousand pounds of coal is used in each twenty-four hours; and at a pressure of thirty pounds, the water is forced to the fourth floors of the "Chenango Block," the most elevated in the city. Thus the upper portions of our highest buildings, within reach of the main water pipes are available for family use; and it is estimated that the value of such buildings is enhanced at least ten per cent. We think the figure should be greater.

We understand from the Superintendent that the number of water-takers has now reached 270, and the number is being increased as fast as the plumbers in the city can put in the service pipes. One day last week twenty-six permits were issued. The Superintendent thinks the revenue from the buildings already supplied with water would now reach four thousand dollars.

The Water Works of our city must be admitted superior, when all their excellencies are considered, to any other on the continent.

CITY OF BINGHAMTON, *April* 28, 1869.

We consider the mode of forcing water directly into main water pipes on the plan of the Holly Manufacturing Company, of Lockport, N. Y., for domestic use, or protection against fires, superior to reservoirs, or *any other known plan*. So far, it has exceeded the highest expectation of our citizens in economy and in cases of emergency. While we may deem it proper to retain for the present, at least, our fire department apparatus, the steamer or hand engines have seldom been brought in requisition at fires, since the establishment of the Water Works in our city.

If there ever was, really, any fears of the practicability of either the machinery or pipes, they have, we think, entirely subsided, as the works have been in successful operation since December last, and service pipe, for domestic purposes as well as for manufacturing, are being put in as fast as four plumbing establishments can do the work.

Signed,

JOB N. CONGTON,
Mayor City of Binghamton.
E. R. CAMPBELL,
Chief Engineer Fire Department.
T. A. SEDGWICK,
Superintendent Water Works.

PEORIA (Ill.) WATER WORKS.

The city of Peoria, a town of 30,000 inhabitants, has for years been considering the question of securing a supply of water. The method proposed was by the construction of a reservoir. To this end, an engineer was employed, surveys made, plans drawn and estimates furnished, showing an aggregate cost of works on this plan to be $340,000. This estimate did not include the cost of ground for reservoir and pumping works, or of grounds to be taken under appraisal in building the works, which would doubtless carried the total cost up to fully $350,000. At this juncture the attention of the committee having the subject in charge, was called to the Holly system, and they deemed it best to examine into its merits. "For this purpose," says the committee in their report subsequently, "they visited Lockport and Auburn, N. Y. It is proper to say that your committee had objections to the system until they had examined into its merits." The committee proceed to make statements of what they saw and heard at Lockport and Auburn, and as the result of it, say:

"From all the information and experience your committee have been able to obtain, they are unanimously of the opinion that it will be well for the city to adopt the Holly plan. By doing away with a reservoir and the necessary force main, we can save about $100,000 in expense. The reservoir system will not, in the opinion of your committee, furnish water for the extinction of fires without the medium of fire engines. They have learned this from the experience of Cleveland, Pittsburg, Buffalo and Syracuse. At Pittsburg, the reservoir is 240 feet above the hydrant near the work of the National Pipe Company. Your committee tested the pressure at that hydrant, and it was less than 25 pounds to the square inch. At Syracuse, the reservoir is over 200 feet above low water. At Cleveland, the reservoir is 158 feet above the water of the lake, and the pressure at the lowest hydrants is 70 pounds, and 40 pounds at the highest. With a reservoir located at the McGinnity place, 216 feet above low water mark in the Illinois, there will be but 60 pounds pressure at the Court House when there is no drawing of water for family purposes in the city. This, it will be seen, will not be of service in cases of fire, except for supplying fire engines. In submitting the proposition of the Holly Manufacturing Company, we call attention to the following: They propose to contract for works which they guarantee to perform certain service. This service is the supply of a certain amount of water to our citizens for culinary purposes. In addition to this, they propose to furnish a fire supply of eight one-inch streams, one hundred feet high each, under the bluff, and three one-inch streams over any building on the bluff. This is definite and guaranteed. The guaranty of the company is thoroughly good."

In conclusion, your committee submit the following resolution and recommend its adoption by the Board.

JOHN. H. FRANCIS,
E. EMERY,
S. A. KINSEY,
LARKIN B. DAY,
} Committee.

PEORIA, *May* 25, 1868.

Resolved, That the water works committee be authorized to contract with the Holly Manufacturing Company, of Lockport, N. Y., for the necessary engines, pumps, and other machinery for the application of that company's system of water works to Peoria, under the terms of their proposition, herewith submitted, at a cost not to exceed the sum of $40,000.

The recommendation of the Committee was adopted by the Common Council, and on the 30th of July a contract entered with the Holly Company for the construction of the works. By the terms of this contract the Holly Company agree that the machinery furnished shall be competent to supply 3,500,000 gal-

lons per day for domestic use, and to throw through and directly from hydrants eight 1-inch streams, 100 feet high, at the same time, and at one and three-quarters mile distant from the pumps. They also guarantee to throw three 1-inch streams at a point upon the Bluffs, two miles distant, and at an altitude 209 feet above the pumps, from hydrants, over any of the buildings located upon said Bluffs. Under this contract the machinery has been manufactured, forwarded to its destination, and will be set up and ready for service early in June, 1869. It is expected that favorable results of tests in fulfilling guarantees will be reported in time for insertion in a portion of this edition of pamphlet.

Meanwhile, it is noticeable that the committee who commenced their investigation of the Holly plan with prepossessions in favor of the Reservoir system, found by actual comparison a saving in first cost of not less than $100,000, by substituting the Holly Water Works. It will be observed, also, that although Peoria has a site for a reservoir 216 feet high, the committee ascertained by examination in Pittsburgh and other cities, that this elevation would not give reliable head or pressure for daily supply, and would only be useful in supplying fire engines with water in case of fire. This irregularity results from loss of power by friction, and the irregular and at times excessive draughts of water from the street mains. It was not surprising, therefore, that the committee should yield their objections against Holly's plan which, unlike the Reservoir head which is fixed, supplies pressure according to varying requirements, whether it be for daily supply of water, or the sudden and urgent calls for fire suppression, and that without any auxiliary aid of fire engines.

BATAVIA, N. Y.

The ninth set of works constructed by the Holly Company was for the beautiful village of Batavia. It has a population of about 3,000—is probably the wealthiest village of its size in the State—and could well afford to protect the property within its borders from destruction by fire. The works for Batavia are to be propelled by steam, and are guaranteed to throw from hydrants four streams at a time, 100 feet high. The works are primarily for fire purposes, but will be used especially in the summer for sprinkling the streets and watering the lawns connected with the many beautiful residences of that village. The machinery is finished and awaits shipment when the building in process of erection for it is complete. A view of this machinery—so far as it can be shown in one view—as set up in the manufactory, may be seen on the cover of this pamphlet. There are very many other villages which would find this set of machinery admirably adapted to their wants for fire protection and water supply.

CANTON, OHIO.

This thriving manufacturing town, with a population of about 10,000 was the tenth in order to call for the Holly Water Works. The works are to be propelled by water, are in style and capacity like the Minneapolis works, and combine fire protection and water supply. Good progress has been made in manufacturing the machinery, and its completion will be consummated at the earliest possible day.

KALAMAZOO, MICH.

The eleventh contract for Water Works was made with the corporation of Kalamazoo, a few days before this pamphlet goes to press. The works are very nearly a duplicate of that for Batavia. Kalamazoo has the reputation of being the most beautiful village in the State of Michigan, and no higher proof of her intelligence and enterprise need be given than her being the first community in that State to appreciate the merits and avail herself of the advantages of the Holly plan of water supply and fire protection.

THE HOLLY SYSTEM.

It will be seen that Mr. Holly's plan is to place one or more of his powerful Elliptical Rotary Pumps within a frost-proof and fire-proof building. He propels them either by water or steam power. These patent pumps are connected with water pipes of suitable size, laid at a depth which secures them against frost, and running through the streets of the town to be protected against fire, or supplied with water. Hydrants are set at proper intervals—*each hydrant being equivalent to a fire engine, and also a water reservoir*—and branch pipes laid as required for the supply of dwelling houses, fountains, sprinkling streets and lawns, or for any other purpose. In addition—as a crowning feature and excellence—it embraces a set of Pressure Guages, Registers, Safety Valves and Water Telegraph, which, by their practical operations, secure an uniform flow of water through all the pipes, notwithstanding the fluctuations in the amount of water drawn from them, and the still farther and most important peculiarty, that in case of fire, the Holly Water Telegraph provides for any required additional supply for its prompt and sure suppression.

It only remains to suggest a few of the advantages of this complete and comprehensive system, over any other plan for fire protection and water supply.

ADVANTAGES OF HOLLY'S SYSTEM.

1. One of the advantages of these works is, the great STRENGTH AND POWER OF THE MACHINERY, as compared with fire engines, for the suppression of fires. The latter are made light as possible, in order that they may be moved with celerity in case of fire alarm. This sacrifice of strength to locomotion, often results in their giving way in some weak point at the critical moment which determines whether the fire shall be quelled or rage unchecked, until immense amounts of property are destroyed. The Holly Water Works, on the contrary, are permanently located, and iron and steel are freely used to make them massive, strong and durable. That they will not give way in time of fire, may be relied upon with great certainty. That they are constructed with superabundant amount of power, and in duplicate sets of machinery, is an additional guarantee of unfailing efficiency.

2. Another advantage of these works is, that they save and make available the precious time consumed by fire engines in reaching a fire, after the alarm is given. Fire engines wait for men to draw them, or are liable to be detained by a balky horse, or by overturning the engine, or by muddy streets, or a deep fall of snow, or some other difficulty, which keeps them from reaching the spot where their services are required, until too late to be of any service at all. The Holly Works, on the contrary, reach out by their under-ground pipes, throughout the entire town, and wherever a fire breaks out there will always be, near at hand, several hydrants—which, under this system, is but another name for most powerful engines—ever standing sentinel, and always ready without waiting to be moved, (upon the turning of a wrench, and the attaching of a section of hose,) for instant and successful action. The value of these works, in this feature, cannot be over-estimated, for a few minutes gained in throwing water upon a fire at the outset, are more than the equivalent of hours at a later period, when the conflagration has spread, and is sweeping all before it in its devastating course.

3. Another advantage of these water works is, that they obviate a serious difficulty, with other systems, in regard to a supply of water for the extinguishment of fires. It too often happens that even when the fire engines are in good working order, and arrive promptly at the conflagration, they cannot grapple with and master it, because of a partial supply of water. In marked contrast with this, by the Holly system, each and every hydrant—OR FIRE ENGINE—is also A NEVER FAILING RESERVOIR, which will yield its full supply, from the main source of supply, until the flames are subdued. The failure of this main source of supply can, in the construction of the works, be abundantly guarded against, and hence it is hardly a conceivable contingency that a lack of water will prevent the suppression of fires promptly, wherever they occur.

4. Still another advantage of these water works is, that the severity of winter weather does not in the least interfere with their efficient operation. Very different is it with the other modes of suppressing fires with either hand or steam fire engines, or any other fire apparatus. They may be in perfect working order, and the supply of water may be abundant, and yet, with the thermometer at or below zero—and it is then fires are most frequent—how often communities stand appalled at the spectacle of conflagrations, which frozen fire engines and frozen hose cannot furnish a drop of water to repress and subdue. To this cause is attributable the destructiveness of the fire in Buffalo, which involved the American block in ruins, and for some time after the flames died out, the hose belonging to the fire department, lay in the streets of the city, frozen and totally unfit for use. Had another fire occurred, while the fire department was in this frozen condition, no one can guess the amount of the destruction of property, which would have been inevitable. Similar instances might be multiplied indefinitely. With the Holly system, it is noticeable that the suction is taken within a frost-proof building, the water is thence pumped into and through long stretches of pipes beneath the ground, and below the reach of frost, is thrown to the surface at the required point, with temperature considerably warmer than the open atmosphere, and thence, with great and unchecked velocity is showered in torrents upon the fire, through short stretches of hose, in which the water cannot congeal in its rapid flow. This circumstance,

alone, very strongly recommends these works above all others, in that the security they afford is not diminished when most needed in intensely cold weather.

5. Another consideration in favor of these water works, is their comparative economy of construction, in that they dispense with reservoirs. These involve a heavy outlay to construct them at the needful altitude, and often require another large amount to convey the water, by pipes long distances to the town where it is used. Frequently, too, as a part of the reservoir plan, costly machinery is required to keep up the supply of water, and a large sum per year for operating this machinery. The folly of this plan of forcing water two or three times higher than the level to be supplied, has an apt illustration in a King of France, who,

"With twenty thousand men,
Marched up the hill,—and then—
Marched down again."

This folly and waste of power is avoided by the Holly system. Its ponderous machinery reaches after the water, lifts it through its underground pipes, to the required altitude, and then supplies it in uniform flow for ordinary water supply, or in increased volume and strength for extinguishing fires. When it is borne in mind that with reservoirs ordinarily, fire engines are required for fire protection, while the Holly system supercedes them as well as the reservoir, the great pre-eminence of the Holly plan is obvious and overwhelming.

6. Another weighty circumstance bearing upon the question of adopting this system of Mr. Holly's, is, that since it *dispenses with fire engines, engine house,* &c., the sale of this property, no longer needed, will contribute largely to pay the cost of the Holly Water Works. In many cases the sale of the engines, engine houses, &c., would provide for nearly, or quite the entire cost of the Holly machinery.

7. Another circumstance in favor of these works, which commends them strongly, is *the nominal sum it costs to superintend and keep them in repair.* At Lockport, for three years after their construction, the care and superintendence was but $150 per year, and recently the authorities have contracted with a practical mechanic to take the entire charge, and keep in repair the entire works, including thirty-two hydrants,—equivalent to thirty-two fire-engines—for the pittance of $250 per year. Let the comparison be made between this and the annual cost of maintaining a single fire engine, whether hand or steam, and tax-payers have an all powerful reason for immediately adopting the Holly system. Repeatedly, at Lockport, have ten good and effective streams, for fire purposes, been thrown at the same time from that number of hydrants by the water works. When tax-payers ascertain and foot up the annual cost of maintaining existing fire departments, they will be startled at the amount, and will appreciate the importance of the Holly system, which reduces it to a trifling sum annually.

8. Yet another circumstance in favor of these water works is, that it relieves communities of the expense, controversies, and demoralizing influences of fire departments as now organized. By the Holly system, hose companies alone are required, and since, wherever laid, the water pipes to that extent take the place

of hose, only a small amount, comparatively, is required. In Lockport, two hydrant hose companies have been organized, composed of citizens interested in the protection of property, and in other places the same classes, prompted by this motive, will readily perform the same trifling service.

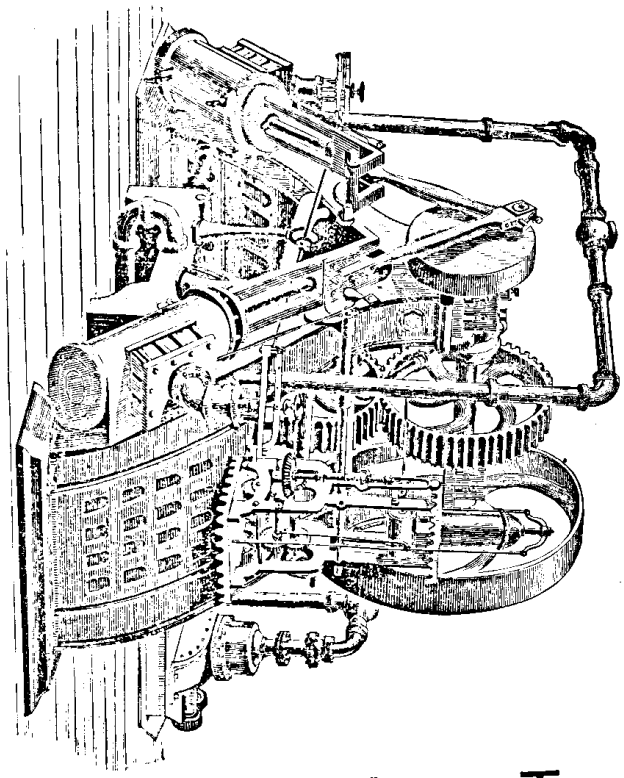
9. Conclusive proof of the superiority of these works, is found in the fact that underwriters readily make large concessions in the rates of insurance, within districts covered and protected by them. It is pertinent to state that in Lockport, with a view of overcoming the incredulity of tax-payers, a prominent citizen, who had faith in the system, secured a large portion of signatures to the petition, asking the Common Council to authorize their construction, by the promise that he would obligate himself to pay the tax of each one, for the amount of saving in insurance for the term of three years. *He has not been called upon to make up any deficiency under his stipulation.* In fact, in many cases, two years' saving has more than equaled the tax paid for construction.

10. It is also worth remembering, that the aggregate value of property which these works would save, if generally introduced, over and above any other system, would annually pay the interest on the debt of the United States, and provide a sinking fund for retiring the principal at no distant day.

11. These works, it is to be observed, also meet a public necessity, inasmuch as they combine fire protection and water supply, without the expense of constructing and maintaining reservoirs and fire engines, and thus place it within the reach and means of communities, to enjoy almost perfect immunity against fire, while at the same time a full supply of water is secured for household and other purposes.

12. In further explanation of the extraordinary and superior efficiency of the Holly system, reference may be made to the rotary principle upon which the pumps are constructed. Water is incompressible, and its momentum, when flowing through pipes, is the same as all other heavy bodies in motion. In all reciprocating pumps, the water comes to a stand-still twice in every revolution of the pump, and has to start back in the opposite direction in order to escape from the pump, on account of this reacting motion of the water. In marked and favorable contrast is the action of the Holly Rotary Pump. From the moment the water comes under the influence of the pump, there is no reaction, no cessation, but one steady and unremitting flow, and with velocity largely increased by this difference of the rotary, over the reciprocating or piston pump.

The prescribed limits of this publication forbid multiplying points in which the Holly Works are preferable to other modes of accomplishing the objects of fire protection and water supply. If enough has been stated to put communities upon the inquiry in regard to them, the object of this pamphlet will have been attained. There are thousands of cities and villages which might, with great advantage, introduce them. An examination of the works now in operation afford a sure means of attesting the correctness of the statements of this pamphlet, and the Holly Company refer to what they have done as conclusively establishing their ability to accomplish similar and desirable results for other communities.



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BY STEAM.

SMALLEST SIZE,

SUITABLE FOR TOWNS OF FIVE THOUSAND INHABITANTS.

LARGER SETS,

AS REQUIRED BY SIZE OF TOWNS,

OF the same general appearance,

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HOLLY WATER WORKS

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FIRE HYDRANTS

FOR CITIES AND VILLAGES.

ALSO

LIFT AND FORCE PUMPS

ELLIPTICAL ROTARY PUMPS, TURBINE WATER WHEELS,

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LIFT AND FORCE PUMPS FOR HAND, IN ALL VARIETIES, THIMBLE SKEINS, GRINDSTONE ROLLERS, BARN DOOR HANGERS AND ROLLERS, AND CAST IRON BARN DOOR RAIL, AMALGAM BELLS, SINKS, SEWER AND BELL TRAPS, WELL WHEELS, CHAIN PUMP REELS, BLACKSMITHS' DRILLS, COACH SCREWS, CAST AND WROUGHT IRON PIPE, CAST AND WROUGHT IRON BENCH SCREWS, CHEESE PRESS SCREWS, STAIR PLATES, REVOLVING CLOTHES IRONS, BEDSTEAD FASTENERS, COAL SHOVELS AND TONGS, HOT AIR FURNACES AND REGISTERS, GAS PIPE TONGS, PULLEY BLOCKS, SAD IRON HEATERS, TAILORS' GEESE, ETC.