B. HOLLY'S SYSTEM

OF

WATER SUPPLY,

AND

Fire Protection,

For Cities and Villages.

Machinery Manufactured under Letters Patent, by

HOLLY MANUFACTURING COMPANY,

LOCKPORT, N. Y.

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WATER SUPPLY

—AND—

FIRE PROTECTION,

FOR CITIES AND VILLAGES.

Defects of the Old Water Works Methods.

THE Reservoir plan of Water Works is confessedly imperfect. Its settling process does not furnish water of satisfactory quality. Its fixed gravitation pressure does not meet the varying wants of communities so far as quantity is concerned. Its value for Fire Protection is generally limited to the supply of Fire Engines. It is withal so expensive that tax-payers shrink from the liabilities it imposes. Topographical difficulties prohibit numerous localities from supplying their wants for water by this method. There was urgent need, therefore, of a new and better way of accomplishing the important objects of Water Supply and Fire Protection.

Origin of Holly's Improved Plan.

Happily these public wants are fully met in the new system of Water Works, invented by BIRDSILL HOLLY. Gifted with a mind which intuitively discerns how mechanical results may be wrought out by simple and effective means, his past life had been spent in devising and perfecting numerous useful inventions relating to hydrostatics. The frequency of fires in Lockport, N. Y., which Fire Engines were lamentably incompetent to check or control, turned his thoughts in the direction of providing a better method of fire protection. An experimental set of machinery, of his devising, was constructed and put in operation in that city under contract with her authorities, which

stipulated that the works should be competent to throw a stream of water 100 feet high, from a hydrant set fifty feet above the pump. Upon the public trial the contract test was largely exceeded, and this pioneer set of machinery, although it will not favorably compare with the subsequent manufactures of the Holly Manufacturing Company, is still performing its work efficiently and satisfactorily.

The experimental works at Lockport, for fire purposes, were duplicated on a larger scale, two years afterwards, at Auburn, N. Y., embracing the additional feature of daily water supply. These works at Lockport and Auburn have been constantly referred to by the Holly Company as demonstrating the utility of the new plan of Mr. HOLLY, and as the results of those examinations similar works have been constructed and put in operation in numerous other localities, a list of which—about fifty in number—will be found on the cover of this pamphlet.

Government Acknowledges Originality and Value of the Method.

The United States Government has acknowledged the originality and usefulness of this improvement by issuing Letters Patent to Mr. HOLLY for "A new and improved system of Water Works for supplying cities and towns with water." The object of the invention, as set forth in the specifications accompanying the Letters Patent, is declared to be "not only to supply cities with water for ordinary purposes, at any desired elevation, without the use of a Reservoir or Stand Pipe, or any other contrivance for calling into requisition the principle of the hydrostatic equilibrium, but also to furnish the means of extinguishing fires at several points at the same time, if necessary, and all this without the use of any movable engine for that purpose." The recognition by the government was made after sufficient time had elapsed for experiments and changes in the construction and combinations of the machinery, as multiplied tests indicated to Mr. HOLLY were needful to bring the system to the highest possible perfection and usefulness.

Patent Sanctioned by four Commissioners.

This patent was obtained upon papers drawn by Judge Mason, of the firm of Mason, Fenrick & Lawrence, Washington, D. C., who once held for four years the office of Commissioner of Patents, and who, after a thorough examination, pronounced it patentable, and this opinion was concurred in by the commissioner then in office, but who retired from

the position before the papers passed through the commissioner's office, and it was left for his successor to issue the letters patent. Subsequently Judge Mason drew up the papers for a re-issue of the patent, and this re-issue was granted by the present Commissioner of Patents. Thus it will be seen that the patent for the Holly System of Water Works has been affirmed by four Commissioners of Patents, and whose opinions are entitled to great consideration.

Method Covered by Several other Patents.

In addition to the patent under the broad claim, as above set forth, and sanctioned by four experienced Commissioners of Patents, there are several subordinate patents upon particular portions of the machinery embraced in HOLLY'S "new and improved system of Water Works for supplying cities and towns with water."

Past efforts to pump direct signal failures.

While numerous efforts have been made in this country and in Europe—some of them centuries ago—to overcome the difficulties in the way of supplying communities with water by pumping directly into the street mains, and combining with it protection to property from fire, without the intermediate agency of fire engines, BIRDSILL HOLLY is the first to accomplish this most important result, and it is safe to conclude that the government of the United States, which has recognized the originality and value of the invention, will maintain his legal and equitable rights, under these patents, against those who have just brains enough to copy what they cannot invent.

Specifications of Patent Claims.

Among the specific claims allowed by the government to Mr. HOLLY is "the COMBINATION OF CONTRIVANCES for furnishing a city with water for ordinary purposes without the use of a Reservoir or Stand Pipe, or enlarged container of any kind, and which can, by an instantaneous augmentation of pressure in the mains be converted into an efficient apparatus for the extinguishment of fires." Another distinct claim for which the government has granted him a franchise is for the "METHOD of supplying a city with water either for domestic uses or for the extinguishment of fires, that is to say, BY PUMPING THE WATER DIRECTLY INTO THE MAINS, with contrivances by which the

pressure on those mains may be readily increased or diminished or preserved uniform, all at the will of the operator."

It will be observed that these claims are broad and comprehensive. They cover not only the "COMBINATION OF CONTRIVANCES" by which the results are produced but the "METHOD" of pumping directly into street mains. Said the Commissioner of Patents recently in giving his reasons for granting an application for a patent:—"The test of invention is the result attained." Guided by this rule never had inventor stronger grounds for a patent franchise than BIRDSILL HOLLY for an invention, which in the emphatic language of T. C. Keefer, an eminent Canadian engineer, is "destined to revolutionize the existing systems of water works."

Attempted Imitation of Holly's Plan.

The growing popularity of this new system of Mr. HOLLY has suggested attempts at imitations, under the delusive idea that it may be done without incurring liabilities under the patent laws. Representations to this effect having been made to the Common Council of South Bend, Indiana, a committee was appointed to investigate and report on the subject. The committee embraced some of the most intelligent and reliable citizens of that city, including gentlemen of the legal profession of high legal reputation. In this report, recently made, the committee state:

"Your Committee is of the opinion, that the Holly System is the most perfect, complete and reliable direct pumping system of Water Works that has yet been invented. The great number of works that this company has constructed throughout the country has enabled it to perfect, as nearly as possible, this system of water supply. The many contrivances necessary for the perfect working of such a system, have all been secured to the Holly Company, by letters patent, and we cannot see how any other company could construct works upon the direct pumping plan, without involving the city in many protracted and costly patent suits. It may be sufficient to state the following as being among the many other strong and important reasons that incline us to this opinion.

"The Holly Manufacturing Company have some twelve patents, embracing over forty claims, securing to themselves the exclusive use and control of the machinery and contrivances, all, or nearly all, of which are absolutely necessary for the successful operation of their works, and we are entirely satisfied that no works of the character proposed can now be erected and put in successful operation without an absolute infringement of some one or more of the Holly Company's patents.

"It may be possible that some other company or parties may erect and put in operation works equal or superior to those proposed by the Holly Company and avoid any infringement of the Holly patents; but so far as we have been able to inform ourselves no parties have thus far proposed so good and complete a direct pumping plan as the Holly Company.

"The claims under patents to the Holly Company are so numerous and voluminous that we cannot incorporate them in this report; but we will mention two or three of their claims and patents that we consider of greater importance than others. One is an hydrostatic pressure guage by means of a regulator connecting the demand for water with the supply, so that the demand is supplied by self-regulating machinery. In other words the Holly Company have a patent upon a machine, located and attached to the works at the fountain head of water, which notifies the person in charge of the works in an instant, when extraordinary power, and more water for fire or other purposes is demanded in any part of the city, and also by this regulator the motion of the machinery is so controlled, without the intervention of any human aid, that the supply of water called for is at once furnished.

"Another patent of the Holly Company is a contrivance which regulates the pressure upon the service pipes in dwellings and other places when the machinery is being worked up to a fire pressure. This regulator is so constructed that in any case when an extraordinary pressure is required in the mains, as in time of fire, this valve will close so that the pressure on the service pipes in the houses is not increased, and it is also constructed that it will furnish water if wanted in such houses during such time of extraordinary pressure on the mains, and will also again close without an increase of pressure on such pipes. This is, in our judgment, one of the most important devices in connection with the entire works, because it avoids to a great extent one of the greatest nuisances that is common to all systems of Water Works, to-wit: the bursting of the service pipes in the ceilings and walls of dwellings caused by the varying pressure on the pipes.

"Still another important contrivance and patent, is a water safety valve, so constructed that if from any cause, as for instance, the sudden closing of one or more hydrants, that the extraordinary pressure from the recoil is removed, and the water allowed to espape until the reaction has slowed the machinery by the action of the hydrostatic pressure regulator, and the pressure brought to the required standard. Were it not for this contrivance, the recoil of the water from the sudden closing of the hydrants, would be so great that it would be impossible to lay pipes that would withstand the extraordinary pressure.

"These are a few of the many patent contrivances that are secured to the Holly Company, and which we think are necessary for the successful working of the direct pumping system of Water Works, we have, therefore, after consultation and deliberation among ourselves unanimously concluded, "that the Holly System of Water Works is the only successful and reliable system yet invented whereby the water is pumped directly into the mains, and the principle of the hydrostatic equilibrium is not called into requisition."

shall avoid all questions of litigation for ... and provide for our people a much more complete, and durable set of machinery than we could by the adoption of ...er plan within our knowledge."

Subsequently, the common council of Port Huron ratified contract with the Holly Manufacturing Company for machinery, as recommended by the Trustees, thus wisely declining the invitation of another firm to become a partner in suffering the consequences of patent infringement.

Now, to evade the legal rights of Mr. HOLLY and those associated with him, has latterly become a subject of earnest inquiry. Besides disturbing the bones of the venerable Peter Morice, who three hundred years ago carried his unfortunate direct pumping experiment down into his grave with him, the pretence has been set up that a method or result is not patentable. A decision of the Commisioners of Patents, on this point, has been already quoted. That standard authority, the *Scientifie American*, in referring to that decision, said:

"The Commissioner of Patents, the Hon. M. D. Leggett, in a recent opinion, places before the public in general some very interesting and instructive information upon the patentable novelty of inventions. The gist of the whole matter is tersely stated by the commissioner in this one sentence, '*the test of invention is the result attained.*' In other words, if an improved result is produced, or if the public is supplied with a better article, or if the same article is produced in a cheaper, or quicker, or better manner, then patentable novelty exists, even though the devices are old by which the improved results are attained."

If HOLLY'S plan is not new and valuable, it is a pertinent question, why the effort to imitate it?

Specious pretences of Holly Imitators tested.

Another specious plea of those who envy Mr. HOLLY his success, and would rob him and his associates of their just reward, is, that all he accomplishes by his new and patented method of direct pumping, may be accomplished without infringement, by simply changing somewhat the mechanical contrivances he uses for that important purpose. In case of McComb, *et. al.* vs Brodie, tried and decided in March last, in the U. S. Circuit Court, for the Southern District of Louisana, for infringement of a patent for "Cotton Bale Ties," the following principles were laid down by the judge and controlled the verdict of the jury in awarding damages to the plaintiff in the suit.

"There may be a claim for two inventions in the same patent if they relate to the same machine or structure; and an action can be sustained for the

"There seems to be a belief with some, that the method of forcing directly into the mains, as is done in the Holly System, cannot be patented because it is not new, and because a method or result cannot be patented. Now, as far as your committee has been able to ascertain, it is quite true that in 1582, Peter Morice made an experiment in London in throwing water by pumping direct into pipes, and it is said put a stream over "St. Magnus' steeple." Mr. Morice's system was not adopted elsewhere, but was abandoned because of its defects and because it was deemed to be of no practical advantage; obviously it was unlike Holly's invention which is a success wherever it has been introduced. There may be many an imitation of Peter Morice's experiment, which may be as worthless as his proved to be, but it is our opinion that Holly's plan is as unlike his, as success is unlike failure. Mr. HOLLY does not claim that he was the first to conceive the idea of furnishing water in limited quantities for ordinary use by means of a force pump; nor does he deny that a stationary pump has heretofore been employed, instead of a moveable one, in supplying the means for extinguishment of fires; but he states that the object of his invention is not only to supply cities with water for ordinary purposes at any desired elevation, without the use of a reservoir or a stand pipe, or any other contrivance for calling into requisition the gravitation principle, but also to furnish the means of extinguishing fires at several points at the same time, if necessary, and all without the use of any moveable engine for that purpose. After describing in detail his mechanism, he is granted a patent by the United States Government for his combination of contrivances for furnishing cities with water for ordinary purposes, without the use of a reservoir or stand pipe, or enlarged container of any kind, and which can, by an instantaneous acquisition of pressure in the mains, be converted into an efficient apparatus for the extinguishment of fires.

"We think it well to bear in mind and should be understood, that the patent office and courts very properly hold that no matter how many unsuccessful efforts have been made, whoever supplies what is lacking to secure an important mechanical result is entitled to his reward under our patent laws.

"Thus has Mr. HOLLY perfected and secured to himself by letters patent the right to manufacture a system of Water Works attempted and abandoned by Mr. Peter Morice nearly three hundred years ago, and from what your committee has been able to learn of the officers of the Holly Manufacturing Company, they are reliable and energetic men, who perform what they promise, and, having large interest at stake, will not be slow to prosecute whatever legal and equitable rights they may have in the premises in case of infringement."

Authorities of Port Huron agree with South Bend that it is unwise to come in conflict with Holly's Patents.

The above conclusions of the committee of South Bend were precisely similar to the results arrived at by the representatives of Port Huron, Michigan. The council of the latter city were seduced by specious and one-sided statements into making an award for direct

eing the first inventor, the contrivance of Mr. Hodgson was not new , but a piracy on the letters patent of Mr. May. The charge of the ustained the views of plaintiff that Mr. May's patent was new and of t utility; that it accomplished the end sought, viz: 'the manipulation and ontrol of prisoners by jailors without actual contact with them,' and that Mr. Hodgson's patent, as used in the Johnson county jail, ACCOMPLISHED THE SAME END BY THE USE OF MECHANICAL EQUIVALENTS.'

The rights of Inventors formerly disregarded.

In the early history of inventions in this country, the rights of inventors were wantonly infringed upon and set at nought. Eli Whitney received but a slight return for his invention of the Cotton Gin—an invention the value of which was beyond all computation. In a letter to his friend Fulton, he stated: "The difficulties with which I have had to contend have originated principally in the want of a disposition in mankind to do justice. My invention was new and distinct from any other, and I have always believed that I should have had no difficulty in causing my rights to be respected if it had been less valuable. But the use of the machines being immensely profitable to planters, all were interested in tresspassing upon the patent right, and each kept the other in countenance. At one time but few men in Georgia dared to come into court and testify to the most simple facts relative to the use of the Cotton Gin machine. In one instance I had great difficulty in proving that it had been used in Georgia, although at that very time there were three sets of this machinery in motion within fifty yards of the building in which the court sat, and all so near that the rattling of the wheels was distincly heard on the steps of the Court House."

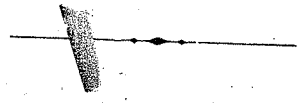
Courts and Juries now punish those would intefrere with rights secured by Patents.

Since the days of Eli Whitney, a great change has occurred in regard to maintaining the rights of patentees. Courts and juries by their decisions and verdicts, uniformily affirm the truth and soundness of the recent declaration of the Commissioner of Patents, that "the policy of the patent laws is to reward the man from whom the public actually derives the benefit received."

Aside from liability for patent infringement, the machinery manufactured by the Holly Company, under BIRDSILL HOLLY'S supervision, is far better worth its price than what is offered by parties

who are novices in the business, and who attempt to palm off their crude experiments by consenting to a ruinously low price for them. They are unable to point out a single example of the successful opera tion of their works, while HOLLY can point to scores of cases whi have uniformly demonstrated the inestimable advantages of his new and improved system of Water Works.

The Holly Manufacturing Company, by virtue of contract with the patentee, BIRDSILL HOLLY, have the exclusive right to manufacture machinery for Water Works under the Holly System. The Company regard the franchise of great value, and it is bound, by contract with the patentee, to protect it from all infringement from other parties. This obligation the Holly Company will most assuredly meet, and to the last extremity.



INVESTIGATION BRINGS CONVICTION OF THE MERITS OF HOLLY SYSTEM.

The new plan of Mr. HOLLY has been adopted by fifty communities in spite of incredulity, and prejudice, and misrepresentations. It is because works in operation are demonstrations of its superiority over the old method, which it is fast superseding. As illustrating this fact, the following quotations from reports of committees of investigation are directly in point.

Peoria, Illinois.

Peoria, Illinois, was one of the first to adopt Holly's Plan. She had 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 estimates furnished, showing an aggregate cost of works on this p to be $357,000. This estimate did not include the cost of ground reservoir and pumping works, or of grounds to be taken under appraisal in building the works, which would doubtless have carried the total cost up to fully $500,000. 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 two hundred and ten feet above the hydrant near the works of the National Pipe Company. Your committee tested the pressure at that hydrant, and it was less than twenty-five pounds to the square inch. At Syracuse, the reservoir is over one hundred and sixty-six feet above low water. At Cleveland, the reservoir is one hundred and fifty-eight feet above the water of the lake, and the pressure at the lowest hydrant is seventy pounds, and forty pounds at the highest. With a reservoir located at the McGinnity place, two hundred and sixteen feet above low water mark in the Illinois, there will be but sixty 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 casees of fire, except for supplying Fire Engines.

The unreliability of gravitation pressure is developed in the above report. At Pittsburg, with two hundred and ten feet of elevation, equivalant to ninty-two pounds pressure per inch, the committe found but twenty-five pounds in the street mains, sixty-seven pounds having been frittered away and lost by friction and draughts for those mains. For this loss reservoirs or stand pipes works have no means of remedy. Pressure is due to the height of the reservoir or stand pipe, and they cannot be elevated or depressed to yield pressure and a flow of water conforming to the ever changing draught upon the street mains; and consequently water takers in the more elevated portions of the area of distribution are often entirely without water, or are only partially supplied when their want of water is the most urgent, and the lack of it most inconvenient and injurious. Holly's process, on the contrary, varies pressure according to the demand for water, and its reliable flow to the highest point of distribution is secured. This is a marked advantage of the Holly Plan over gravitation works.

Columbus, Ohio.

Columbus, Ohio, after a thorough examination of the workings of Holly's Plan, adopted in preference to the old method. This action was based upon the report of an investigating committee of the Council, who thus stated their conclusions :

"Your committe, therefore, unhesitatingly recommend the Holly System of Water Works as the best adapted to supply the city of Columbus with water, both for general city purposes and for fire protection. In conclusion, your committee are satisfied, from the examination they made and from all the information they could obtain, that the true interest of the city of Columbus is, at once to take the neccessary steps to build these works for the use of the city, believing as we do that the improvement in this style of Water Works make them vastly exceed in value the old Reservoir System in usefulness, and at the same time costs, in the judgment of your committee, not more than about one-half in the expense of building.

Kalamazoo, Michigan.

Kalamazoo, Michigan, which deservedly has the reputation of being the most beautiful village in the State of Michigan, has proved her superior enterprize and public spirit also in 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 works were successfully inaugurated in the month of November 1870.

Jackson, Michigan.

The neighboring city of Jackson, could not long remain quiet in view of what Kalamazoo had acquired in putting in the Holly Water Works. Her wide-awake and energetic Mayor, Hon. Wm. M. Bennett, devised a sensible method of ascertaining whether it would be wise for Jackson to follow the example set by Kalamazoo. He chartered a special train of cars, invited the influential citizens of the place to take a Water Works excursion, and fifty of them accepted the invitation. After a day spent in critically examining the Kalamazoo Works, and in witnessing the display of fire streams, the excursionists met and formally organized, with chairman and secretaries, for the purpose of embodying the opinion of the delegation on the important subject before them. It was found, after full interchange of views, that every man was in favor of introducing similar works into Jackson without delay. A Sub-Committee of five, at the head of which was

Judge Gridley, were appointed to draft a detailed report of the Water Works investigation, and were instructed to append the name of each individual comprising the party. The report thus adopted, signed and published, is quite too lengthy for insertion here, but a few paragraphs are copied as indicating the tenor of the entire document. The report thus concludes :

"It only remains for us to say in this report, that we are of the opinion, unanimously, that the Holly Water Works at Kalamazoo are a great success; that they are an exceedingly desirable improvement, and that it is indispensible that similar works shall be constructed and put into operation in our own city as soon as it can be done consistently with the magnitude of the enterprise, and we recommend that immediate steps be taken to procure the same protection against fires, for the preservation of health, and the same means of comfort and convenience that are enjoyed by our fellow citizens of Kalamazoo, to whom much credit is due for the spirit manifested in inaugurating and carrying out to completness their very fine and valuable Water Works.

"This is not a new and untried experiment, and we deem it entirely safe to enter upon this work without delay. Indeed, we consider it the height of folly and a reckless disregard of our best interests to further prolong the time. Our disastrous experience surely warns us to 'move at once upon the works.'"

The report was at once published in all the papers at Jackson, and, at a public meeting called immediately thereafter, which drew out almost the entire voting population of the city, the proposition authorizing the Common Council to proceed with the enterprise was, after full discussion, adopted with entire unanimity.

Norwalk, Ohio.

The village of Norwalk, Ohio, feeling her need of Water Supply and Fire Protection, called a meeting of her citizens which was largely attended, and at which a committee of ten of the most prominent citizens was appointed to visit Kalamazoo and inspect the Holly Water Works, in operation in that village. In forming the committee, five were purposely selected as friends of the Holly System, and five as unbelievers of the plan. The committee visited Kalamazoo, spent a day in close examination of the works, and then, after a full comparison of views, unanimously signed a long and able report drawn by one of the five selected as skeptical in regard to this new method of Water Supply. This report, after a clear and minute description of the Kalamazoo Water Works, says: "Your committee have studied well all the plans heretofore presented for suppying the village, and conclude in their deliberate opinion that this is the first and only practical and

efficient mode by which the town can be supplied with an abundant quantity of water, sufficient to meet the present and future wants of our inhabitants."

The committee made their report at a large meeting of the citizens of Norwalk, and the following resolution was unanimously adopted :

"*Resolved*, That the citizens of Norwalk adopt the plan of the Holly Water Works for supplying the village with water; and that we will use our influence to carry the same into effect."

The village authorities subsequently called an election of the people, at which, by a vote of five hundred and eighty to twenty-one, the issue of bonds to pay for Water Works was authorized, and at an early day afterwards the works were put in successful operation.

Covington, Kentucky.

The Common Council of the city of Covington, Ky., appointed a committee consisting of five of its members to examine and report on the Holly System. In August of last year, the committee visited the Peoria Water Works, and the following extracts embody the results of the visit and examination :

To the President and Members of the City Council of Covington, Kentucky :

GENTLEMEN :—Your special committe appointed to visit Peoria, Illinois, to examine the Holly System of Water Works, now in operation in said city, respectfully report that on Wednesday, August 11th, they left Covington, and arrived in Peoria on Friday morning, and spent the day in examining and testing said works.

[The committee give a detailed description of the works, and conclude as follows :]

"Your committee, after carefully examining the machinery, buildings, filter-beds, &c., tested the works as to their applicability for fire purposes; first, by attaching hose to a fire plug, situated about sixty feet from the works. After throwing water for half an hour, the distance was carefully measured with tape line, and found to be one hundred and seventy-two feet, through a one inch nozzle. The next test was given two and a half miles from the works, by placing hose to four fire plugs, at intervals of five hundred feet apart, making the distance between the two extreme pipes fifteen hundred feet. After throwing four streams for nearly an hour, the distance thrown by each stream was measured, and found to be as follows: The stream farthest from the works (which was about three miles) was thrown one hundred and seventy-five feet, with a one-inch nozzle. The next stream, one hundred and eighty feet, with a one and a quarter-inch nozzle. The third stream, one hundred and fifty-nine feet, with an inch nozzle. The fourth stream, one hundred and fifty one feet,

with a one-inch nozzle. The last two streams named were not a fair test, as thee hos bursted, and leaked very badly. The pressure used for the above test was ninety-five pounds—the time required to raise the pressure from sixty to ninety-five pounds was six minutes. The above is a fair and unbiased description of the Peoria Water Works, as far as we were capable of judging, and, after examining the workings of the same, we are satisfied it is the cheapest and most appropriate works for our city."

In view of this testimony, corroborated by information acquired from other localities where the Holly Works are in operation, the Common Council made contract for machinery with the Holly Company.

Cumberland, Maryland.

The city of Cumberland, Maryland, appointed a committee consisting of the mayor and other prominent citizens, to visit Dayton and inspect the Holly Water Works of that city. The committee performed the duty assigned them, and from the report submitted, the following extracts are made:

"Four streams were thrown from one and a quarter-inch nozzles, 187 feet high; three streams from one and one-eighth inch nozzles, 130 feet high, with a pressure of sixty pounds of steam—the volume of water sufficient to flood any fire. All of this is effected by simply attaching the hose to the fire plugs. As many as sixteen streams, from one and a quarter inch nozzles, have been in operation at one time, each throwing 136 feet high. It is unnecessary to go into any further details in reference to the Holly Works, as the above speaks volumes, and the System has, by its practical working, utterly exploded the Reservoir Plan of Water Supply. The ordinary pressure which is suitable for ordinary purposes is about forty pound to the inch, and which, at a moment's notice, can be raised to any pressure required for any fire. By a perfect system of telegraphing, the engineer, in an instant, furnishes the pressure necessary. The water is pumped directly into the pipes or mains, and at just such pressure as the engineer may choose.

"This plan must supercede all other modes of supplying towns and cities with water.

"As to the cost, as compared with other systems, your committee believe it is more economical. In the first place, it will cause a reduction of 25 per cent. in insurance; does away with the neccessity of Fire Engines—no engine is required by the Holly System; furnishes to every manufactory and private residence a complete security against fire, by having a force and volume of water in the building, which will at once flood any ordinary fire.

"Your committee, therefore, have no difficulty in recommending the adoption of the Holly Plan."

The Common Council concurred in the recommendation, and the works were constructed by the Holly Company, for that city, and are in successful operation.

Evansville, Indiana.

A committee of the Common Council, of Evansville, Indiana, made inspection of the Dayton works, and gave a detailed report thereof. They came to the following conclusion:

"Your committee examined the machinery in all its parts, and all seemed to work well and give satisfaction to the city authorities and to the citizens generally. They are quite satisfied that the Holly System of Water Works is simple in construction, effective in use, and as cheap, if not cheaper, than any other method.

"The plan is certainly more adapted to the wants of our own city than any other, and they respectfully recommed that the Holly System be adopted."

As the result, the city of Evansville was added to the places in which water by the Holly Plan has been introduced.

Danville, Pa.

The city of Danville, Pa., having heard of the new plan of Water Works sent out a committee of examination. The committee inspected works on this plan at Buffalo, Auburn and Binghamton, and made report endorsing the plan in the following emphatic terms:

"As your committee in the prosecution of a special duty, we have carefully examined the Holly System in all its parts, and in all particulars. We find also that the people, where they are in operation, say they work well and give full satisfaction. We find that these works are simple in construction, efficient in use, and that they will do all that is claimed by their most ardent friends.

"We therefore respectfully recommend the adoption of the Holly System, by the Council, to supply with water the borough of Danville."

In pursuance of this recommendation, contract was subsequently made with the Holly Company for the machinery.

Syracuse, N. Y.

The city of Syracuse, N. Y., has Water Works on the Reservoir Plan belonging to a chartered company. The growth of the city has outstripped the capacity of their works, and the company was necessitated to seek for an increase of water supply. The president of the company, Hon. E. W. Leavenworth, made examination of Holly's

System and gives it the preference over the gravitation plan for the following pithy reasons :

" Reservoirs are not only unnecessary, but entirely superfluous. If they are high enough to give the necessary pressure for fire purposes, they are quite too high for the ordinary delivery of water. If they are low enough for ordinary delivery, they are entirely unfit for fire purposes. The one requires a pressure of about forty pounds to the inch, the other not less than eighty.

" Under the new System devised by Mr. HOLLY, of Lockport, these ends are perfectly accomplished by his very ingenious machinery."

The recommendation of Mr. Leavenworth was potential in inducing the company of which he was president, to make contract with the Holly Company for machinery instead of providing for increased Water Supply by multiplying reservoirs, of which the company already had two—one one hundred and twenty-four, and one one hundred and sixty-four feet high.

Toledo, Ohio.

The Committee on Water Supply for the city of Toledo, Ohio, recently made report on the subject of Water Supply for that city, and embodied their views in the following paragraph :

" The Committee desire to further say that, in their opinion, the adoption of the Holly Plan of supplying the city with water will greatly lessen the cost of insurance, and will obviate the necessity of so great an outlay for a fire department, as with that System in full operation it is believed that not more than two steam fire engines will be needed in our city for a long time to come."

East Saginaw, Mich.

A committee of the Common Council of East Saginaw, Mich., as the result of a tour of inspection of Holly Water Works, say :

" In conclusion, your committe, after having carefully examined the different methods of introducing water, and after carefully examining the machinery, manner of filtering, and testing the works, as to their merits for fire purposes, we are satisfied that the Holly method is the cheapest and most appropriate works for our city."

Rochester, N. Y.

A committee appointed by the Common Council of Rochester, N. Y., to investigate and report upon the question of Water Supply for that city, made an exhaustive examination, and gave approval of the Holly Plan for the following among other reasons :

" The great and peculiar merit of the Holly System is, that within three or four minutes of the receipt of fire alarm it will supply a pressure sufficient to

Ottowa, Canada.

Thos. C. Keefer, Esq., under whose skilful direction the Reservoir Water Works of the cities of Montreal, Toronto and Hamilton, in Canada, were constructed (all gravitation plans), was appointed to examine and report upon the most feasible plan for supplying with water the city of Ottawa, the new capital of the British Provinces. From his published report, dated May 13th, 1869, the following extracts are made :

" Gravitation supplies must be assumed for a fixed level, and with the increase of consumption and waste, an annually increasing loss of head sets in, for which there is no remedy save a higher head, which the fixed level cannot supply ; but with the direct pumping system, the water can be kept up to any required level by the application of more power.

" My instructions require me to keep the estimate, if possible, within $300,000, and direct my attention to what is known as the 'Holly System,' which is exclusively a pumping one, and conspicuous for its economy.

" For speedily extinguishing fires, nothing can equal high pressure hydrants, from which, as soon a hose can be attached, a ceaseless stream is poured on the flames, confining them to the place of origin. This system not only extinguishes the fire in the shortest possible time, but it has been found greatly to reduce the number of fires, and has been the means of detecting incendiarism. The fire is extinguished before the proofs of intended incendiarism are destroyed, *and the prepared and saturated combustibles are thus revealed.*

" Holly's Hydrostatic Pressure Regulator is a most valuable attachment to any pumping machinery, working directly into the distribution, and such a regulator would be indispensable here, where, to secure the fire pressure, we must adopt the system.

" Mr. HOLLY, by his ingenious and economical arrangement, has done invaluable service to many towns, and by his rendering all kinds of fire engines unnecessary, WILL DOUBTLESS CREATE A REVOLUTION IN THE EXISTING SYSTEM OF WATER WORKS THROUGHOUT THE UNITED STATES."

Canton, Ohio.

Another experienced engineer, J. L. Pillsbury, Esq., of Ohio, was employed to recommend plan and take direction of the construction of Water Works in Canton, Ohio. Familiar only with the reservoir method, his preliminary surveys and estimates were made with reference to construction upon that system.

Having afterwards examined the working of the Holly System of Water Works, he reported to the City Council of Canton, as follows :

" Desiring to construct the best possible system of works for this place, I believe it is my duty to ask you to permit me to amend my former report and

cated by the water guage, throwing through short elbows (another disadvantage, as the hose purchased by the Company did not arrive in time for trial,) two one inch streams to the height of 105 feet. It can now safely be said, that the Gouverneur Water Works Company is in every respect a perfect success."

Minneapolis, Minn.

The fourth set of works was constructed for Minneapolis, Minn. The *Tribune*, of that city, in its issue of November 5th, 1868, gives the following glowing description of their first and highly satisfactory performance :

"The weather yesterday was exceedingly unfavorable for 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 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 one and one-half 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."

Ogdensburgh, N. Y.

The works at Ogdensburgh, N. Y., were publicly tested January 27th, 1869. From the detailed account of the *Ogdensburgh Journal*, the following extracts are taken :

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PUBLIC TRIALS OF HOLLY WATER WORKS.

In making contracts for machinery, the Holly Company have been accustomed to make gurantees as to capacity for daily water supply and throwing of fire streams, and preliminary to acceptance, therefore, it has been customary to have public exhibitions, at an appropriate time and with more or less of public ceremonies. Abridged accounts of these tests are subjoined :

Lockport, N. Y.

In the contract for the pioneer works at Lockport, it was stipulated by the Holly Company, that from a hydrant set at a point fifty 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 fully seventy-five 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 seven-eighths to one and one-fourth 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,

Auburn, N. Y.

The stipulation in the contract for the construction of the Auburn Water Works was, that these works should be competent to throw three streams of water eighty feet high, by hose attached directly to hydrants. By the annexed official statement, it will be noticed that the performance far surpassed the guarantee. It is entitled to consideration, 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 sixteen miles of mains laid in the city, of twelve, ten, eight, six and four 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 of 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 Treasurer.*
J. M. HURD, *Mayor City of Auburn.*
G. H. BATTAMS, *Chief Engineer.*
JOHN S. CLARK, *City Surveyor.*

Gouverneur, N. Y.

At Gouverneur, N. Y., the Holly Company's guarantee was, to throw four one inch streams eighty feet high, under head of eight feet. The trial of the works for acceptance was made on the eleventh of December, 1867. It was a most unfavorable time for the test. An unexampled drought had reduced the head of water from eight feet, as stipulated by the Gouverneur authorities, to three and one-half feet, less than one-half the height promised. " The performance of the works, notwithstanding this very material diminution of water power," says the *Gouverneur Times*, " was more than could have been expected. They held a pressure of seventy-five lbs. to the square inch, as indi-

cated by the water guage, throwing through short elbows (another disadvantage, as the hose purchased by the Company did not arrive in time for trial,) two one inch streams to the height of 105 feet. It can now safely be said, that the Gouverneur Water Works Company is in every respect a perfect success."

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"On Thursday, the president and secretary of the Holly Company came on to have a trial of 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 a 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, forty-five 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 one one-fourth inch stream elevated ninety-six 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 one hundred pounds 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."

Binghamton, N. Y.

Thus far the works constructed and put in operation were propelled by water power. In the fall of 1867, the authorities of Binghamton, N. Y., after careful examination, by committee, of the Auburn works, entered into contract with the Holly Company for works on the Holly Plan to be propelled by steam—the pioneer works of its kind. The Company guaranteed to Binghamton "six powerful fire streams." From the long and minute account of the trial, on the 4th of May, 1869, as given by the *Binghamton Republican*, the following quotations must suffice :

"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. The trial began at two o'clock, the steam was run up to sixty pounds, and both engines at the reservoir wells were attached to the pumps. Six hydrants were opened. 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 three one-half o'clock ninety 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 ninety 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 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 further, 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.

"In the 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."

Peoria, Ill.

The next set of works constructed by the Holly Company was for Peoria, Ill., and two public tests were made—one on the 8th and the other on the 21st of July, 1869. On the first day a stream was thrown over the spire of one of the churches, one hundred and fifty feet high. It was a one and one-fourth stream, from a hydrant nearly two miles from the works and at ninety-four feet elevation above the pumps. At the same time a similar stream was thrown from a hydrant located at a distance of two blocks. The test was witnessed by a large concourse of people, who all seemed highly satisfied with the result. Of the second and final test, on the 21st of July, the *Peoria Transcript* gave the following account:

"Last evening another test of the Water Works for fire purposes was made, and eleven streams were thrown at one time, on Adams street. If anything was wanted to convince any of our citizens of the efficacy of Water Works in use for fire purposes, the test of last evening gave it. A stream was played for several minutes entirely over the smoke-stack of Chase's mill, a height of one hundred and twenty feet, while all along the route streams were thrown far higher than any of the loftiest buildings. On Main street a height of one hundred and fifty feet was reached.

"At no time did the pressure at the works exceed 100 to 115 pounds, but was sometimes below that. While the streams were all in operation, playing straight upward, they presented an imposing sight, when viewed from either end of the street. The street was fairly flooded, and the great safety the test gave assurance of in time of fires, called forth exclamations of delight from hundreds of citizens who witnessed the trial."

Kalamazoo, Mich.

The works constructed by the Holly Company for the thrifty and beautiful village of Kalamazoo, Mich., were made the subject of a formal public trial on the tenth and twelfth of November last. Invited guests from abroad were present in large numbers—the citizens of the village thronged the streets during the fire streams' display—the strains of a band of music harmoniously blended wind and water—and in the evening a public meeting, collation, congratulatory speeches, music, etc., closed the ceremonies. The entire proceedings filled several columns of the local newspapers. There is only space in this pamphlet for extracts from the report of the committees officially charged with making the trial preliminary to acceptance of the works. The guarantee of the Holly Company was six streams, each 100 feet high. Says the committee:

"One by one, at short intervals, the hydrants were opened, and soon after two o'clock P. M. the six streams stood, in the center of Main street, like crystal columns supporting clouds of white spray. Water was next thrown from the hydrant at the corner of Cedar and West streets, through *one thousand feet of hose*, from seventy to eighty feet high. *Fifteen hundred feet of hose* was next used, and with nearly or quite as favorable results, thus demonstrating that protection against fire is furnished far beyond the present extreme limits of the pipes and hydrants. Your committee see no reason to doubt the ability of the machinery to carry, through hose, water sufficient for all fire purposes one-third or even half a mile, in all directions, beyond the hydrants.

"The next exhibition of the power of the machinery was made at the new Methodist Church, on the corner of Lovell and Rose streets. The fine new tower of this church, not quite complete, and surrounded by its scaffolding, afforded an excellent opportunity for the exact measurement of the height of a stream of water. A single stream was taken from the hydrant at the corner near the church, and water was thrown *one hundred and eighty-five feet*—or ten feet above the top of the spire, which is nearly 175 feet from the level of the street!—a result that, to the inexperience of your committee, seems quite remarkable.

"Your committee met in the evening pursuant to adjournment, and, being called to order, heard, from Messrs. Hobbs and Dodge, on behalf of the mechanical committee, a report of their examination of the machinery. It will be sufficient to say of their report, that the machinery was represented to be strong, durable, of good proportions, well adjusted, admirably adapted to its purpose, working smoothly, and in all respects first-class machinery. A vote was then taken in the committee to determine whether, in its opinion, the several tests and guarantees contained in the contract between the Holly Manufacturing Company and the village of Kalamazoo had been satisfactorily fulfilled. After a unani-

mous affirmative vote on all these tests and guarantees separately, the following resolution covering the whole ground, was *unanimously* adopted, viz:

Resolved, That the tests of the machinery for Water Works, provided in the contract between the Holly Manufacturing Company and the village of Kalamazoo, have been fully and satisfactorily made; and, that we hereby recommend the acceptance of said machinery."

The report from which the above quotations are made, was unanimously signed by the members,—comprising thirty of the most prominent citizens of the village,—and being submitted to the Council, that body, by an unanimous vote, accepted the works, accompanied by individual expressions of strong and hearty commendations.

Canton, Ohio.

This city—not so well known as it deserves to be—is one of the most flourishing towns of Southern Ohio. It has a population of full 10,000, and with its large, prosperous and growing manufacturing interests, and the enterprise and public spirirt of her citizens must continue to increase largely in population, wealth and importance. Feeling the need of a supply of water, arrangements were well nigh completed for securing it by means of the Reservoir plan, when, on recommendation of the engineer, J. L. Pillsbusy, Esq., the project, in this form, was abandoned, and works constructed by the Holly Company, under the Holly Plan. The city had a triple jubilee on the twenty-second of February 1871—Washington's Birthday—the dedication of a new and splendid Court-house just erected—and the inauguration of the Holly Water Works. Crowds of people from the surrounding country towns, and invited guests from abroad, were in attendance. The limits of this pamphlet preclude account of the procession, speeches, &c., making a part of the celebration; and hence, necessitates compressing in brief space what had reference to the Holly Water Works. The contract test was, five fire streams, each eighty-feet high. The *Canton Democrat*, in its issue next day, says: "Under a pressure of ninety pounds to the square inch, FIVE streams were thrown at the same time to a heighth of ONE HUNDRED FEET. The most skeptical could not fail to be convinced of their superior efficiency for protection, over everything before attempted." The *Canton Repository*, of the twenty-third of February, said the "test proved more than equal to the contract between the city and the Holly Company. Canton may well pride herself on being the pioneer in the introduction of the

Holly Water Works into the State of Ohio, and of having the honor of presenting them to her distinguished visitors, who came far and near to examine the workings of their superior system. No doubt the occasion will be productive of scores of orders from other cities, to the Holly Company, for this improved machinery." The neighboring city of Akron was present by delegation which filled FIVE PASSENGER CARS. The editor of the *Akron Beacon* published a long and glowing sketch of the excursion. Of the throwing of fire streams, he says: "The exhibition of the power of the Holly Machinery was entirely satisfactory and convincing to all spectators. Indeed, the Holly Water Works are a complete success. Akronians concluded that Canton has a cheap bargain in getting such soft, excellent water in every house in the heart of the city, with eight miles of street mains and seventy-five hydrants (each proved by this trial to be as good as a fire engine), for a little more than $100,000. Would that Akron was as well provided."

Dayton. Ohio.

The test of the Holly Water Works took place on the 31st of March, 1870, in the above City, and from the description in the *Dayton Journal*, the following extracts are made:

"The official test, yesterday, of the Holly Water Works Machinery, recently erected in this city, was one of the most notable events which has ever transpired here. The test was most thorough, developing the admirable capacity of the works in every department, and their entire reliability in cases of fire, each hydrant answering to be the best fire engine extant. And the test fully showed the capacity of the works to supply, at the same time, any quantity of water that citizens may require, for all purposes.

"At precisely one o'clock the programme was inaugurated, by attaching two sets of hose, 1,000 feet long, from hydrants at Second street, and near the Baptist Church, a square and a square and a half distant from Third street; and these were laid south to a point opposite the Phillips House, where a wire was suspended over Main street, exactly a hundred feet high. The water was turned on, and the stream leaped up through the pipes away over the wire some twenty or thirty feet—solid water, while the spray rose far above that, and floated away like dense clouds. The people were astonished at the complete success of the test, and very general admiration was expressed at the splendid throwing, which quite exceeded the popular expectation.

"At about two o'clock sections of hose were attached to six hydrants in the vicinity of Third and Main streets, and the water was sent rushing up heavenward, through inch les. If there was any differance in the throwing of the two and the six streams, we were unable to see it. The public were unable to

see it. It performed the work allotted cleanly and splendidly, and evoked the hearty applause of the throngs in the street. These six streams were sustained right along for about an hour, so that the most skeptical of those opposed to the Holly Plan, through thick an thin, were able to get the success of the thing through their heads.

"At three o'clock six other streams were added, making twelve in all, playing right along Main street, within two squares of each other, making altogether, the most remarkable spectacle ever witnessed in the west! These twelve streams were kept up to an altitude nearly equal to the half dozen, for nearly an hour until it seemed that there was no end to the capacity of the works to throw water, and the unbelief was completely washed out of the doubters. All the streams towered above a hundred feet, and twice as high as any building in the city. Had the half of these staeams of never-failing water been fired into and upon the Opera House, it would not have been destroyed by fire last year. We heard this remark made by many persons, a number of whom doubted the capacity of the works to make anything like such a wonderful demonstration, prior to the test. We are not exaggerating the public sentiment in this matter.

"Three one and a half inch streams were thrown through sections of hose at four o'clock; and these monstrous streams towered up like great columns of water to the height of a hundred feet. A sailor who saw the throwing said the streams resembled a whale spouting at sea!

"The exhibition closed after five o'clock P. M., by throwing huge streams of water from the hose, without pipes, showing the capacity of the hydrants for sending out water in torrents that would, if the hose were elevated to the top of a burning building, smother out in a short order, any fire that could be built.

"During all these hours of test, the people stood in the streets, under the shelter of umbrellas, frequently catching 'side wipers' from the pipes that were lowered to the earth. Nobody appeared to mind the wetting, and many seemed rather to like it! Indeed, everybody we saw seemed to be in a good humor.

"It is admitted, on all hands, that the public test was a very gratifying success to all concerned—to the committee of Water Works; to the people, who are so vitally in having a thorough protection from fire, and the Holly Company, who had invested so extensively in the *experiment!*

"Visitors here, from all points, were enthusiastic in their praise of the Holly System, and we heard many of them predict the erection of works, on the Holly Plan, in the cities they represented, before another season past over. Our Memphis visitors, who wished to see for themselves the practical working of a theory which they approved, were especially delighted with the test. In fact, we should not particularize where all were so enthusiastic in admiration, and so determined to secure the system for the places they represented. The inauguration of the Holly Water Works has opened a new era in the history of Dayton; and henceforth our citizens can sleep with a sense of security that they have hitherto been strangers to."

After such a public and satisfactory demonstration, the Common Council accepted the works. The construction had been directed and

prosecuted to completion in the face of the strong and persistent opposition of a respectale minority of the Council. Upon the question of accepting the works however, the affirmative vote was UNANIMOUS

Jackson, Mich.

These works were tested on the 25th and 26th days of August, 1870, and the occasion was one of universal interest to the public-spirited citizens of that young but thriving and beautiful town. Her local press—the *Patriot* and *Citizen*—gave detailed and enthusiastic accounts of the performance and attending ceremonies. The former, among other things eulogistic of the works, stated:

"Large crowds of people thronged the city to witness the trial, among whom we noticed many citizens of surrounding towns and cities. Everybody seemed exceedingly pleased with the performance of the works, and our citizens congratulate themselves on apparent immunity from destructive fires."

The *Citizen*, in its account, had the following in reference to a part of the machinery:

"Pursuant to adjournment, the committee met together at the Water Works at eleven o'clock to-day, and the first thing in order was a test of the efficacy of the Automatic Pressure Regulator and Telegraph Machinery. It would seem almost as though this apparatus was endowed with a brain, so unvaringly and accurately does it perform the work for which it is intended. From 'no time all' to twenty seconds from the opening of an hydrant, according to the distance from the works, the relief of the pressure in the pipes acts upon this machine by opening the cylinder, which drops, accelerates the speed of the machinery, and at the same time opens an ear-piercing whistle; so that in any case of extraordinary demand for water, as for a fire, power sufficient to supply it is immediately given, and by the alarm the engineer is placed upon the alert to supply additional steam, and other duties involved upon him by the exigencies of the occasion. When the first hydrant was opened, just nine seconds elapsed before the alarm sounded and the increased motion was given; and when the water was released from the hydrant close to the works, the action was almost simultaneous, no time at all being indicated by the second-hand of the watch.

"As the parties left the building, each one felt a peculiar joy in his heart that we had become the possessors of such a desirable acquisition, and felt, as was expressed, like dedicating it as a monument to the untiring zeal and energy of our worthy Mayor, to whose efforts we are so largely indebted for its conception and completion."

The editor of the Saganw (Mich.) *Courier*, who, with the Council

of that city, was present, among many other invited guests, published an account from which the following paragraphs are selected:

"The machinery, as a whole, is as perfect as human skill and ingenuity ever devised, and elicited the highest encomiums from all practical mechanics who saw it work to-day.

"The trials to-day were more than satisfactory. The first was the throwing of two streams, each through 1,000 feet of hose, over 100 feet high. The test lines were drawn across the street, near the Hibbard House, and the water from the pipes not only reached them, but went above them from twenty-five to thirty feet. The second test—that provided by the contract—the throwing of six streams at one time, was equally satisfactory, the streams being thrown anywhere from twenty to forty feet above the test lines. The scene, when these six streams were in full blast, was very animating and auspicious. As they continued to throw these large volumes of water high above any buildings, all along the main street, and over a mile distant from the Water Works, the spectators knew that the Jackson Water Works was a success, and that hereafter they were to have an abundant supply of water, and the best protection against fire ever instituted.

Covington, Ky.

A correspondent of the *Cincinnati Enquirer*, sketches the trial of the Holly Water Works in the above city in April, 1871, in the following terms:

"The official test of the Holly Works Machinery recently erected in this city, was one of the most noticeable events that ever transpired here. The test was most thorough, as it was performed in accordance with the programme published in the Cincinnati papers of Wednesday. The first test was to demonstrate the time required to raise the water pressure on the pipe throughout the city from forty pounds to one hundred pounds to the square inch. This was done in thirty seconds; from time of alarm given at the water works office to the pumping house, the gauge in water works office indicated one hundred pounds pressure.

"At precisely thirty minutes past one P. M., the programme was inaugurated by turning in a fire alarm from a fire hydrant. This alarm was given by turning water through the fire hydrant, full, for about one second, closing down again, attaching hose, open the hydrants, and the alarm is given at pumping-house by means of an Automatic Regulator that is controlled by the pressure of water in the pipes.

"In opening a fire plug in *any* portion of the city, this regulator causes a small whistle to sound, calling the engineer's attention to the fact of more pressure being required on the pipes.

"At about two o'clock sections of hose were attached to six fire hydrants, in the vicinity of Pike and Madison streets, and the water was sent rushing up

heavenward through one inch nozzles. It performed the allotted work cleverly and splendidly, giving satisfaction and evoking hearty encomiums from the throng on the streets, and those gathered on the house-tops to gain a fair view of the heighth attained by the streams.

"At fifteen minutes past two, six additional sections of hose were attached, near the corners of Seventh and Madison, within two squares of each other, making a remarkable spectacle.

"These twelve streams were kept up to an altitude equal to the half dozen for half an hour, demonstrating there was no end to the capacity of the works to throw water—the doubters being carried away with the streams. All the streams towered above one hundred feet, and away above the top of any building in the city, relieving those who doubted the capacity of the works to make anything like such a demonstration, prior to the test.

"We are not exaggerating the public sentiment in this matter.

"At three o'clock four one and a quarter inch streams were thrown through sections of hose, and these monster streams towered like great columns of water above the height of one hundred feet.

"At half past three one lead of hose 1,000 feet, and two of 500 feet each, were run out and attached to the fire hydrants, and gave the most entire satisfaction of any effort made during the day, especially to those familiar with the difficulties to be overcome in forcing water through a long lead of hose. Each of these streams was one and a quarter inch, and exceeded 125 feet in height when the wind would lull. The exhibition was finally closed with throwing twelve huge streams of water from the hose without pipes, showing the capacity of the hydrants for sending out water in torrents that would, if the hose were carried to the top of a burning building, quench in short order any flames that could be ignited in an ordinary structure.

"During all these hours of test, the people crowded the sidewalks, frequently catching '*splatters*' from the hose when turned upon the street that made them surge and rush for protection to the nearest shelter. Nobody appeared to mind the wetting, but rather appeared to like it, for it was Hol(l)y water. Everybody seemed to be in a good humor.

"In accordance with published programme, all fire was removed from the boilers at half past four P. M., but owing to the fact of an order delivered at the pumping-house being misconstrued by the party sent, the fire was withdarwn at twelve minutes past four—the steam gauge indicating seventy pounds.

"The machinery was set in motion at twenty-two minutes past four with sixty pounds of steam. At the expiration of one hour from that time, the water gauge indicated a pressure of seventy pounds to the square inch, steam-gauge fifteen pounds and vacuum twenty-two inches. At the expiration of one hour and twenty minutes, water gauge eighty pounds pressure, steam gauge thirteen pounds, with twenty-two inches vacuum; this pressure being equal to raising water 184 feet vertically. At one hour and thirty minutes, water gauge eighty pounds, steam eight, vacuum twenty-two inches. At the expiration of one hour and forty-five minutes, water pressure eighty-eight pounds, steam

gauge six pounds, vacuum twenty-two inches, eighty-eight pounds pressure of water being equal to raising it vertically 202 feet. After running two hours the water pressure was ninety-five pounds to the square inch, steam none, vacuum twenty-two inches.

"From and after the expiration of two hours, the machinery was run with a vacuum in the boiler (steam exausted), This continued to run the machinery until closed down, after two hours and twenty-seven minutes from the time of withdrawing the fire from the boilers, pumping 281,880 pounds of water 184 feet vertically, the engine making twenty-two revolutions a minute on the average.

"Visitors here from all points were enthusiastic in their praise of the Holly System, and we heard many of them predict the erection of works on the Holly Plan in the cities they represented before another season passed over."

Cumberland, Md.

Upon the acceptance of the Holly Water Works by the authorities of the above city, in October, 1871, the following tests were made as described by the *Daily News* of that city:

"Precisely at the appointed moment the loud, hoarse whistle of the Water Works sounded the signal to open the first two hydrants mentioned in the programme, when instantly two streams shot high up in the air, and could be seen from many points in the city.

"For the information of those unacquainted with our city, and for the sake of a record of the matter, we will state that the farthest plug opened at that time was about three quarters of a mile from the works and the other a little less than one quarter of a mile, the two being about a half mile apart, and both at an elevation of about thirty feet above the Water Works.

"Again, at the appointed time, *two more streams* sent forth volumes of water, and although there was considerable breeze at the time, the distance reached with the water was greater than when two streams only were throwing.

"And again the signal sounded for *two more streams* to be thrown, and then away went six volumes of water steadily, strongly, beautifully—up and down the street, over the house tops and away up in the air. There was no diminution—steadily and surely the streams kept on, the men held firmly to the pipe, and played the water in all directions; but at last they began to weary of holding so long and steadily, as the pipe required the united strength of three men to control each nozzle. It seemed that HOLLY meant to tire out human strength, for still the water kept spouting, with no perceptible change, when, at last, after nearly an hour of constant, regular throwing, the signal sounded and the hydrants were closed, much to the relief of the pipemen, one of them exclaiming, 'I wondered if they meant to pump the river dry before they stopped!' During the time that these six streams were thrown our reporter visited the works to see things as they were there. He found the steam gauge to

to indicate seventy-five pounds, and the average water pressure to be 125 pounds. The large engine only was in operation, and was working regularly and smoothly, without any apparent labor.

"After the trial on Baltimore street, another took place on the highest portion of the hill above the works. Hose was attached to the plug in front of Mr. George Henderson's residence, on Washington street, fully a half mile from the works, and also at the same time to a plug on the corner of the street opposite Judge Pearre's residence, these two being the farthest and highest points from the works on the west side of Wills' creek. The elevation above the river is about *one hundred feet*. This was to prove how far the distance and elevation through only a four inch main, could be overcome. We are pleased to record that at both places an inch stream of water was thrown at least *one hundred feet*.

"Trials also took place on Columbia and North Centre and Mechanic streets, proving highly satisfactory. With this last exhibition of the powers and efficiency of the Holly System, the trial ended with a glorious success for the Holly Works.

"The following summary of the distance water was thrown is as near correct as we could arrive at, and was determined by measuring such distances as could be done, and estimating others by the known heighths of surrounding buildings:

Streams.	*Perpendicular.*	*Horizontal.*
Two 1 inch.	115 feet.	160 feet
Four 1 inch.	125 feet.	180 feet
Six 1 inch.	128 feet.	198 feet

"This, we believe, greatly exceeds the agreements specified in the contract, and to all persons seemed to be fully satisfactory."

Denver, Colorado.

The *Denver Tribune* of January 8, 1872, gives the annexed account of the trial of Holly Water Works in that young and thrifty city:

"The formal trial on the afternoon of Saturday last, demonstrated beyond contradiction the thorough success of the Holly System of Water Works, which have been for many months in process of construction in this city. By universal and spontaneous acclaim our citizens pronounced the verdict of unqualified satisfaction and approval.

"The test of last Saturday—preparatory to turning over the works to the 'Denver City Water Company'—determined, first, that the time from the opening of the hydrant, on the corner of F and Larimer streets, to the blowing of the alarm whistle at the engine house, was about fifteen seconds, whereupon the pressure was increased from the ordinary to the fire pressure; second, that the rotary engine and *rotary* pump, (held in reserve for fire purposes) threw four one inch streams over the test pole of one hundred feet in height; (This experiment brought into use only about three-fifths of the entire power of

varying demands for water—securing its flow without any circumlocution or extra lift into Reservoir or Stand Pipe—to the precise point, and in the exact amount needed for use, either in daily supply or for throwing fire streams from hydrants.

ADVANTAGES OF HOLLY'S SYSTEM.

Among the advantages of this invaluable and comprehensive system over the old methods of Water Supply and Fire Protection, are the following :

1. These works, it is to be observed, meet a public necessity, inasmuch as they combined Water Supply and Fire Protection, 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.

2. 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 to an extra height, and a large sum per year for operating this machinery. This folly and waste of power is avoided by the Holly System. Its efficient machinery reaches after the water, lifts it through its under-ground 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.

3. Another 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

the engines ;) third that the *gang* pumps and main piston engines (for general domestic purposes) threw six streams 130 feet high, under water pressure of 120 pounds to the square inch ; and, fourth, that the *rotary* pump and main engine threw six streams about 140 feet in height. The full capacity of the engines is 400 horse power, and able to throw twenty streams over the test pole, as readily as the six above referred to. Another fact was satisfactorily demonstrated, that, although at the rate of six streams for twenty-four hours, 4,500,000 gallons of water would be used, yet, during these trials, the reservoir showed no material decrease. The supply of water is considered inexhaustible. The well is thirty-eight feet in width by fifty-eight feet in length, and will contain about twelve feet of water at all times."

Schenectady, N. Y.

(From the Schenectady Union, June 17.)

"The completion of the Water Works consumates an event that is vitally connected with the welfare of the city. It supplies a need that has long been felt, and which was known to be indispensable to the growth and development of the city. It is an enterprise that will be far-reaching in its results, and will be the foundation of many others that could not have existed but for it. Indeed, it may be said the starting point of our significance and importance as a city, especially in a manufacturing sense, will date from the time when the beautiful sight of Saturday, June 14th, was seen. The towering columns of water, six in nnmber, that lifted themselves high above our highest buildings, and filled State street with a watery blaze of glory, constituted a scene of beauty, of progress and of hope, greater than ever before rejoiced the hearts of our citizens. In the brilliant rainbows that glistened in every part of the street on that ocasion, produced by the action of the sun on the water from the pipes, could be read the promise of our future growth, the assurance of our increased prosperity and the evidence of our substantial progress.

"The water for the works is obtained from wells constructed near the river. The wells altogether are 194 feet long and from 3½ to 5 feet wide, and about 10 feet deep. The water is filtered into these wells through the soil, or natural filters, and is of the most excellent quality. The filtering surface of the wells amounts to over 2,000 feet, and they will hold 50,000 gallons of water.

The exhibition of the works on Saturday, was witnessed by a large portion of our people who were delighted with what they saw. Streams were thrown from six hydrants at the same time, through nozzles an inch and an inch and a quarter in diameter. State street seemed to be literally filled with water. The streams were thrown horizontally a distance of two hundred feet, and perpendicularly from one hundred to one hundred and thirty feet. Six steady streams, all standing simultaneously far above the highest building on State street, and reflecting beautiful rainbows at every point, and filling the street from Ferry to the Park with a thick mist of many colored beauty, presented a scene that will not soon be forgotten, and which drew forth many expressions of enthusiastic

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.

4. 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 engines, 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 be, near at hand, several hydrants—which, under this system, is but an other 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 overestimated, 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.

5. 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, the 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.

drawing smoke out of a room, no stream is more effective. Engine No. 1 will be for sale after the Holly is in full operation, and the purchasers will have in it the only engine of its capacity that has showed to such advantage in contrast with the Holly."

Rock Island, Illinois.

(From the Davenport Gazette, July 19, 1872.)

The citizens of Rock Island indulged in a Water Works jubilee yesterday, and scores of Davenporters were over to help them. It was the day appointed for the formal, official and severe test of the Holly System of Water Works, which has just been completed there. The proceedings opened at ten o'clock, when the Western Steam Engine Company marched to the house of the Eggleston steamer, and then both companies, with the Mayor, Alderman and Water Commissioners, headed by a band, marched to the Market Sqnare. Then the four hose companies went to the various fire plugs on Illinois street, and laid hose for six streams, each of which was to be thrown at least one hundred feet high, according to contract, and all to play at the same time. When all was ready, the signal was given—and in a minute a one and one-eighth inch stream was playing over the bell-tower on the old Presbyterian church—forty feet above it. Another at the corner of Illinois and Second streets, reached a height of 113 feet; the third went up 145 feet; the fourth, at the *Argus* office was sent 109 feet; the fifth played a distance of 107 feet, and the sixth and last went far over the chimneys on the Harper House, its highest point being 108 feet. During the test a water pressure of 115 pounds to the square inch was kept on the pipes, with a steam pressure of ninety pounds. In fact, the trial was as much a test of hose as of the works, and several sections burst.

The trial passed of to the satisfaction of everybody. Thousands of people were in the streets to look at the streams. Expressions of delight could be heard on every hand, and many of the men who confessed they opposed the works in the beginning, were now among the most enthusiastic to praise them.

The streams were splendid ones—steady, strong, and full volume for a long distance from the nozzles. It was as if six steam fire engines were at work—only there was none of the "rumble, grumble and roar" which attend steamers when in operation.

Well, the throwing test as to number of streams being concluded, the Firemen, City Council, and Water Commissioners proceeded to the Court House park, where

Lunch and Speaking

were in order. Several Aldermen and other citizens of Davenport were among the invited guests. Substantial food and cooling drinks were served upon long tables, and the dinner was heartily enjoyed.

After appetites had been gratified ex-Mayor Eggleston introduced Mr. Geo. H. Parker of this city, who made a sensible speech, in which he congratulated the Rock Island people on the result of their public spirit and enterprise as manifested in the imporvement.

dozen streams can be thrown at once, if necessary. Then the convenience for house-keepers, hotels, stores, livery stables, and manufacturers cannot be overrated. We hope our citizens will make it a matter of business to cross the river and examine these works—then before long we shall have the city full of water works enthusiasm, and so the works will be here before long.

OFFICE ROCK ISLAND WATER WORKS,
July 19th, 1872.

At a meeting of the Commissioners of the Rock Island Water Works, held this day, Commissioner Eggleston introduced the following resolutions, which were unanimously adopted :

WHEREAS, The Commissioners of the Rock Island Water Works, appointed by the City Council, made and entered into a contract on the nineteenth day of September, 1871, with the Holly Manufacturing Co., of the State of New York, to deliver, set up, and put into operation, a set of machines, consisting of engines, pumps, and all the necessary working machinery as set forth and described in said contract, and,

WHEREAS, Said engines, pumps and machinery have been erected and tested by the said Holly Manufacturing Co., in accordance with the terms and conditions of said contract ; therefore be it

Resolved, That the works as erected and put in operation for the city of Rock Island, by the Holly Manufacturing Co., be, and are hereby accepted.

Resolved, That the test made yesterday by throwing six streams of water over one hundred feet high through the ordinary nozzle, simultaneously, meets the unqualified approbation of the Water Commissioners, and exceeds their most sanguine expectations.

P. L. MITCHELL, President.
THOMAS MURDOCK,
WM. EGGLESTON.
JAMES KELLY,
GILPIN MOORE,
JACOB RILEY,
J. H. DRAYTON,
Water Works Commissioners.

THE HOLLY SYSTEM OF WATER WORKS—WHAT IS IT ?

It will be noticed that Holly's Plan of Water Works is to place his Pumping Machinery within a frost proof and fire proof building. This machinery may be propelled either by Water or Steam Power. Experience has demonstrated that the best combination is the Holly Piston Pump (with several cylinders taking stroke in succession,) for daily supply under low pressure, and the Holly Patent Eliptical Rotary in reserve for powerful efficient Fire Streams. By means of the Holly Hydrostatic Regulator and other ingenious contrivances, the motion of this machinery is put under the control of the pressure of water in the street mains supplied by it, and the movement is thus increased or diminished in exact ratio to the increase or diminution of the draughts from these mains. Thus the Pumping Machinery responds to the

varying demands for water—securing its flow without any circumlocution or extra lift into Reservoir or Stand Pipe—to the precise point, and in the exact amount needed for use, either in daily supply or for throwing fire streams from hydrants.

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2. 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 to an extra height, and a large sum per year for operating this machinery. This folly and waste of power is avoided by the Holly System. Its efficient machinery reaches after the water, lifts it through its under-ground 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.

3. Another 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

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.

HOLLY VS. FIRE ENGINES.

The relative efficiency of the Moveable Fire Engines and the Holly Stationary Fire Engines has been much discussed, but has been conclusively settled, by numerous trials, in favor of Holly. The following are given as specimen results of contests between these two agencies for fire suppression:

Minneapolis, Minn.

In June, 1869, there was a firemen's tournament at Minneapolis, Minn., and steamers were brought thither from various points on the Mississippi river to compete with the Holly Works just then put in operation there. The *Tribune* of that city gives this account of the trial:

"At the conclusion of the speaking the fire companies returned to the city for a trial of the Water Works and engines. Upon reaching the Cataract House a halt was made, and the Minneapolis companies attached their hose to three of the hydrants on Washington avenue, and threw six streams of water for some time, giving general satisfaction. From here they proceeded to the canal at the mills, where a general trial toook place, which resulted in the triumph of the Water Works over the steam and hand engines. The following is the result:

"Cataract Engine, of Red Wing, through a three-fourth inch nozzle threw 250 feet.

"Steam Fire Engine, City of St. Paul, through one and one-eighth inch nozzle threw 233 feet.

"The Minneapolis Water Works, through a one and one-quarter inch nozzle threw 277 feet.

"Cataract Engine, of St. Anthony, through a seven-eighth inch nozzle threw 181 feet and eight inches.

"On a second trial through a one inch nozzle threw 198 feeet and ten inches.

..e indicated 151 pounds pressure. Then Holly went up with five powerful streams, while Newport went out of the ring—feeling well, but not eminently satisfied.

"The Newport had 190 pounds pressure, and was barely able to force one stream to the distance that the Holly streams reached, and then had to stop three times, while our works *kept on.*

"The cistern from which the Newport took suction, was being supplied by the Water Works during the contest, the water flowing into it so fast, that the engine could not keep the streets from being flooded. This was an additional taxation on the pumping works of the Holly."

HOLLY WATER WORKS AS A FIRE EXTINGUISHER.—UNIFORM AND EXTRAORDINARY EFFICIENCY.

What the above amateur tests indicate is abundantly demonstrated in practical use of the Holly Plan for the suppression of fires. The movable fire engine system bears no comparison with it in efficiency, as the following examples plainly show.

Lockport, N. Y.

In Lockport, where these works have been longest in use, it is universally acknowledged by the citizens. that the prompt suppression of a single one of the fires which have occurred, 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 twenty feet wide on the street, and seventy-five 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 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,

"Germania Engine, St. Anthony, threw 166 feet and four inches.

"Minnesota Engine, St. Anthony, threw 166 feet and three inches.

"On second trial threw 178 feet and three inches.

"The St. Paul steamer threw a fine stream of water, but of course cannot throw as far nor near such a volume of water as the Water Works. The trial yesterday was a very fair one and seemed to satisfy every one of the great superiority of our Water Works over everything else. It threw water with such force on the roof of the Morrison planing mill as to tear the shingles off.

Auburn, N. Y.

At the reception in Auburn, N. Y., of a fire company from Utica with their steamer, a fire stream trial was had, and the *Auburn Advertiser* makes the following statement in regard to it:

"The trial was made at the corner of Genesee and South streets, the steamer taking water from the reservoir, a large crowd of interested spectators being present to witness the sight. Fifty feet of hose were used, the pipes being held at the same elevation, the steamer using an inch and one-eighth nozzle, while the Water Works used one of an inch and three eighths. On a fair measurement it was conceded that the latter threw its stream fifteen feet farther than that of the steamer, and throwing a much heavier volume of water.

"The crowd were enthusiastic in their plaudits at the result, which sets at rest all questions as to the immense superiority of the Water Works."

Norwalk, Ohio.

In Norwalk, Ohio, a firemen's tournament was held August 31, 1871, which brought together a number of steam engines from various parts of the state. The performance of the best steamer was 234⅓ feet horizontal, while the Holly Water Works throw 265 feet!

Buffalo, N. Y.

The Buffalo *Courier* gives the following account of a contest between the Holly Water Works and a steamer in that city:

"A second trial of the Holly Water Works took place yesterday forenoon, in the vicinity of Niagara street and Forest avenue—this time, with especial reference to the settlement of the question whether Black Rock, in view of the completion of the works, would require a steam fire engine, and whether the Common Council would find it necessary to make an appropriation for the same. The steamer Geo. R. Yaw was brought into competition with the Holly hydrants, and although she did good execution, she but illustrated beyond question, not only the efficiency of the Holly but its absolute superiority. The steamer first took suction from the reservoir pressure, for the purpose of showing

what results could be obtained from pressure and steam combined. Necessarily, the display made by the steamer was a good one. Still later the steamer took suction from the canal, at the foot of Forest avenue, and played through about five hundred feet of hose, with a one and one-eighth inch nozzle, while the Holly hydrant supplied one line of hose of the same length, with a one and one-fourth inch nozzle, a second line of hose about four hundred feet long, with one inch nozzle. There was a pressure of about one hundred and thirty-five pounds at the point of trial. The experiment on the Holly hydrants was continued an hour, during which time the streams were uniform, while those of the engine were fitful and uneven. In the hour, the Holly pressure burst one link of hose, while the steamer was compelled to suspend work five times within forty minutes, to repair damages caused by disrupted hose. The perpendicular stream thrown from the Holly hydrant ranged from about 110 to 120 feet, and the spray of the steamer's stream reached the same altitude with her best effort which could be obtained with 120 pounds of steam and 180 pounds water pressure. The best horizontal stream thrown by the Holly Works was about 200 feet, while that of the steamer fell short from ten to twenty feet.

"After the contest, a line of hose between 800 and 900 feet in length was attached to a Holly hydrant and water forced through a one and one-eighth inch nozzle, a distance of 120 feet, while another hydrant stream was being thrown thrrough 400 feet of hose. This execution needs no comment from us ; it speaks more eloquently of the splendid effectiveness of the Holly System than anything we can say. More continuous and uniform than the steam fire engine, the Holly streams were thrown to a greater distance and showed far less liability to burst the hose."

Indianapolis, Ind.

The Indianapolis *Sentinel* recently published the annexed account :

"The insurance men, who have been holding a convention in this city for the past two days, having expressed a desire to test the facility with which the Fire Department and Water Works could be brought into service in case of an emergency, a trial of the same was had yesterday afternoon,

"At four o'clock prompt the signal for starting was given from the central alarm tower and the department turned out with all their customary vigor. Within four and a half minutes all three of the engines were throwing water ; so, also, the Water Works. The No. '1's' were the first, water issuing from the nozzle in less than three minutes. This engine threw from the cistern in front of Hubbard's block. The No. '3's' was second, and the 'John Marsee' third. The former engine was delayed at crossing of Union tracks by a freight train, and the latter by lacking sufficient suction pipe to reach the water in the cistern ; which fact probably made one minute's differenee in the time for each.

"The No. '3's' used a one and one-eighth inch nozzle ; the 'John Marsee' a one and one-fourth ; the No. '1's' a one and one-eighth, and the Water Work, part of the time, a one and one-fourth, one and one-half, and two inch. The test was eminently satisfactory ; enormous quantities of water, sufficient to

deluge a block, being thrown in an incredible short space of time. The Water Works used the hydrants corner of Circle and Meridian. and Washington and Meridian streets ; the latter in partially replenishing the cistern. During the early part of the trial the hose connecting with the first-named hydrant burst some two or three times, not being sufficiently strong to stand the pressure Water, both by the engines, and by the Water Works was thrown fully 125 fett high, and far over the roof of the *Sentinel* building.

"The trial demonstrated one thing, that in a fair, square tuzzle with the Holly System of Water Works, giving each equal facility as regards steam and pressure, the balance of power is decidedly against the steam fire engines, and our gallant Fire Department will have to recognize the fact.

"The stream from the Water Works yesterday, barring the bursting of hose, indicative of its tremendous force, was a solid, irresistible avalanche of water ; and that, too, thrown without noise, smoke or confusion whatever.

"The insurance men expressed themselves highly pleased with the experiment.',

Covington, Ky.

A Cincinnati paper gives the following account of a contest in the city of Covington, between the Water Works and a Steamer from the neighboring city of Newport, Ky. :

"A few days ago there was a formal public test of a set of Holly Works at Covington, Ky., which attracted a large crowd and tapered off with great eclat. The day after the firemen of the neighboring city of Newport, ambitiously entered the ring in contest with this new competitor.

"About four P. M., a large delegation accompanying the steam fire engine 'Newport No. 1,' to test the thing and throw water for the edification of those who had little faith in 'HOLLY.' They raised steam, and threw a fine stream of water away above the wire stretched across Madison street, at a height of one hundred feet, for which feat they received boisterous cheers ; their spurt lasted about five minutes, when they shut off to recuperate *and get up steam*, which they did in a commendable short space of time, then away went the water again even higher than before.

"In the mean time 'our Holly' had not opened. When they did, it was through a one and one-half inch nozzle, throwing through one hundred feet of hose, and keeping it up as long as desired. Then an additional stream of one inch was put on. Away it went, far above *either* stream of the former ; then *three more ;* then a one and one-half inch stream, all going far above the one hundred feet mark (a wire stretched from Walker to Drexilleus' store). As the pressure on the pipes throughout Covington—over sixteen miles—was but 105 pounds to the square inch, Dr. Cushman, electrician of the fire-alarm telegraph, sent word to put on heavy pressure, which was immediately responded to by the engineer at the works, and in twenty-five second the gauge in the Water Works

office indicated 151 pounds pressure. Then Holly went up with five powerful streams, while Newport went out of the ring—feeling well, but not eminently satisfied.

"The Newport had 190 pounds pressure, and was barely able to force one stream to the distance that the Holly streams reached, and then had to stop three times, while our works *kept on.*

"The cistern from which the Newport took suction, was being supplied by the Water Works during the contest, the water flowing into it so fast, that the engine could not keep the streets from being flooded. This was an additional taxation on the pumping works of the Holly."

HOLLY WATER WORKS AS A FIRE EXTINGUISHER.—UNIFORM AND EXTRAORDINARY EFFICIENCY.

What the above amateur tests indicate is abundantly demonstrated in practical use of the Holly Plan for the suppression of fires. The movable fire engine system bears no comparison with it in efficiency, as the following examples plainly show.

Lockport, N. Y.

In Lockport, where these works have been longest in use, it is universally acknowledged by the citizens that the prompt suppression of a single one of the fires which have occurred, 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 twenty feet wide on the street, and seventy-five 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 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 every other case in Lockport, the breaking out of a fire, when the works have been in operation, has been followed by its prompt suppression WITHIN THE BUILDING IN WHICH IT ORIGINATED.

In February, 1872, a fire broke out in the Holly Manufacturing building, and if it had been destroyed the claim of superior merit for the system would have been met by the injunction of "Physician heal thyself." Was it destroyed? The Lockport *Union* of February 10, 1872, tells the story.

"A fire occured last night in the Holly building. Property to the extent of one hundred and fifty thousand to two hundred thousand dollars was in great jeopardy, and, but for the most perfect system of water protection yet devised, there would have been a total loss. The fire started in what is called the 'core oven,' a room devoted to drying and hardening the moulded sand about which certain castings are made. It communicated almost instantly to the boiler room adjoining, constructed in most part of wood, thence ascended to the loft and to the roof of the middle structure of the extended main wing on Caledonia street. All the wood work, consisting of casings, floors, roof boards, partitions, shelves, etc., was dry as tinder. Five minutes from the time the fire got headway, was sufficient to set the whole upper part of the wing referred to, some 100 feet or more, in one unbroken flame. It was at this stage that the Holly System of Water Works was put in operation. Ten streams of water did the business. The completely charred floors, beams, rafters, etc., shows how stubbornly the fire resisted the watery element.

"Such a contest between fire and water never before occured in this city. We doubt if there are many instances recorded anywhere. Hundreds of our citizens visited the scene this morning, and but one expression was heard, and that was that no system of Water Works except the Holly System, could have saved from total destruction the entire buildings of the company. It was the severest test that could have been applied, The triumph is complete, overwhelming."

Auburn, N. Y.

Since the erection of these works, several fires have broken 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

9th 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

was disposed of in the following summary manner, according to the Ogdensburg *Journal* of April 16, 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 Co. 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 the arrival of the Hose Co. 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!!

Another fire took place in Ogdensburg on the 21st of July, 1870, which the *Journal* of that city thus describes:

"A fire broke out in the new wooden dwelling house of J. F. Arnold, on Green street, about eleven o'clock Wednesday night. It took in the chamber over the kitchen, and when discovered was well under way, having communicated to the garret of the whole building. Yet in a short time after the alarm the firemen were at work and had the fire reduced and under control. The building was most elegantly finished and just ready to be occupied. The damage from fire and water will reach probably $1,500.

"The performance of the Water Works on this occasion was most satisfactory. In one minute after the alarm was sounded, sixty pounds pressure was upon the pipes, and the flood of water from the hose was overwhelming. It is owing entirely to the efficiency of the works that we are spared the presence of a great black burnt district in one of the most beautiful places in the city.

"The first stream of water passed through the pipes, in this city, on the first day of November, 1868, but up to Wednesday night we have neve
opportunity to test their full value as a fire annihilator. On this occ
took in a wooden building in a locality where it could not burn withc
nicating fire to several other buildings, and was well going when
The water in the pond was at its lowest ebb, the weather so dry th
was like a tinder box. Yet, instantly after the alarm, the pumps

An instance in this village during the year may be cited, where twenty thousand dollars worth of property was saved by a *single* fire hydrant, and this hydrant was eight hundred feet from the building saved. The Baptist Female Seminary is referred to. This building would have been destroyed but for the single hydrant above named."

Canton, Ohio.

Since the Holly Water Works were put in operation in Canton, there had been two or three fires there which were promptly and easily mastered with trifling loss. It was not fully understood, however, by her citizens, what these works were worth for the protection of property, until the night of October 17th, 1870, when a fire broke out with results as stated by the local newspapers in the following terms. Says the Canton *Democrat*, in its issue of October 21st :

"On Monday night about, ten o'clock, our city was endangered by a serious fire which broke out in Mr. Doud's stable in Court Alley, west of Market street, and on the block immediately south of the Square. It was soon enveloped in flames, and the fire soon communicated to the two stables of C. Oberly, reaching 7th street, and the wind blowing from the southwest, in a brief time lashed the flames into fury. The stables of course were more or less full of hay, straw, oats, &c. Mr. Oberly's large two story frame warehouse abutting his stable on the east also caught. Indeed the flames spread very rapidly, and for a time looked very dangerous, threatening to sweep through to Market street, and north to Eagle block. Our firemen and hosemen were soon in position and got their hose attached to the water plugs. From three to six fierce streams of water continued pouring upon the fire for over an hour, and gradually subdued the raging and devouring element, and prevented its spreading.

"Our citizens again on this occasion witnessed the efficacy of our Water Works. IT IS HARD TO SAY WHERE THE FIRE WOULD HAVE RUN TO HAD WE DEPENDED ON THE OLD SYSTEM OF CISTERNS AND ENGINES AND WELLS."

The other city paper—the Canton *Repository*—after giving a detailed account of the severe conflagration, adds the following :

"It is unanimously agreed that OUR SYSTEM OF WATER WORKS REPAID THEIR ENTIRE COST ON MONDAY NIGHT. The entire Eagle and Harter's blocks must have been destroyed, for a high wind was blowing from the south. Indeed we doubt if the fire could have been stopped until it had swept to the north end of the city. Houses three blocks distant caught fire time and again, and flaming shingles were borne on the wind for a quarter of a mile. The old barns amid which the fire raged was tinder, yet even some of these were saved, and that after their mowsful of hay had been filled with flame time after time. Through all the hose it is computed that an amount of water equal to the cubic contents of all the available cisterns was emptied

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."

Another 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 Binghamton *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."

Of another fire in Binghamton, on the 28th of May, the *Republican* says :

"Almost as soon as the people in the immediate vicinity of the fire were aroused, the fire companies were on the ground and had the fire under control.

"There were a number of valuable frame houses situated within a few feet of the barns, which must have been destroyed had it not been for the promptness and great activity of the firemen, and the valuable aid of the City Water Works. Those houses were only slightly damaged by the heat, which blistered the paint considerable on some of them.

"It is estimated by experienced firemen that at least twenty-five thousand dollars worth of property was saved by the Water Works. The nearest reservoir is at the corner of Court and Carroll street, and before a stream could have been thrown from that the fire would have ignited six or seven dwellings. In this lies the great value of the Water Works for fire purposes. THEY ARE ALWAYS THERE, ALWAYS READY, AND ALWAYS EFFECTIVE."

Peoria, Illinois.

Soon after the Holly works were introduced into Peoria, a fire broke out in a saloon on Adams street, about midnight. When discovered, the whole inside had the appearance of being a mass of flames. The *Transcript* of that city gives the annexed account of it:

"A section of hose was at once attached to the hydrant, and *in three minutes from the time the fire was first discovered, a stream was playing upon it through a two inch nozzle.* As soon as this stream was set going, another was put into play, and for an hour, two streams, one at each end of the building, played upon the fire, completely flooding the cellar and putting the flames out, after they had gained such headway as to charr the joists and burn nearly through the lower floor.

"If the friends of the Water Works had wished to give a most convincing trial, to show what the works were capable of accomplishing, they could not have planned a better one. Certainly they could not have given a more convincing proof. The pressure at the works was about ninety pounds to the square inch, and the locality of the fire is nearly at the extremity of the pipe laying, about three miles distant from the Water Works machinery. It was as complete a triumph as the friends of the Water Works could have wished, and the premises need only to be examined now, to prove how great was the danger and how successful the rescue. Hereafter, we may as well make up our minds to bid farewell to fires in Peoria. The policy of the Water Works is, not to let two or three buildings burn down, but to put out the fire and save the first building, before the damage is very great, even though the flames have begun to burn fiercely and threaten destruction to a block. That the Water Works can do this, was abundantly proved night before last—proved beyond a doubt."

Speaking of the burning of a grain elevator in Peoria, the *Review* says:

"The fire last night demonstrated in a peculiar way the value of our Water Works. We could not save the building itself, it is true. It was built of pine, with immense bins running from the ground floor to the roof. No water could be got into them, and the fire raged through them as if they were so many chimneys. The draught was so great that large flakes of burning cinders were carried all over the city. The roofs were exceedingly dry, and the wind was blowing steadily from the south. If we had had only the old fashioned ordinary protection, it is not difficult to see what the result would have been. We should have had a dozen fires instead of one. But whenever a building was then endangered, the owners got out their small hose and speedily deluged their premises with water. Many incipient fires were checked in this manner."

Dayton, Ohio.

In Dayton, the Holly Works have performed signal service on

confidence of safety from large conflagrations. It has in THESE TWO FIRES ALONE, IN DOLLARS AND CENTS, SAVED DAYTON THE ENTIRE EXPENDITURE FOR THE CONSTRUCTION OF THE WORKS."

Kalamazoo, Mich.

In Kalamazoo the local newspapers give the following accounts of the fires occuring there since the introduction of the Holly Water Works. The first took place May 6, 1870, and the Kalamazoo *Telegraph* says of it:

"Yesterday afternoon an alarm of fire was sounded from Mrs. Longbottom's house on Portage street. The flames had made considerable progress under the roof, and the chances to save the building looked rather squally. But Phelps has been waiting for just such an opportunity to show off the Holly Works. The hose was brought out, and the water was poured on in several streams, and in great abundance. The fire was squelched at once. It is no use to start a fire in Kalanazoo. There were from two to six streams of water pouring on it at once. The people were pleased to see how quick the thing was done. A few hundred dollars damage was done by fire and water, but there was an insurance on the house for $500. The crowd returned from the scene shouting "Great is Holly! Great is Sweet Water!"

On the 18th of May there was another visitation by fire, with the following result, as stated by the same paper:

"A few minutes before twelve o'clock, last night, flames were discovered bursting out of a barn belonging to LeGrand Whitcomb, located in the rear of his premises on Portage street. The alarm of fire was given, but owing to the impossibility of effecting an entrance to the engine house, there being no keys to be found, a considerable time elapsed before the hose could be got upon the ground, and in the mean time the fire had communicated to an adjoining barn also the property of Mr. Whitcomb, situated immediately in the rear of J. Tailor's residence, and as the fire was rapidly spreading in that direction, it seemed as though that building also would be destroyed; but the hose having been attached to a hydrant on the corner of Portage and Cherry streets, the water was turned on, and then the value of the Holly Water Works was fully demonstrated. The shingles and siding flew in every direction, and the flames that until then had towered above the tree tops, disappeared as if they had been deluged by Niagara Falls, and in a short time hardly a spark of fire was to be seen. There are those in Kalamazoo who have pronounced the Holly Water Works a failure; if they were at the fire last night and witnessed how quickly the fire was extinguished, we have no fear of hearing their complaints hereafter."

The committee on Water Works in Kalamazoo, in their report for 1872, make the following statement:

"Protection from fire is the especially strong point of the Holly System.

several occasions in prompt fire suppressions. Of one of them—occurring on the 13th of June, 1871, the Dayton *Journal*, says:

"On the 13th instant, a little after seven o'clock, a fire was discovered in the extensive Wheel Manufactory of S. N. Brown & Co., southwest corner of Fourth and St. Clair streets. Fortunately, the immense building is supplied with water from the Holly Works, and the water was immediately sent from the hose over the fire, drenching it out in a few minutes, and before the alarm, which was sent from the box in the vicinity, could possibly be answered by the presence of the fire engines.

"A huge fan is used in the manufactory, to carry the dust and shavings away from the workmen to the 'shavings room,' and it was, doubtless, this arrangement which, by rapidity of motion and friction, caused the fire. The flames were forced up into the second story by means of the 'shavings carrier,' and were making frightful headway when first seen.

"Had it not been for the Holly Works in the building, there is no question among sensible men but that the flames would have gained such headway among the combustible matter in the upper floors that the mammoth building would have been past saving before the steamers could have got there and commenced to throw water on the fire.

"Here is a brilliant instance of the invaluable Holly System as a protection against fire."

We learn from the Dayton *Journal*, of January 19th, that on the evening previous a fire broke out in the second story of Harshman's three story brick building, occupied as a bank, corner of Main and Third streets, whence the flames soon shot to the roof. The *Journal's* report says:

"Water was played upon the fire—seven streams from the Holly hydrants—over two hours, when it was thoroughly extinguished. The streams were thrown far over the tops of the buildings, and tore away the shingles from the roof, illustrating the power of the streams to the complete satisfaction of the spectators. Mr. John H. Winters, of Winters' Bank, adjoining, reported no damage of consequence from water. He said the Holly Water Works at the Beckel House fire, and in the fire last night, had saved to Dayton their whole cost.

"While we cannot commend the management of the fire as the best possible under the circumstances, the spectators were again satisfied abundantly that the Holly System of Water Works is worth infinitely more to the city than any fire department that has been devised."

The Dayton *Herald*, which bitterly opposed the introduction of these Water Works into Dayton, speaking of this fire, says: "It is a matter of great congratulation among our citizens that the two great fires—the Beckel House, and Bank corner last evening—have thoroughly tested the Holly System and inspired our citizens with

into the fire every twenty or thirty minutes. THE WATER WORKS SAVED THE CITY."

La Porte, Ind.

Within thirty days after the Holly Works were started in La Porte, in 1871, their value for Fire Protection was tested under the following circumstances as narrated by one of the local newspapers:

"About noon on Wednesday the fire alarm sounded—the flames had caught in the roof of the M. S. & L. S. freight house. The boys were up and on duty like 'old lightning.' Engineer Ephlin immediately opened a hydrant, and in *six seconds* the chime whistle answered at the Water Works. In just *six and a half minutes* from the time the Court House bell first rang, the stream was playing on the fire, and some ten minutes thereafter the order was given to take up the hose, the flames being literally drowned out. Within *twenty-eight minutes* after the first alarm, the hose was back in the engine house. The whole affair did not occupy quite half an hour."

Decatur, Illinois.

In April, 1872, the fire alarm was sounded in the above city, and the cause and results are thus stated by one of the local newpapers:

"About one o'clock A. M., Friday, a fire broke out in the old Edson House, on the corner of Morgan and Eldorado streets. The fire originated in the kitchen, and the proprietor of the hotel, with great promptitude, took an ax and immediately broke in the doors of the boarders' rooms in order to get them out. Two men in the immediate vicinity of the destroying element, just escaped with their lives, as the roof fell in almost at the very instant of their exit from their rooms. The fire had got well under way before any assistance came to hand. The hose company got there in good season after the alarm was sounded, and immediately got a stream to work, and right well did our Water Works perform its duty. The building was built entirely of wood, and though the fire had a furious start, the amount of water poured upon it entirely extinguished the flames, and left two corners of the building standing—a good test of the protection we have instituted here."

Saratoga Springs, N. Y.

The engineer of the Holly Works in Saratoga, gives the following account of a fire in that village in September, 1871:

"On Wednesday night, the 13th inst., during the Fireman's Tournament in this place, we had a terrible conflagration in this town. There were three distinct fires started by some villains in human shape, and before the firemen were ready, the flames had gained a fearful headway. Our works were ready

some time before the firemen opened a hydrant. However, everybody turned out, and plug after plug was opened on the fire until there was *twenty going at one time;* but our works kept them all fully supplied, To illustrate the difference between our stream from a plug and that of a steam fire engine, I will state the following facts: During the prevalence of the fire, a steam fire engine coupled their suction to one of our hydrants near the scene of the fire, and to the same hydrant men had attached 150 feet of hose, and the stream of water thrown from the hose beat that thrown from the steamer at least twenty-five feet. So you will see that the steamer was only in the way, as water could have been thrown further directly from the hydrant than passing through the pumps of the steamer. The streams from our works were kept going with a uniform force all night long. Nothing wearied, nothing gave out—continually was the water flowing in streams, far exceeding the several steam fire engines, and at last the flames were subdued, and Saratoga was saved. Hundreds of people visited our works the morning after the fire, to see the machinery and express their admiration of its great powers and efficiency. Everybody said steam fire engines are of no use where Holly reaches. Our water pressure during the night of the fire was kept at 110 to 115 pounds. All worked smoothly and satisfactorily."

In March, 1872, there was another fire in Saratoga. The *Saratogian* stated:

"At half-past twelve o'clock this morning, a fire broke out in the dry-house of Morey's Tannery, on Willow Walk. The alarm was not sounded as promptly as it should have been, but as quick as the hose companies were on the spot, and attachments made to the Holly Works hydrants, the flames were met by two powerful streams, and their further progress checked, although not until an immense pile of bark piled near by had caught fire. The Zion M. E. Church was somewhat scorched by the fire. The fire got underneath the bark, and it being impossible to reach it with a stream, probably two-thirds of the entire pile will be consumed. Three streams have been playing on the bark all day, and still the smothered fires are burning underneath.

"The cold last night was intense, and the gallant hose boys suffered greatly from the frost, many of them being completely encased in garments of ice. The supply of water was abundant, and the power of the streams projected was tremendous. No engines turned out all, the Holly Works furnishing all the water required."

Cumberland, Maryland.

The Cumberland *Daily News* of March 2, 1872, chronicles the occurrance of a fire in that city in the following terms:

"At about eleven o'clock A. M. yesterday, the roof of the old wooden house on the hill on Green street was discovered to be on fire. The alarm was promptly given at the Water Works, and there being some hose and pipe at the

works, they were immediately carried to the street plug nearest the fire, and speedily attached and water thrown upon the burning building, and the flames at once extinguished. So quick and perfectly was the fire put out, that by the time the Pioneer hose reel arrived upon the spot there was no fire to be seen, although the great whistle at the Water Works had very promptly sounded the fire alarm. The efficiency of the Water Works as displayed upon this occasion was entirely of the most satisfactory character, and gave renewed assurances of the ample fire protection afforded by the Holly Works. But for the promptness of these works we should undoubtedly have to chronicle a conflagration, as the house which was on fire is surrounded by old dry wooden buildings, which, had the flames reached, would have made a terrible fire."

On the 17th of April, another fire broke out, and the *Alleganian* says of it:

"Several fires occurred last week, though not attended with heavy loss. The first in order was the partial burning, on Wednesday last, of the stable in the rear of the property of A. L. Withers, Esq., on Bedford street. The building being of brick, nothing but the roof was destroyed, causing a loss of perhaps one hundred and fifty dollars. A high wind prevailing at the time excited a good deal of apprehension for the safety of adjacent property, but the Holly Works proved equal to the occasion, and speedily brought the flames under control."

Jackson, Michigan.

Under date of November 8, 1870, the Mayor of Jackson, Hon. W. M. Bennett, describes the first fire in that city after the Holly Works put in operation:

"Last evening we had the first severe test of the efficacy of the Holly Water Works. The Marion House, a hotel adjoining my store, took fire in the attic. This is an old wooden structure, forty by one hundred feet, three stories high, and thirty-six years old, and like a tinder box. We have all said for years that 'when the old Marion House burned, look out for terrible losses.' The fire had made great progress; in fact, had burst through the roof before the alarm was given. The whole attic was apparently a mass of fire. It looked a little dubious at first, on account of the progress the fire had already made in such a combustible mass. In a very few minutes, however, we had three streams pouring upon it. The first dash convinced all spctators that the fire was completely controlled. The roof was mostly consumed, but the fire did not extend below the attic. Considering the condition of the building, its location, the progress the fire had made before discovery, and the gale of wind prevailing at the time, it is generally conceded that the Holly Water Works saved more than one-half their cost last night.

"I particularly, and the entire community generally, are so much elated

over this complete practical success of the works that I hasten to give you the news, which cannot be otherwise than gratifying to you and all interested."

Dunkirk, New York.

Before the Holly Works in Dunkirk were fully completed or accepted by the village, their value was demonstrated as follows:

"Dotterwich's Brewery was discovered on fire this (Thursday) morning, about eleven o'clock, in several places on the roof, caused by sparks from his steam engine; fortunately steam was up at the Water Works and pressure on. The workmen at once attached the hose kept at the brewery, and within five minutes extinguished the flames. The entire establishment would have been in ruins, involving at least $50,000 loss if it had been necessary to have gone for a hand engine."

It will be universally acknowledged that the above accounts end all controversy in regard to the extraordinary efficiency of the Holly method of fire suppression. The entire history of fire engine service cannot furnish a record which will at all compare with their uniformly successful performances in saving property from destruction by fire. It is not surprising, therefore, that wherever Holly Water Works are introduced it is found by experience that fire engines are superfluities.

THE HOLLY WATER WORKS SUPERCEDE HAND AND STEAM FIRE ENGINES.

On this point a few quotations are made from the corroborative statements of those who speak from observation and experience:

The Chief Engineer of the Lockport Fire Department, L. W. Bristol, Esq., in a published statement, dated February 25, 1868, thus speaks of the comparative merits of the Holly and engine plan: "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 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."

His successor as Chief Engineer, John Humphrey, Esq., in a certificate, dated May 1, 1869, says: "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."

The Secretary of the Auburn Water Works Co., A H. Goss, Esq., in a letter of August 16, 1869, says: "We have no fire engines and require none. Every hydrant is a perfect engine in case of fire. No money could take the Holly Works from us, or induce us to change for any other plan known."

The Chief Engineer of Auburn Fire-Department, W. B. Reynolds, in a published letter, dated January 25, 1869, says: "We are not blessed with steam fire engines, nor with hand—they are all laid aside for the Holly Force Pumps. We take our streams direct from the hydrants, and know that while it takes from fifteen to twenty minutes for a steamer to get to work, WE GAIN FROM ONE-HALF TO TWO-THIRDS OF THAT TIME IN GETTING STREAMS ON THE FIRE. SINCE WE HAVE HAD THE HOLLY WATER WORKS WE HAVE NEVER LOST THE SECOND BUILDING."

The Mayor of Minneapolis, H. G. Harrison, Esq., under date of January 5, 1867, says of the Holly Water Works: "Twelve months' trial has convinced all that the Holly System is the best in use—DISPENSING WITH EXPENSIVE RESERVOIRS, STEAM FIRE ENGINES, &c."

The City Clerk of Minneapolis in reply to a recent letter of inquiry from the Mayor of Omaha, speaks thus of the Holly Water Works of that city: "At a late fire department display the Water Works threw a stream 277 feet at an angle of forty-five degrees through a one and one-fourth inch nozzle, the large St. Paul steamer throwing only 234 feet. At any point along the line of mains we can concentrate six heavy streams of water and reach an elevation of 150 feet. Playing through 800 feet of hose we can sweep any point distant eight blocks from the line of mains and throw 150 feet perpendicular. We have no steam or hand engine but only hose and hook and ladder companies, and the great superiority of our Water System attracts great attention."

The Mayor of Ogdensburg, Hon. W. C. Brown, in a published letter dated Jan. 28, 1869, says: "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 withing 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."

Subsequently Mayor Brown, in a message to the Common Council recommended the sale of the three hand engines owned by the city, to be followed up by the sale of the steam fire engine during the ensuing year, for the reason as he states, "each 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 Council adopted the recommendation of the Mayor and advertised their engines for sale.

The Superintendent of the Binghamton Water Works, T. A. Sedgwick, Esq., under date of Feb. 3, 1870, says of the superior efficiency of the works over fire engines: "We have had some fires in the heart of our city—not fifty rods from the building where nearly all of the fire apparatus is kept, and in most of these cases the fire has been *entirely put out* before steam or hand engines could reach the ground; and we are quite sure that we have the most efficient fire department in the State. In some cases, small hose has been connected to the street sprinklers and fires put out, before even the hose could be connected with the fire hydrant. This, in practice, has become of such utility, that a large portion of our citizens would be in favor of selling all of the hand engines, and would probably so dispose of the steamer if the city owned it."

The committee of the Peoria Common Council, under whose superintendence the Holly Water Works were constructed for that city, in their final report giving a detailed history of the enterprise and announcing the completion of the work, state that these works "not only supply our citizens with abundance of water of good quality for domestic and other purposes, but it affords one of the most complete fire protections ever invented. The value and superiority of the system lies in the fact that it allows of no large conflagrations, but is brought to bear upon and extinguishes a fire in its incipiency."

Shortly after the introduction of Holly Works into La Porte, Ind., the Common Council passed the following ordinance:

"WHEREAS, By reason of the construction of the Holly Water Works in and for the city of La Porte, the further services of engine companies heretofore organized in said city, are considered unnecessay; therefore,

"SEC. 1. Be it ordained by the Common Council of the city of La Porte, that all Fire Engine Companies heretofore organized in said city, be, and the same are hereby forever discharged from the service of said city."

The preceding quotations plainly show that the introduction of Holly Works is the signal for the abandonment of fire engines, and this

LARGELY REDUCES TAXATION FOR FIRE DEPARTMENT EXPENSES.

This reduction of taxes is no trifling affair. The expenses of a fully equipped and well regulated Fire Department, including a full complement of engines makes a large portion of the expenses for which municipal corporations provide by taxation.

The total cost of the Chicago Fire Department property is $678,086.93, and of this sum the fire engines and auxiliary apparatus cost $286,198, or nearly one-half the gross amount. The annual cost of maintaining her Fire Department was officially reported last spring at $400,000, and it was stated by one of the Board of Public Works that at the present rate of increase it will soon reach $1,000,000 per year.

In 1867 the expenses of the Boston Fire Department were $147,060, of Cincinnati $239,000, and of St. Louis $186,000.

The expenses for fire purposes in Toledo last year are reported at $52,238.20, with a Fire Department numbering only three engines.

The committee of the Columbus (Ohio) Common Council, in their report recommending the introduction of the Holly Water Works into that city, state that the Fire Department expenses are rapidly increasing and that it is a fair conclusion to estimate that the expenses of the Department for the year ending April, 1870, together with the unpaid indebtedness of former years, and the cost of wells and cisterns contracted for last year, will amount to thirty thousand dollars.

In continuation the committee remind the Council that "the Fire Department and machines now used, and the employees and appliances for the extinguishment of fires are not materially greater now than they were seven years ago, and it is safe to say that the increase of population and growth of your city in the way of buildings has been at least one-third in that time, and if what was done then in the creation of the Fire Department was necessary, has not the time arrived, if not, will it not soon be an absolute necessity that the Department must be doubled in the number of machines and employees, and hence the annual expenses be at least doubled, with a direct

outlay in buying ground, building honses, purchasing engines, hose carts, &c., and all other things necessary to complete the additions made and required to be made of not less than $100,000; nor will it be safe to estimate when these things are done that the annual expenses of the Department can be less than from $50,000 to $55,000. The Holly Works will relieve the public of two-thirds of the expense of the present fire department, dispensing as they do with all the steam fire engines and requiring nothing in the shape of a fire department, save hose and hose carts, fire ladders and the necessary number of employees to handle the same. They will relieve the city from the annual expense of digging cisterns and wells and the expense of maintaining them after being built—which, if the present system of a fire department is continued must be a greater expense than ever heretofore."

Columbus, in respect to its costly and increasing fire department expenses, is a type of numerous other cities, and they like her may be relieved of full three-fourths of the burden by imitating her example in the introduction of the Holly Water Works.

Another result invariably follows the establishment of Holly's mode of fire suppression in a community. Underwriters recognize it as giving far better protection to property and unhesitatingly make

LARGE REDUCTIONS IN INSURANCE RATES.

The following quotations will abundantly establish this important fact. The Board of Underwriters in Lockport make the following statement of facts and opinions:

To the Holly Manufacturing 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.

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

May 1, 1869.

The Underwriters of Auburn, it will be seen by the annexed certificate, concur with those at Lockport:

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

To the Holly Manufacturing 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 OSBORNE, *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.

In Ogdensburgh, soon after the Holly Water Works had been put in operation, the citizens called for a reduction of insurance rates. The Ogdensburgh *Journal* thus records the result:

"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."

A newspaper correspondent, writing from Ogdensburgh, and referring to the same exhibition, stated that "the agents of foreign insurance companies gave our Water Works an inspection on Wednesday last, with a view to re-establish rates of insurance. A reduction of one-fourth to three-fourths of one per cent. was made. In three years this will pay the whole cost of construction of the works."

In Binghamton, the Superintendent of the Holly Water Works, under date of Feb. 3, 1870, says:

"Our insurance rates have been reduced, since the establishment of the Water Works in our city, about one-quarter—the reduction amounting to at

least $15,000 on the premiums paid yearly—this amount being more than the interest on the entire cost of the works, and the yearly expenses of running the same. The $15,000 is the aggregate reduction, some risks, considered hazardous, and *extra hazardous*, have been reduced fifty per cent. from rates in 1868, previous to the establishment of the works here."

The city of Buffalo has Water Works on the reservoir plan. They do not supply the wants of the city either in quality or quantity of water. After long and thorough investigation her authorities decided not to multiply imperfections by constructing another reservoir, but instead thereof to introduce the Holly Water Works. Among the considerations which brought her to this conclusion, it is reasonable to suppose, was the following:

BUFFALO, October 23, 1868.

To the Hon. the Common Council of the City of Buffalo:

We, the undersigned, fire underwriters in the city of Buffalo, do respectfully recommend the adoption of the Holly System of Water Works, believing that its introduction will materially decrease the liability of damage by fire.

D. P. DOBBINS & SON.
C. H. WOODWORTH.
ROUNDS & HALL.
STRINGER & CADY.
JOHN C. GRAVES.
WALKER & EUSTAPHIEVE.
L. B. FORTIER.
WM. LOVERING, JR.,
Secretary Mutual Ins. Co., of Buffalo.
C. B. ARMSTRONG,
E. D. LACY,
Assistant Secretary Buffalo City Ins. Co.
E. B. SMITH,
Secretary Western Ins. Co.

In Peoria, the Committee of Construction, in their final report to the Council, declared the Holly Plan the most complete fire protection ever invented. "In proof of this," says the committee, "we need only to point to the heavy reduction in the rates of insurance consequent upon its introduction. This reduction has been sufficient to pay the entire expense of operating the works and interest on the water bonds issued, and in many instances to pay the water rents of parties insured. Your committee might cite hundreds of instances to verify this statement. Our public houses, which are among the largest consumers of water, find the saving in insurance much more than pays their water rents, and this, too, when the insurance is upon personal property as liable to be damaged by water as by fire. How much more the saving to the owners of the hotel and other buildings who pay no water rents, and whose per cent. of reduction for insurance is much larger."

J. C. Hansel, Esq., of Peoria, doing a large busines as Insurance Agent, in reply to a letter of inquiry, makes the statement:

D. H. PEASE, ESQ., *Norwalk, Ohio.* PEORIA, Ill., February 2, 1870.

"DEAR SIR:—Your favor of 29th inst. received, and I take pleasure, as far

as I am able, in replying to your questions. As to rates there is an average reduction of nearly fifty per cent. As a fire extinguisher the Holly is all that is claimed. The largest loss since their introduction is, I think, $600—on any one fire—and our two largest hotels have been on fire, one of them twice, and a few evenings since our leading factory (plow shop,) stock and buildings, worth perhaps $150,000, saved by their own two and one-half inch pipe in the building; damage perhaps fifty dollars."

Very Truly, J. C. HANSEL.

The expense of running pipe through the plow factory referred to by Mr. Hansel, and by which $150,000 of property was saved, as stated by him, was $680. The reduction in the insurance on the property for one year reimbursed the outlay and the water rate for the supply of the building besides.

In Kalamazoo, Foster Pratt, M. D., in answering inquiries addressed to him, states:

"The premium on our fire insurance is lessened from fifteen to twenty per cent., according to the nature of the property insured, and we shall save, in two years, in this item alone, from former expense, more than the cost of our works."

The city of Grand Rapids, Michigan, by a committee, investigated this question and reported as follows: "The fact of superior fire protection is recognized by insurance companies, by important reduction in rates in districts supplied with these works. Peoria, Illinois, and Canton, Ohio, say their rates are reduced twenty-five per cent.; Binghamton and Gouverneur, New York, thirty-three per cent.; Kalamazoo thirty-three to fifty per cent. Ogdensburgh says 'lessened the rates materially."

The evidence on all these points is conclusive and satisfactory.

The Lockport *Journal*, of recent date, made the following comments upon a fire which was summarily squelched by the Holly Works:

"The promptness with which the fire was extinguished on Main street, in this city, on Saturday night, furnished another illustration of the immense value of the Holly Works as a means of protecting our city. The fire originated in the heart of the city. The wind was high, and but for these works and the promptness with which floods of water were brought to bear on the flames, hundreds of thousands of dollars would have been laid waste in a few hours.

"The strongest argument that could possibly be made in favor of these works would be facts showing the comparatively small amount of property destroyed by fire in this city during the six years since their construction, compared with the amount destroyed during the six preceding years. It can be shown that if the insurance companies had themselves paid the expense of their construction they would have been compensated by the diminution of losses at

least five times over. Although the cost of insurance has been greatly reduced in consequence of these works, it can be shown that since the Holly Works have been in successful operation at least ten dollars have been paid to insurance companies in this city where one dollar has been received from them in the payment of losses. If, on the other hand, we were to take six years before the erection of these works, we should find that insurance was a losing business in this city. We do not know what facts more conclusive could be produced on this subject, or could even be desired."

The aggregate amount paid for insurance is much larger than is generally supposed. In Toledo, for illustration, it is stated on good authority, that the amount thus paid last year was $245,590.40. The loss by fire above insurance was $38,454. Insurers in Toledo, as is universally the case throughout the country, complain of the high and burdensome rates exacted by underwriters, and yet it will be noticed that in that city the business involved a considerable loss to the insurance companies. The result is the more significant, since Toledo, with a population of about 31,000, pays annually almost two dollars per head for maintaining her inefficient fire engines, which come lamentably short of protecting her property, or of making the insurance business profitable within her limits. Investigations in other communities will develope results similar or approximating to the above in the city of Toledo. The lesson they teach is, that instead of complaining of high insurance rates, communities would be wise in availing themselves of the protection to property which the Holly System of Water Works universally bring, and thus secure a reduction in the rates of insurance, which, in from two to five years, will be the equivalent of the entire cost of constructing these works.

Thus far the pages of this pamphlet have been chiefly occupied in establishing the value of the Holly Water Works for fire protection. It remains to present some considerations which prove their superiority over other methods of water supply. And first of all, because it is first in importance, it is to be noticed that in comparison with the reservoir and stand pipe system the Holly Plan secures to communities a

BETTER QUALITY OF WATER.

In the old Reservoir Water Works the *settling process* is relied upon for purification, which is confessedly inadequate to relieve water of its impurities. Hence the almost universal complaint of communities supplied through reservoir of the *poor quality* of water furnished.

In contrast with the reservoir *settling process* the Holly Plan, for purification of water, may be described as a *filtering* method. The city of Binghamton receives water from the Susquehanna river (at times very turbid,) by means of the Holly filtering process, and its *quality*, AT ALL TIMES, is thus referred to by one of her newspapers: "We must congratulate our citizens that they are not as the people of so many cities are, drinkers of water they know not of. New Yorkers [illegible] Croton, but sometimes it is exceedingly impure. We hope [illegible] will appreciate the filtered water. They are favored abo[illegible] mortals." The works at Binghamton stand one hundr[illegible] Susquehanna river, and the water from the river flows into the pumping wells (which are sunk eight feet below the river bottom,) through the intervening gravel bed. In Dayton, also, the same process yields abundance of water, transforming the turbid flow of the Mad river into clear and healthful streams. In other places where the Holly System is introduced, as, for instance, Peoria, Ill., the banks of the Illinois river—the source of supply—being clay, an artificial filter constructed in sections along the river bank, secures the same result. Thus, either by natural or artificial filter, the Holly Plan assures to communities the inestimable boon of pure and wholesome water.

There are innumerable cities and villages throughout the land suffering great inconvenience and loss for want of an abundant supply of pure and wholesome water. Individual arrangements by wells, cisterns, &c., although involving large aggregate of original cost and yearly expense, do not provide a reliable and satisfactory supply. The want of something better than existing arrangements for the protection of property from destruction by fire is also well nigh universal. Conceding all that is claimed and proved in the preceding pages of this pamphlet concerning the value of Holly's new and improved method of supplying these lamentable deficiencies, there still remains a question to be considered, which exceedingly troubles the most influential class in every community, and postpones, in many cases, the introduction of what all acknowledge to be a most important public improvement. It is the question of debt to be paid by the imposition of taxes. It is almost universally assumed by the class referred to—the tax-payers—that the construction and maintenance of Water Works is but another name for taxation. In fact, however, this assumption is almost or entirely erroneous. Most improvements, such as streets, sidewalks, public buildings, &c., are of necessity paid for by taxation,

but happily the supplying communities with the boon of water confers its countless benefits without imposing corresponding burdens. One general fact in reference to Water Works throughout the country—including the costly reservoir and stand pipe plan—is that when owned and judiciously managed by corporations

WATER WORKS ARE SELF-SUSTAINING WITHOUT TAXATION.

This statement can and will be placed beyond dispute or cavil by an exhibit of facts from reports of officials charged with the superintendence of Water Works in various localities.

The city of Detroit has Reservoir Water Works, owned by the city, which cost $1,030,372.47. The revenue in 1869 was $125,104.29 The operating expenses were $37,387.41. The debt for the works has been reduced to $750,000, on which $52,027.50 interest was paid, leaving $35,689.38 as the net profits of the year's business, over and above running expenses and interest account.

There was received for each million gallon of water supplied	$68 65
Current expenses per million	12 48
Net profits per millions	$56 17

The sum of $24, 210.05 was paid out in extending street mains and other improvements, and the balance carried to sinking fund, which, it is officially stated, is steadily increasing, and correspondingly absorbing the debt for construction. Population of Detroit, 80,000.

The city of Cambridge, (Mass.,) has works on the reservoir plan. They were constructed by a company and purchased by the city in 1865. The total cost up to June, 1870, was $828,100.69. Probably $300,000 of this sum was for reservoir, stand pipe and appurtenances. Notwithstanding this, these works are profitable. The revenue for the year ending Nov. 30, 1869, was $91,347 92

Current expenses and repairs same time	$20,082 91	
Interest on debt	46,344 00	66,426 91
Net yearly profit above expenses and interest		$24,921 01

The Mayor, in a recent letter, states that "with very moderate rates for the use of water the works are accumulating a sinking fund which will pay for the works in twenty-five years. The population of Cambridge is about 40,000, and there are some 6,000 water takers, and of

these 4,863 are families supplied. Water pumped in part into reservoir at a heighth of seventy-three feet, and a portion through a stand pipe at ninety feet elevation.

The city of Cleveland, Ohio, has Water Works which cost, up to Jan. 1, 1870, the sum of $798,243.52, exclusive of lake tunnel for improving quality of water, now in process of construction.

The revenue for 1869 was		$62,869 72
Running expenses	$18,880 13	
Repairs	3,299 56	22,179 69
Excess for interest and sinking fund		$40,690 04

The report states that the funds in the hands of the Sinking Fund Commissioner are pledged for the payment of the principal of the water works bonds, which fund will, without doubt, be sufficient to pay the same at the time of their maturity." The daily supply of water is stated at 2,462,839 gallons, which at the rate of twenty-seven gallons for each inhabitant and 127 gallons for each consumer. The expense of this supply is increased by the cost of pumping it into a reservoir 158 feet high. Population, 93,000.

The total cost of the Boston Water Works to May 1, 1870, was $9,765,959.87. There are five reservoirs at different elevations, the aggregate cost of which is stated at $3,031,295.56, exclusive of engineering for the whole work, which amounted to $101,303.33, and a large portion of which was due to reservoir construction. Population, 254,000. Average daily consumption of water about 15,000,000 gallons. Number of water takers, at date of report, 31,500.

The income for the year was		$653.170 86
The current expenses were		193,878 27
Excess of receipts over expenses		459.292 59
Interest on water debt		538,179 31
Excess of current expenses and interest above income		$ 78,886 72

The Board state that the aggregate amount added to the water debt. by excess of interest and current expenses over receipts, has been $1,332,340.17. The Board very properly propose to the Council that the sum of $1,300,000 be transferred from the water debt to the city debt, as a fair equivalent for the use of water by the fire department and other public uses since 1848, for which, it appears, no credit has been given. If this equitable change is made, and in the future water for all public uses charged for, as is authorized by recent ordinance,

the Board declare it "would enable this department to be self-sustaining." If these works, staggering under a debt of over $3,000,000 for five reservoirs can under any circumstances be "made self-sustaining," what Water Works by judicious management may not be?

The above examples are specimens of numerous others which might be quoted of the same tenor. It is obvious that if needlessly expensive works on the reservoir plan may be constructed and maintained with little or no taxation, no ghost of taxation need be conjured up to frighten property holders, in view of supply of water and protecting property by Holly's economical and effective method. Indeed, so far as a comparatively brief experience serves as a test, Holly's Water Works are not only self-sustaining, but

PROFITABLE AS AN INVESTMENT.

The Auburn Works on the Holly Plan have been longest in operation. They were constructed by a chartered company about six years ago. The Secretary, in reply to recent letter of enquiry, stated:

"It has been a financial success. Our chartered capital was $100,000. We have now seventeen miles of mains, and have expended $50,000 more than our capital, $150,000 in all.

"We have paid our stockholders three and one-half per cent, semi-annually, from the start, and our net earnings now are about fifteen per cent. and constantly increasing. No stock for sale."

It turns out, however, that while there is no stock for sale *voluntarily*, it will probably all be sold to the city under a clause of the charter which gives authority to take the works at a valuation. A meeting was held there on the 20th of October last, which was attended, says the *Auburn Advertiser*, "by some of the prominent business men and representative tax-payers. The meeting favored the purchase of the works, which will cost the city about $180,000." It was decided to obtain facts bearing upon the question, and the meeting adjourned to meet again in furtherance of the project to purchase. Now it is morally certain that the tax-payers of Auburn would not thus inaugurate a movement to take these works away from reluctant stockholders, after five years' experience, if there was the slightest danger the city would be taxed or any way impoverished by doing so.

The Holly Water Works at Binghamton commenced duty in December, 1868. In February, 1870, the superintendent made in writing the following statements:

"We have over eight hundred 'Water Takers.' This embraces many stores, shops, business houses and manufacturers. A large portion of 'Water

Takers' at residences have good wells of pure and wholesome water, conveniently located, but are now used in many cases for cess pools. I think if any one, two years ago, had predicted such a result, his opinion would have been at a heavy discount.

"We expect to reach at least fifteen hundred 'Water Takers' during the summer."

"The Commissioners have not yet completed their annual report, but I believe the revenue will amount nearly to $11,350. This amount embraces some rents received for building purposes. It is proper to state, in this connection, that our builders find that the ready access to water from the main water pipes facilitates their work, and considerable revenue is received from this source.

"We are quite confident that the revenue, one year from this time, will more than pay the entire interest on cost of the works, and all expenses attending the running of the same, leaving surplus for sinking fund annually, which will ultimately pay off the construction bonds. I see no reason to doubt the same results may be attained elsewhere."

With such results in so brief a space of time, it is plain that the superintendent makes an estimate for the future upon which other communities may implicitly rely.

In Peoria, where the Holly Works have been performing service a little more than two years, there are 1,500 "Water Takers" reported, from which a revenue of $16,000 per year is derived and the number is steadily increasing. There are 192 hydrants in use, which at the yearly price allowed the Auburn company by the city, $75, would amount to $14,400, carrying the earnings up to $31,000 per year. In his letter, in reply to inquiries, Mayor Brotherson says: "We save in our Fire Department and in insurance more than enough to pay the interest on the cost and the expense of running the works.' Upon this basis, the above income of $31,000, lays the foundation within little more than two years after the works were put in operation for a sinking fund to retire the construction debt.

In Kalamazoo, Dayton and other localities which have recently introduced Holly Water Works, time has not elapsed to give yearly results, but the reports of operations so far as they go, compare with those above referred to. Large revenues to Water Works for water are assured by its comparative cheapness, and because it secures convenience and luxuries which the individual arrangements cannot supply.

The whole question resolves itself into this: instead of not being able to build Water Works, communities cannot afford to be without the benefits which the Holly Method of Water Supply and Fire Protection will most assuredly confer.