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CONSTITUTION AND BY-LAWS

OF THE

# AMERICAN WATER WORKS ASSOCIATION

TOGETHER WITH THE

## PROCEEDINGS

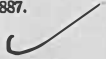
OF THE

1st, 2d, 3d, 4th, 5th and 6th Annual Sessions

HELD AT

ST. LOUIS, MO., 1881; COLUMBUS, O., 1882;  
BUFFALO, N. Y., 1883; CINCINNATI, O., 1884;  
BOSTON, MASS., 1885; DENVER, COL., 1886.

MINNEAPOLIS.  
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1887.



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1881

*To the Officers and Members of the American Water Works Association:*

GENTLEMEN:—Your Committee to whom was assigned the duty of revising and reprinting the Proceedings of the First, Second, Third, Fourth, Fifth and Sixth Annual Sessions, have, to the best of their ability endeavored to perform that duty, and have furnished electrotype plates of the entire work, for future use, if desired, and respectfully submit this work for your approval.

G. E. BEACH, Chairman.

COMMITTEE OF ARRANGEMENTS

SEVENTH ANNUAL SESSION,

MINNEAPOLIS, MINN., JULY 13th to 18th, 1887.

J. W. HENION, Chairman.....	Minneapolis, Minn.	
ANDREW RINKER,.....	"	"
JOHN T. FANNING,.....	"	"
L. W. RUNDLETT,.....	St. Paul,	"
H. H. HARRISON,.....	Stillwater,	"

RETROSPECTIVE COLLECTION

MASS. INSTITUTE  
DEPARTMENT OF  
CIVIL ENGINEERING  
OFFICERS AMERICAN WATER WORKS ASSOCIATION

OFFICERS FOR 1881-2.

PRESIDENT—Col. J. T. Foster, Chicago, Ill. (Union Stock Yards)  
VICE PRESIDENTS—W. C. Stripe, Keokuk, Ia.; J. G. Briggs, Terre Haute, Ind.;  
St. Louis, Mo.; W. L. Cameron, Memphis, Tenn.; M. X. Chuse,  
Bloomington, Ill.; J. G. Briggs, Terre Haute, Ind.  
SECRETARY—J. H. Decker, Hannibal, Mo.  
TREASURER—Horatio D. Wood, St. Louis, Mo.  
EXECUTIVE COMMITTEE—Officers above, *ex-officio*.

OFFICERS FOR 1882-3.

PRESIDENT—Col. J. T. Foster, Chicago, Ill. (Union Stock Yards.)  
VICE PRESIDENTS—J. G. Briggs, Terre Haute, Ind.; W. C. Stripe,  
J. James R. Croes, New York City, N. Y.; Thos. J. Bell, Cincin-  
nati, O.; Edwin Darling, Pawtucket, R. I.  
SECRETARY—J. H. Decker, Hannibal, Mo.  
TREASURER—Horatio D. Wood, St. Louis, Mo.  
EXECUTIVE COMMITTEE—Officers above, *ex-officio*.

OFFICERS FOR 1883-4.

PRESIDENT—J. G. Briggs, Terre Haute, Ind.  
VICE PRESIDENTS—W. C. Stripe, Keokuk, Ia.; J. J. R. Croes, New  
York City, N. Y.; L. H. Gardner, New Orleans, La.; Carl  
Schon, Toledo, O.; Geo. A. Ellis, Springfield, Mass.  
SECRETARY AND TREASURER—J. H. Decker, Hannibal, Mo.  
EXECUTIVE COMMITTEE—Officers above, *ex-officio*.

OFFICERS FOR 1884-5.

PRESIDENT—L. H. Gardner, New Orleans, La.  
VICE PRESIDENTS—W. C. Stripe, Keokuk, Ia.; Edwin Darling, Paw-  
tucket, R. I.; Geo. A. Ellis, Springfield, Mass.; A. G. Moore, Cin-  
cinnati, O.; B. F. Jones, Kansas, City, Mo.  
SECRETARY AND TREASURER—J. H. Decker, Hannibal, Mo.  
EXECUTIVE COMMITTEE—Officers above, *ex-officio*.

OFFICERS FOR 1885-6.

PRESIDENT—Peter Milne, Jr, Brooklyn, N. Y.  
VICE PRESIDENTS—Geo. A. Ellis, Springfield, Mass.; Edwin Darling,  
Pawtucket, R. I.; Arthur G. Moore, Cincinnati, O.; B. F. Jones,  
Kansas City, Mo.; W. J. Milner, Birmingham, Ala.  
SECRETARY AND TREASURER—J. H. Decker, Hannibal, Mo  
EXECUTIVE COMMITTEE—Officers above, *ex-officio*.

OFFICERS FOR 1886-7.

PRESIDENT—B. F. Jones, Kansas City, Mo.  
VICE PRESIDENTS—W. L. Cameron, Memphis, Tenn.; H. G. Holden,  
Lowell, Mass.; J. M. Diven, Elmira, N. Y.; W. J. Milner, Bir-  
mingham, Ala.; Richard Holme, Denver, Col.  
SECRETARY AND TREASURER—J. H. Decker, Hannibal, Mo.  
FINANCE COMMITTEE—Jas. P. Donahue, Davenport, Ia.; A. N. Den-  
man, Des Moines, Ia.; J. T. Sawyer, Waverly, N. Y.  
PAST PRESIDENT—Peter Milne, Jr., New York, N. Y.  
EXECUTIVE COMMITTEE—The officers named above.

COMMITTEE ON REPRINTING  
PROCEEDINGS OF  
THE AMERICAN WATER WORKS ASSOCIATION.  
First to Sixth Sessions Inclusive.

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G. E. BEACH, Minneapolis, Minn.

I. L. LYMAN, Lincoln, Neb.

W. L. CAMERON, Memphis, Tenn.

## PROCEEDINGS OF FIRST ANNUAL MEETING

ENGINEERS' HALL, WASHINGTON UNIVERSITY, }  
ST. LOUIS, MO., March 29, 1881 }

Pursuant to a call issued by W. C. Stripe, Secretary and Superintendent Keokuk Water Company, the following officers of water companies and those interested, met in convention :

W. C. Stripe, Keokuk, Iowa ; H. G. Belche, Peoria, Ill. ; James Millard, Peoria, Ill. ; M. Donohue, Davenport, Iowa ; Alex. Miller, Davenport, Iowa ; Ira A. Holly, Burlington, Iowa ; M. X. Chuse, Bloomington, Ill. ; Charles A. Smith, St. Louis ; J. H. Decker, Hannibal, Mo. ; H. D. Wood, Hannibal, Mo. ; J. G. Briggs, Terre Haute, Ind. ; John W. Harrison, St. Louis ; John Long, Louisville, Ky. ; F. L. Kimball, St. Louis ; Sylvester Watts, St. Louis ; J. B. Quigley, Atchison, Kan. ; Wm. H. Burnham, Batavia, Ill. ; W. L. Cameron, Memphis, Tenn. ; T. J. Rembert ; C. E. Gray, St. Louis ; Wm. Ratekin, Jacksonville, Ill. ; and Col. J. T. Foster, Chicago.

At 10:30 A. M. the Convention was called to order by Mr. Stripe, who gave a short statement of the causes leading to the call.

On motion of H. D. Wood, J. T. Foster, of Chicago, was elected President.

On motion of Sylvester Watts, J. H. Decker, of Hannibal, was elected Secretary.

On motion of Ira A. Holly, H. D. Wood, of St. Louis, was elected Treasurer.

On motion of H. D. Wood and Sylvester Watts, W. C. Stripe, of Keokuk, and Prof. Chas. A. Smith, of St. Louis, were elected First and Second Vice-Presidents, respectively.

Col. Foster, on taking the chair, alluded pointedly and briefly to the business before the body, and suggested that great benefit would ensue from an interchange of views on the subject of water-works. These institutions differed so much that all had something to learn and something to impart. He suggested that a history of water-works be given, with the various improve-

ments made from time to time, and that each member describe the particular works with which he was connected.

On motion of Sylvester Watts, the temporary organization was made permanent.

On motion of Mr. Watts, a committee of five was appointed to draft a constitution and by-laws, with rules of order.

The Chair appointed the following as the committee: Sylvester Watts, St. Louis, Mo.; W. L. Cameron, Memphis, Tenn.; W. C. Stripe, Keokuk, Io.; Ira A. Holly, Burlington, Io.; J. G. Briggs, Terre Haute, Ind.

On motion of W. C. Stripe, a committee of three was appointed and instructed to report at once subjects for to-morrow's discussion.

The chair appointed the following committee: W. C. Stripe, Keokuk, Io.; M. X. Chuse, Bloomington, Ill.; J. B. Quigley, Atchison, Kan.; who retired to make up their report.

President Foster presented a profile showing the results obtained at his works, viz.: 1. Duty in foot pounds; 2. Gallons pumped per day; 3. Water pressure in discharge main; 4. Vacuum on induction main; 5. Evaporation in pounds of water generated into steam, per pound of coal; 6. Coal burned per day in pounds; and gave quite a detailed account of the working of the Lake Water-works. Quite a number of questions were proposed by different members, which were satisfactorily answered.

The Committee on Subjects for Discussion having returned to the hall, they presented the following report:

#### LIST OF SUBJECTS FOR DISCUSSION.

1. FUEL.—Per million gallons raised one foot high; Firing; Consumption of Smoke; Coal vs Wood, Corncobs, Oil, or Gas.
2. MAINS.—Depth in the Ground; Iron, Wood, or Cement.
3. SERVICE PIPES.—Plain Iron, Varnished Iron, Galvanized Iron, or Lead.
4. Rates, Motor, Meters, Water Closets, Fountains, Bath-Rooms, Sprinkling.
5. WASTE.—(The Committee called attention to this.)
6. Fire Hydrants; Freezing, Thawing.
7. "Ellis Tables;" has any one verified them?
8. VARIOUS SYSTEMS.—Direct Pressure: Stand-Pipe Reservoir, and Elevated Reservoir.
9. Why not make sleeves in two parts, with lugs and bolts, and thus obviate the necessity of taking up two lengths of pipe and three joints to repair a small break?
10. Work of Plumbers.

[Signed.]

W. C. STRIPE.  
Chairman of Committee

On motion of H. D. Wood, the report of the committee was adopted.

Jno. W. Harrison, of the Shickle, Harrison & Howard Iron Co., extended an invitation to the Convention to visit their Cast-Iron Pipe Works.

On motion of Mr. Holly, those desiring to inspect the works were to meet there at 9 o'clock A. M., Wednesday.

President Foster, here stated that the Convention would not be bound exclusively to the subjects presented by the committee for discussion, but that all matters germane to the water supply might be fully discussed.

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## SECOND DAY, WEDNESDAY, MARCH 30.

### MORNING SESSION.

Convention met at 10:45 o'clock, with Vice-President Chas. A. Smith in the chair.

The journal of Tuesday's proceedings were read, and approved.

The Committee on Constitution and By-laws reported a preamble, constitution and by-laws for the consideration of the convention, which was amended as follows and adopted :

#### PREAMBLE.

We, the undersigned, desirous of forming an association for the exchange of information pertaining to the management of water-works, for the mutual advancement of consumers and water companies, and for the purpose of securing economy and uniformity in the operation of water-works, do hereby associate and adopt the following constitution and by-laws:

#### CONSTITUTION.

##### ARTICLE I.—NAME.

The name of the Association shall be The American Water-Works Association.

##### ARTICLE II.—OFFICERS.

SECTION 1. The officers of this Association shall consist of a President, five Vice-Presidents (who shall respectively be residents of different States), a Secretary and a Treasurer. All the above officers shall be elected annually by ballot, and shall serve for one year, or until their successor are elected.

SEC. 2. The President shall preside at all meetings. In his absence one of the Vice-Presidents shall preside.

SEC. 3. The officers of this Association shall, ex-officio, constitute an Executive Committee.

SEC. 4. The Executive Committee shall have control of the property and management of the affairs of the Association, shall provide

suitable rooms for all annual meetings, may suggest topics for discussion, and shall have power to expend the funds of the Association; *provided*, that no indebtedness shall be incurred exceeding amount of the funds in the hands of the Treasurer. It shall have power to call special meetings of the Association.

SEC. 5. The Secretary shall keep the minutes of all meetings, conduct all correspondence, receipt for all fees and dues, and turn over to the Treasurer all moneys received, taking his receipt therefor. He shall have such compensation as the Executive Committee may determine.

SEC. 6. It shall be the duty of the Treasurer to receive from the Secretary all money for the Association, to keep correct accounts of all receipts and expenditures, and to pay all demands against the Association when approved by the President. At the annual meeting he shall exhibit a statement of his accounts. The Treasurer shall give such bond as may be required by the Executive Committee.

#### ARTICLE III.—MEMBERSHIP.

SECTION 1. All persons connected with the construction and management of water-works shall be eligible for membership. Any person applying for membership shall make a written application to the Secretary, stating his name, age, residence, business and position, accompanying his application with the regular initiation fee. The Secretary shall refer each application to the President, and, with the latter's approval, shall issue a certificate of membership.

SEC. 2. All persons or firms engaged in furnishing material for the construction and maintenance of water works, desiring to join the Association, may be admitted as honorary members by the usual form on the payment of an initiation fee of ten dollars, and be entitled to one representative at each meeting.

#### ARTICLE IV.—AMENDMENTS.

Amendments to this Constitution and By-Laws must be in writing, and may be made at any regular meeting, by a vote of two-thirds of the members present.

### BY-LAWS.

#### ARTICLE I.—MEETINGS.

The annual meeting of the Association, for the election of officers and the transaction of business, shall be held on the second Tuesday in March of each year. At each annual meeting the place for holding the subsequent meeting shall be determined by ballot.

#### ARTICLE II.—ORDER OF BUSINESS.

The President shall take the chair at the appointed hour, and the order of business shall be as follows:

- 1st. Call of roll.
- 2d. Reading of minutes of last meeting.
- 3d. Reading of all letters and communications.
- 4th. Reports of Secretary, Treasurer and Committees.
- 5th. Unfinished business.
- 6th. New business.

#### ARTICLE III.—DUES AND FEES.

- The initiation fee shall be five dollars.  
The annual dues shall be two dollars.



An opportunity now being given to sign the constitution and pay the initiation, it was embraced by the following active members: Sylvester Watts, St. Louis, Mo.; J. G. Briggs, Terre Haute, Ind.; W. C. Stripe, Keokuk, Io.; Ira A. Holly, Burlington, Io.; H. G. Belcke, Peoria, Ill.; J. B. Quigley, Atchison, Kan.; M. X. Chuse, Bloomington, Ill.; W. Donohue, Davenport, Io.; Wm. Ratekin, Jacksonville, Fla.; W. L. Cameron, Memphis, Tenn.; Thos. J. Whitman, St. Louis, Mo.; W. L. Holman, St. Louis, Mo.; J. H. Decker, Hannibal, Mo.; J. F. Foster, Chicago, Ill.; H. D. Wood Hannibal, Mo.; C. E. Gray, St. Louis, Mo.; Chas. A. Smith, St. Louis, Mo.; John P. Hely, St. Louis, Mo.; F. Wm. Raeder, St. Louis, Mo.; Wm. H. Burham, Batavia, Ill.

And the following as honorary members: Shickle, Harrison & Howard Iron Co., St. Louis, Mo.; Dennis, Long & Co., Louisville, Ky.; N. O. Nelson & Co., St. Louis, Mo.; Ripley & Kimball, St. Louis, Mo.

Professor Smith, after first stating that as at Tuesday's session there had been an election of permanent officers, and as the constitution provided for an additional number, in order to avoid a conflict, he moved a full election be entered into.

President appointed Mr. Watts teller.

The following were nominated as the officers of the association for the ensuing year: President, Col. J. T. Foster, of Chicago, Ill.; Vice-Presidents, Wm. C. Stripe, of Keokuk, Io.; Prof. Chas. A. Smith, of St. Louis, Mo.; W. L. Cameron, of Memphis, Tenn.; M. X. Chuse, of Bloomington, Ill.; J. G. Briggs, of Terre Haute, Ind. Treasurer, H. D. Wood, of Hannibal, Mo.; Secretary, J. H. Decker, of Hannibal, Mo., and were elected.

On motion, the Association selected Columbus, O., as the place for holding the next annual meeting.

Col. Thos. J. Whitman extended an invitation to the association to visit the St. Louis water-works after noon. Accepted.

The motion that when the convention adjourn it adjourn to meet at the hall at 8 P.M., for discussion of the topics as presented by the committee was passed.

Mr. Hunt, representing Furney's patent water regulator, stated that he had one placed in the Manual Training School of the University and would be pleased to have the members examine it after adjournment.

The hour being past noon, the convention, on motion, adjourned.

WEDNESDAY, MARCH 30.

EVENING SESSION.

The hour for opening having arrived, Vice-President Smith called the Association to order.

On motion the reading of the journal was dispensed with. At this moment President Foster came in, and after tendering an apology, took the chair.

The first topic for discussion being fuel required to raise 1,000,000 gallons 1 foot, was, in the opinion of many members, too formidable a one for present discussion. Mr. Holly was of the opinion that it would take fifteen days to clear up the list, and suggested that the topics of meters, motors and waste be taken up.

Mr. Briggs moved that a committee of two be appointed to draft a form of record for water-work, so as to insure some uniformity for comparisons, and give the members of the Association a better opportunity to discuss these topics from about the same standpoint. Upon the motion being put, it was carried, and Ira A. Holly and J. G. Briggs appointed.

Mr. Briggs declined to serve, and suggested the president in his stead. The secretary objected on the ground that both the gentlemen named represented the same system, viz: "Direct Pumping," and was of the opinion that the "Reservoir" system should be represented as well, claiming that if these forms were to be general and cover all the points of water-supply and distribution, that they should be got up so as to meet the wants of all systems. After some further discussion from Professor Smith and others, the chair appointed Mr. H. D. Wood as the other member of the committee. Professor C. A. Smith stated that there were present representatives of two "Fuel Saving Furnaces," and moved that they be requested to explain their devices, which motion was seconded and carried. Mr. Frank H. Pond, representing the "Jarvis Patent Furnace" was introduced, and proceeded at some length to explain the merits of his furnace, and stated that the furnace at the Collier White Lead Works was effecting a saving of 40 per cent by the use of slack coal, where formerly lump coal had been used.

Mr. Holly desired to know what rate of evaporation had been attained from slack. This Mr. Pond was unable to answer, stating that as yet he had not made any test, but expected to within a short time.

Prof. Smith desired to know the cost of the furnace. Mr.

Pond replied that they charged one hundred and fifty dollars royalty, and that the cost of setting the same would not vary materially from the ordinary setting.

Mr. Holly: What is the cost of resetting boilers with your furnace?

Mr. Pond replied that it depended entirely upon the cost of mason-work, but that it should not exceed fifty dollars.

Mr. Cameron asked: Suppose you can get nothing but good coal, then what is your saving?

Mr. Pond replied from 10 per cent. to 15 per cent.

Mr. Holly asked what would be the saving where slack or cheap coal was now being used, and received the same reply. There being no further questions put to the gentleman, he retired and Mr. R. L. Walker, of Boston, Mass., patentee of "Walker's Twin Furnace," was introduced and claimed to have a "smoke consuming" furnace. He presented a number of circulars, and brought with him drawings showing the full modus operandi of his furnace, and fully explained its workings, stating that he had evaporated as high as thirteen pounds of water per pound of combustible, by actual test.

President Foster asked how many pounds of water he could evaporate per pound of anthracite coal.

Mr. Walker replied that they had by actual test shown an evaporation of 10 3-10 with feed water at 76°. In reply to a question as to how much of a saving he would be willing to guarantee for the furnace, he stated that the furnace would show a saving of 33 per cent. to 40 per cent. fuel, and would guarantee a saving of 25 per cent., or ask no royalty.

Prof. Smith took issue with the gentleman on some of the statements made, with reference to the amount of air required to support combustion and the proper mode of admitting it to the furnace (Mr. Walker having made the statement that the air should be admitted over the grate), the Professor stating that in considering the subject this must be borne in mind, that it was one thing to burn fuel in a furnace and another to get the heat into the water, and that he had found it made no difference whether the air was admitted above or below the grate, so that "it did not come in chunks," and a proper amount was admitted to support combustion. He had frequently, he said, worked the furnaces at the University with the doors partly open. The main part in the admission of air to a furnace was to have it evenly and uniformly distributed. The great trouble, he stated, with Western furnaces was too much grate area and too thin fires, which admitted too

much air, and too small combustion chamber. His experience was, that the grate area could not be made too small, nor the combustion chamber too large, while just the opposite was easily done.

Mr. Stripe presented some data as results obtained at his works, stating that he was using 38 pounds of coal to raise 1,000,000 gallons one foot high, and was satisfied that it was entirely too much fuel, and, being desirous of knowing how or where to economize, wished the discussion confined entirely to this topic. He felt confident that it was costing his company entirely too much, and he wished to have a comparison made with what others were doing.

The President stated that the locality would, in a great measure, govern the cost of fuel for a million gallons, as the prices of coal varied with the locality.

Prof. Smith stated that so many items of engine duty were to be considered (evaporation, pump waste, etc.,) that it would be utterly impossible to consider the matter fully at the present session.

The President suggested that it would be better to defer the matter until the next meeting.

Mr. Cameron agreed, and said it would be well to take Mr. Stripe's data as a basis. Some further discussion ensued on this topic, when the subject of cylinder oils was introduced and discussed by Messrs. Briggs, Holly and the Secretary, their experience varying with the different oils used.

At 10:15 the Association on motion adjourned to meet at 9 o'clock A. M., Thursday.

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### THIRD DAY, THURSDAY. MARCH 31.

Association called to order at 10 o'clock A. M., President Foster in the chair. The reading of the journal was dispensed with. Prof. Smith asked for the opinion of the members as to the relative merits of wood and coal as a fuel; but none of the members present had had any experience in the use of wood.

Mr. Holly stated that he had tried corncobs as an experiment for two months, and his results showed that  $3\frac{1}{2}$  pounds of cobs were equal to one pound of coal (Illinois,) cobs costing him forty cents per ton, delivered.

The secretary had used cobs for some time, but in conjunction

with coal, and found them about 15 per cent. more expensive than coal alone, he paying at the rate of fifty cents per ton.

On the subject of crude oil as a fuel, none of the members present had had any experience. Prof. Smith advanced the opinion that it could not possibly pay as a fuel, and President Foster coincided. The subject of gas was introduced, not as a fuel, but as a motive power with a gas-engine, Prof. Smith stating that a friend of his was about constructing a water-works in Texas, and proposed using a gas-engine as a motor.

Mr. Watts said he had experimented with gas-engines and tested the subject thoroughly, and was satisfied that for small works, or where a power not to exceed 12 to 15 horse was required, that it was the cheapest motor known, the chief expense, that of an engineer, and the boiler and its attendant repairs is done away with; there is no consumption of fuel except when actually at work, then consumed precisely as the power was developed. In reply to a question as to whether it would pay to manufacture gas for an engine alone, he stated it would not, and that a gas-engine could only be utilized where there was an established gas supply. As a proof of the economy, he stated that a tobacco factory in the city is using two elevators, doing an equal amount of work each, one run by water motor, the other by a gas-engine, and the latter had proved to be much the cheaper.

Coal was the next subject. Mr. Holly stated that at Burlington he had tried several kinds, the best he had used being mined in the vicinity of Peoria, Ill., but that lately he had discontinued the use of good coal and was using slack.

President Foster had tried slack, but found no advantage in it, as it cost him about \$3.20 per ton, while lump coal (Indiana block) cost but \$4.

Mr. Whitman stated that the St. Louis Works was at present using only Illinois coal. In comparison with anthracite the advantage is about one cent per bushel. From experiments made comparing Big Muddy coal with Pittsburg, it showed about 67 per cent; Pittsburg being 100. In a test he had made in the East, with Pittsburg and anthracite, the results were about equal.

Depth of mains was next taken up, and the members generally expressed the view that that matter would be decided entirely by the locality of the works; for in the city of New Orleans, a depth of 18 inches would be sufficient, while in Minneapolis, Minn., they had a main 8 feet deep where they were compelled to keep the water running to prevent the main freezing.

Mr. Watts suggested that the members state the depth of mains of their respective companies, and the following reported :

Mr. Cameron, Memphis, Tenn.....	2¼ feet.
Mr. Stripe, Keokuk, Iowa.....	5 "
Mr. Quigley, Atchison, Kan.....	4 "
Mr. Ratekin, Jacksonville, Ill.....	4 "
Mr. Belcke, Peoria, Ill.....	4 "
Mr. Whitman, St. Louis.....	4½ "

President Foster stated that the main idea was to lay the mains sufficiently deep to prevent freezing, and to protect them from extreme summer heat, and cited a case at Chicago where water was delivered eight miles from the lake and showed a temperature two degrees lower than at the lake.

#### IRON, WOOD AND CEMENT MAINS.

A short running debate was held on this subject, and the evidence was unanimous in favor of cast-iron mains for general service. The objection to wood or cement mains was the difficulty of making a tap without causing leakage.

#### SERVICE PIPES.

On this subject quite a lengthy discussion ensued, Mr. Cameron introducing a resolution that it was the sense of the Association that the water companies should have exclusive control of the service pipes, and make reasonable charges therefor. The resolution called forth a spirited debate, Prof. Smith and others opposing on the ground that it was strictly a private affair of the different companies. Some companies were now doing just what the resolution called for, while others were leaving the matter of service pipes entirely to the plumbers, and still others were laying services to the curbstone free of charge. On putting the question it was lost, and at the request of the mover he was allowed to take the resolution from the table.

On the relative merits of materials for services, Mr. Whitman stated that the city of Boston had thoroughly tested galvanized and enameled wrought-iron and lead, and had proved lead pipe to be the best in all particulars.

Mr. Holly quoted a case of lead poisoning and the causes thereof, which clearly proved that the case was due to negligence in not washing out the pipes. He (Mr. Holly) used enamelled wrought-iron exclusively.

Mr. Holman raised the question of laying services on unfinished streets and considered it bad policy.

The President stated that it had been done at South Park, Chicago, and that they had to be taken up and relaid.

Mr. Whitman instanced the laying of a four inch pipe under the side-walks to avoid unfinished streets, and cited one case where it had proved an unwise experiment. Mr. Cameron asked for a call of the roll to ascertain how many companies represented here charged for services, which was granted, and the following shown: Keokuk, Io., Peoria, Ill., Jacksonville, Ill., St. Louis, Mo., Chicago, Ill., Atchison, Kan., and Memphis, Tenn., while Burlington, Io., and Hannibal, Mo., laid them to the curb line free of charge.

#### RATES, METERS AND MOTORS.

President Foster stated in reference to motors, that he allowed none to be used, as the capacity of his works was too limited.

Mr. Cameron advanced the statement that no consumer could use a motor if the water company charged anything like rates for the water used, as they were fearful water wasters.

Mr. Stripe, being desirous of retiring for awhile, asked leave to offer a resolution of thanks, which was granted, and the following resolution was offered and unanimously adopted:

*Resolved*, That this convention hereby tender its thanks to Prof. Charles A. Smith and other officers of the Washington University for their kindness in tendering the use of this hall and other rooms for the meeting of this convention.

Mr. Whitman presented and desired to have read a letter from Geo. H. Frost, Esq., proprietor ENGINEERING NEWS, requesting the convention to furnish official proceedings for publication, and moved the secretary be instructed to furnish the same. Unanimously carried.

Mr. Cameron presented the following and moved its adoption. It was carried unanimously.

*Resolved*, That a vote of thanks is hereby tendered to Messrs. J. W. Harrison, Ripley and Kimball and other merchants of the city, for courtesies extended to this convention, especially for the very pleasant drive to the water-works. Also to Mr. Whitman, superintendent of the water-work, for his attentions.

#### WATER METERS.

Mr. Whitman was called upon for his views and said St. Louis had a large number of meters in use, chiefly the "Worthington," but had a number of "Crown" and "Union" meters, all of which were giving satisfaction. President Foster said he was using the Worthington exclusively and they were giving fine service.

Mr. Whitman said he had always found the Worthington meter just to the consumer; it had been in use thirty years, and had always given satisfaction. Out of 400 meters in use in 1879, they

only had one hundred repair items, and they were mostly of a trifling character.

#### WASTE.

This most important subject was opened by Mr. Holly, who stated that about a year ago his waste became excessive and in making examinations to find the cause, located it principally in water closets. After stopping them, or shutting off the water, his "leakage" was reduced about 190,000 gallons per day.

Mr. Whitman stated that no one consideration of water supply required so much care as that of the waste, and none was so hard to control. At his own works, at no hour of the twenty-four does the quantity of water drawn from the mains fall below 52 per cent. of the rate drawn at midday, and sometimes the minimum of the day's consumption is over 70 per cent. of the maximum. What then becomes of this immense quantity of water? But one answer can be given: that it is running away through pipes left carelessly or willfully open, and found to be mainly in water closets, in which it was the practice to leave the water running continually.

He said that whenever there is a smell about the house people think they can stop it by letting the water run. In 1872 the water supply became very short, and observations were made of the amount pumped and the amount remaining in the reservoir. It was discovered that an immense amount of water was used or wasted between the hours of 10 P. M. and 6 A. M. On Dec. 10, 1878, they commenced to make hourly measurements, which have been kept up ever since, and the profiles show that between 1 A. M. and 3 A. M. a very large amount of water was used which could not possibly have gone to legitimate uses, and the inference was, an immense waste. Accordingly the board of public improvements had drafted the following ordinance, and submitted it with the subjoined letter to the mayor.

#### LETTER AND PROPOSED ORDINANCE.

OFFICE OF THE PRESIDENT OF THE BOARD OF  
PUBLIC IMPROVEMENTS, ST. LOUIS, }  
November, 5, 1879. }

*Hon. Henry Overstolz, Mayor:*

SIR: The Board of Public Improvements, in fulfillment of the promise contained in its last annual report, herewith submits for your consideration, and for transmission to the Municipal Assembly, should you deem it expedient, the draft of "An ordinance to secure a more equal distribution and to lessen the waste of water." In doing so the Board desires to call your attention to the facts which, in its judgment, make such legislation a matter of the first importance.

The purpose of the city in building and operating the water-works was to furnish to its citizens a supply of water for their actual daily needs, and the rates for dwellings were fixed with a view to charging



each water-taker a nominal price for the quantity of water which it was supposed he would really require; and it is a part of the contract contained in every water-license that no water shall be allowed to run except when it is actually needed.

Experience, however, has shown that this contract is violated in the most shameful manner, and to a degree which, without actual proof, would be incredible. But repeated measurements have established, beyond all controversy, that in the dead of night, when nearly the whole population is asleep, water is running to waste through the house service pipes at a rate which is from 60 to 80 per cent. of the rate of consumption at mid-day. In fact, over 50 per cent. of the water pumped out of the river runs back into the river without having been put to any use whatever. At present this waste is about fourteen millions of gallons per day, to pump which costs the city \$140 per day, or \$51,100 per year, for the single item of coal alone. But if, in addition, account be taken of the interest on the cost of the works, and the expenses of labor, superintendence and collection of revenue, the total cost will be found to be about six times this amount, or more than \$300,000 per year.

This enormous waste of water is caused mainly by defective plumbing and by willfully letting it run through water closets and hydrants.

That this explanation is adequate is proved by actual experiments which show that a single water closet or hydrant left running, will, in twenty-four hours, discharge from 20,000 to 50,000 gallons of water, according to the pressure in the street mains! Taking the lowest figure, it needs only 700 taps, or one twenty-seventh of the total number, to be left open to account for the whole 14,000,000 gallons of water wasted.

The magnitude of the injustice, not to call it by any harder name, involved in this waste is seen in the fact that one open closet will in one year consume a quantity of water which has cost the city, for coal alone, seventy-three dollars, while the sum paid for it is only five dollars.

But the pecuniary wrong done the city is not the only one which is committed. Owing to the great differences of level which exist in this city, amounting, in some cases, to more than one hundred feet on a half mile of pipe, when water is allowed to escape on the low grounds, it very rapidly diminishes the pressure on the high grounds.

A few taps left open on a low level may destroy the pressure over a whole district on a higher level, and put its inhabitants to serious inconvenience.

Every man, therefore, particularly on low ground, who willfully lets water run to waste robs not only the city, but his neighbors also, and is in a double sense a public enemy.

In some other cities the evils which arise from a difference of elevation are cured by a distinct service for higher levels. But this always is an expensive remedy, and in St. Louis, owing to the great number of the hills, its cost would be so great as to put it wholly out of the question, and we must therefore get along as best we can with our present system of water distribution.

But in order to do this it is necessary, particularly on the low grounds, that no water be allowed to escape except as it is needed for actual use. In other words—to equalize the distribution, and to give to those on the upper levels of the city their fair share of water, the waste of water must be stopped on the lower levels. And without a large expenditure for additional distributing mains, this same necessity for economy would exist even if the capacity of the pumps were double what it is now.

Great as are the evils of water waste under any and all circumstances, they are multiplied many times by the fact that at the present rate of increase the consumption of water will very soon overtake the capacity of the pumps. The average daily consumption at the present time is about twenty-five million gallons—the minimum being twenty-

two millions and the maximum thirty-three and a half millions. This last figure has, it is true, so far been reached only once—on the sixth day of January last—but there were nine days during that month when the average daily consumption was thirty-one and a half millions.

The daily consumption has, for a number of years, been increasing at the rate of one and a half million gallons per year. Next year, therefore, we may expect an average daily consumption of twenty-six and a half million, and as a maximum thirty-three million to thirty-five million of gallons. But the utmost capacity of the present pumps for any length of time is thirty-three million, and even this cannot be relied on except when the smaller pumps are in perfect order. Within a year therefore, we may, at the period of greatest consumption, expect a demand for water equal to or beyond the capacity of the present works to supply, and the moment this limit is passed a train of the most serious and alarming consequences will at once be set in operation. Of these the first will be the gradual depletion of the the reservoir, and as it holds only 60,000,000 gallons, it will only require a draft 3,000,000 gallons per day for twenty days to leave it entirely dry. While being depleted the water will leave the high grounds and at the end of the process very large areas of the higher levels will be deprived of water—the whole supply having been consumed on the lower levels. At this time if a fire should occur in one of these higher districts there would be no means of arresting its progress, and a large portion of the city might thus be destroyed. It is, in fact, impossible to overstate the dangers which may threaten the city from a short supply of water; yet should the present reckless consumption of water be not checked, it will be only a short time before these dangers will be upon us.

Even if the city had the money to build additional water-works, which it has not, and owing to the constitutional limitation of the city debt, for many years will not have, it would be impossible to construct them in time to avert danger entirely. But if we can stop the waste we will probably for ten or twelve years be entirely safe, and by that time the ratio of the city's debt to the assessed valuation of property will, no doubt, be such that money for the extension of the water-works can be obtained without much difficulty. In the meantime, the surplus revenues of the city can be most profitably spent in extending the sewers and reconstructing the streets.

The sole object of the present bill is to check the present wholesale and wicked waste of water. The means by which it proposes to accomplish this are:

1. To leave the rates as now established precisely as they now exist, but to fix in each license an ample but definite limit of quantity, beyond which the water-taker shall not go without becoming liable to additional payment.

2. To give the Water Commissioner, whenever there is reason to believe that this limit is passed, power to ascertain the fact by the use of a meter.

If a greater quantity has been used than that stated in the license, the Assessor and Collector of water rates is required to exact payment therefor before issuing another license. It is proposed, in a word, to make the contract between the city and water-taker more definite, and to provide specific means for its enforcement.

The basis on which the limit of quantity is determined is, first of all, to give to every water-taker, without regard to the amount paid, a quantity sufficient for every domestic or sanitary purpose. By the present proposed bill, this quantity is fixed at thirty cubic feet, which is equal to 225 gallons, or five and one-half barrels of water.

That this is ample for every purpose of cleanliness or health no one can question. In addition to this quantity every water-taker is allowed 100 cubic feet for every 15 cents of his license, or 100 gallons for every 2

cents, which is the ordinary meter rate to manufacturers. The whole amount per day which this will give for each license is shown by the following table :

TOTAL AND AVERAGE DAILY AMOUNT OF WATER WHICH MAY BE CONSUMED UNDER LICENSE COSTING FROM \$2.50 TO \$15 FOR SIX MONTHS.

LICENSE FOR SIX MONTHS.	TOTAL QUANTITY.		AV. DAILY QUANTITY.		
	Cubic Feet.	No. Gals.	C. Feet.	No. Gals.	Bbs.
\$ 2.50.....	7,142	53,422	39	293	7½
4.00.....	8,142	60,902	45	334	8½
5.00.....	8,808	65,883	48	362	9
6.00.....	9,476	70,873	52	390	9¾
7.50.....	10,476	74,853	57	430	10¾
9.00.....	11,476	85,833	63	470	11¾
10.00.....	12,142	90,823	67	500	12½
12.00.....	13,476	100,793	74	550	13¾
15.00.....	16,476	116,763	85	635	16

An inspection of this table will show that the quantity allowed is in every case as large as can, under ordinary circumstances, be required, and is certainly as much as the city can afford to furnish for the money.

If, however, any one desires to use more, or lets the water in his hydrant or water-closet run constantly, he becomes liable to pay for it at the very low rate of 15 cents for every 100 cubic feet. But after paying one such bill it is not likely that he will ever pay a second, and the practical result will be that the greater part of the waste will be stopped, and the city will thus be enabled, with the present works, to meet all demands for many years. And as the rates are to be left just as at present, all this will be accomplished without any loss of revenue.

For unless it can be shown that some who now take water will not take it under the proposed bill, the only change it can possibly make in the revenue will be to increase it.

The Board is further of the opinion that the waste of water cannot be effectually prevented in any other way. The only other means possible to effect it is to employ a large force of detectives to enter houses, and, by inspection, to ascertain whether or not water is being wasted. This system, besides being very expensive, and at the same time very irritating to householders, can only reach one cause of the trouble. With a vigorous administration it may discover, and to a large extent cure, defective plumbing, but as against willful waste, which is the great evil, it is wholly powerless. For, even if the inspector finds the water running, it is in most cases impossible to inflict any penalty because of the impossibility of proving that at that particular moment the water was not being used ; or the water may be stopped at the time of the inspector's visit, but turned on again as soon as he is out of the house.

The only detective worth anything against willful waste of water is a meter which is always on the ground, and which tells a story that cannot be gainsaid.

In conclusion, therefore, the board very strongly recommends the enactment of the ordinance herewith submitted because the plan it proposes is, under all circumstances, the most just and reasonable, and also because it is, in its judgment, the only plan which can effectually ward off the rapidly approaching and terrible evil of an inadequate supply of water. By order of the Board.

THOMAS J. WHITMAN.  
President *pro tem*.

AN ORDINANCE TO SECURE A MORE EQUAL DISTRIBUTION AND TO  
LESSEN THE WASTE OF WATER.

*Be it ordained by the Municipal Assembly of the City of St. Louis, as follows :*

SEC. 1. All licenses for the right to use water, other than licenses issued to manufacturers and other large consumers of water under meter rates, shall state : First. The premises on and purposes for which the water is to be used. Second. The amount paid for said license. Third. The total and average daily quantity of water the water-taker is entitled to use without additional payment. Fourth. Such other information as may be deemed requisite by the assessor and collector of water rates.

SEC. 2. Any party holding a water-license may use a greater quantity than the total quantity stated in his license during the specified time, provided that at the expiration of the license said party shall pay to the assessor and collector of water rates 15 cents for each 100 cubic feet of water used in excess of the total quantity stated in the license.

SEC. 3. Any party holding a water-license who shall use water in excess of the quantity stated in his license, and fail or refuse to pay for such excess, in accordance with Section 2 of this ordinance, shall be considered delinquent in the payment of water taxes. The assessor and collector of water rates shall refuse to issue to said party any new license until said payment has been made.

SEC. 4. The total quantity of water stated in the license, and which the holder thereof is entitled to use without extra payment within the time specified, shall be determined by allowing 100 cubic feet of water for each 15 cents of the amount paid for said license, and an additional 30 cubic feet of water for each and every day during the time for which the license has been issued.

SEC. 5. Should the assessor and collector of water rates have reason to believe that the quantity of water consumed on any premises is in excess of the quantity stated in the license for said premises, he shall notify the water commissioner, who shall thereupon place a water meter upon the pipe supplying said premises ; or the water commissioner may of his own motion place a meter on any supply pipe whenever he shall have reason to believe that the amount of water passed through said pipe is greater than the quantity stated in the license, but in every such case the water commissioner shall immediately notify the assessor and collector of water rates in writing of the placing of said meter. Within twenty days after the placing of a meter under the provisions of this ordinance the assessor and collector of water rates shall cause said meter to be read, and shall notify the water-taker of the average quantity of water which has been used per day. If a meter be placed on any premises during the term for which the license has been issued, the settlement at the expiration of the license shall be made under the presumption that from the date of the issue of the license to the date when the meter was placed, the daily consumption of water had been the average daily quantity stated in the license, but from the date of the placing of the meter the quantity used shall be taken and held to be that shown by the meter as read under the direction of the assessor and collector of water rates.

SEC. 6. All meters placed under the provisions of this ordinance shall be paid for by the city out of the water-works revenue, and all work of placing, repairing and keeping said meters in order, shall be done under the control of the water commissioner.

SEC. 7. If any water-taker should remove from the premises for which his license was issued, before the expiration of the same, he shall notify the assessor and collector of water rates of such removal. The latter shall then cause the meter at said premises to be read. If the water-taker is found to have used an average quantity of water less than

that stated in license, he shall be entitled to a credit on a subsequent license, which credit shall be in the proportion that the unexpired term of his license bears to the full term for which the license was issued. If the average daily quantity is found to be in excess of that stated in his license, the water-taker shall receive a credit which shall be in the proportion that the total quantity of water not used bears to the total quantity of water stated in the license. If the total quantity of water used is found to exceed the total quantity stated in the license, no credit shall be given and no new license shall be issued to the water-taker until he has paid for the excess at the rate fixed by Section 2 of this ordinance. In case no meter has been placed on the premises in question, the credit given by the assessor and collector of water rates shall be in the proportion that the unexpired term of the license bears to the full term for which the license was issued. Any water-taker, deprived of the use of water in consequence of the destruction by fire of the premises for which the license was issued, shall be entitled to have a transfer made under the provisions of this section.

SEC. 8. The assessor and collector of water rates is hereby authorized to shut off the water from all premises and hydrants for non-payment of license, or for the non-payment for water used under provision of Section 3 of this ordinance.

SEC. 9. Whenever the assessor and collector of water rates shall cause the water to be shut off from any premises or hydrant, and it shall be let on again without permission of said assessor and collector of water rates, he shall notify the water commissioner, who shall immediately cause the connection with the main pipe to be cut off. Any person procuring water from a hydrant or pipe that has been shut off by said assessor and collector shall be deemed guilty of a misdemeanor, and upon conviction thereof, shall be fined not less than five dollars nor more than fifty dollars.

SEC. 10. For any violation of the provisions of this ordinance, for which a special penalty is not hereinbefore provided, the offender shall be deemed guilty of a misdemeanor, and, upon conviction thereof, be fined not less than three dollars, nor more than one hundred dollars, to be recovered before the police justice as in other cases of violation of ordinance.

SEC. 11. In order to carry out the provisions of this ordinance, the Board of Public Improvements is hereby authorized and directed to advertise for proposals for furnishing one thousand meters. Said proposals to be made upon the understanding (which is to be expressed in the contract) that by paying for one thousand meters, the city of St. Louis shall acquire the right to manufacture for its own use meters of the same design, up to and including one inch aperture, without any further payment. The board shall make examinations and tests at the meters offered, comparing them on the several points hereinafter mentioned, and shall grade them in accordance with their relative merits up to the numbers given under each head, to-wit: First. Cheapness of price; the highest grade number to be seventy-five. Second. The nature of the material of which the meter is composed, which shall not be liable to injurious corrosion: the highest grade number to be seventy-five. Third. Simplicity of construction, and non-liability to get out of order; the highest grade number to be one hundred and twenty-five. No meter shall be considered where the error of registration, under ordinary conditions of supply opening, exceeds ten per cent., and the error must be in favor of the water-taker. The Board of Public Improvement shall award the contract to the bidder whose meter has received the highest total of grade numbers, or may reject all bids. The contract to be subject to the approval of the council.

SEC. 12. The sum of ten thousand dollars is hereby appropriated

and set apart out of the water-works revenue for the purpose of paying for such meters as may be procured under authority of this ordinance.

SEC. 13. All ordinances or parts of ordinances that are in conflict with this ordinance are repealed.

The feeling Mr. Whitman said, was very much against the ordinance, some people declaring that they would not have a meter in their house. As an instance of what might be saved by placing a meter, Mr. Whitman cited a case where a year ago a meter was placed into a house where the tax allowed a consumption of 400 gallons per day. It was found by meter registration that 2,800 gallons were being used. The resident's orders were then to allow matters to go as they had been, and no more care than ordinary to be taken in the use of water; the same consumption and waste were recorded. Then care was ordered in the use of water and no waste allowed, but no obvious stinting where the water was required, and the result was, that but little more than 400 gallons per day were registered. He stated that it cost the city fully \$300,000 annually in fuel alone to simply supply the waste. Another great source of waste is the freezing and bursting of pipes, and if some means were devised to drain all pipes and the consumer compelled to do it, a large saving might be effected, and it would lighten the duties of the water inspector as well.

Mr. Whitman stated that one objection to the general use of water meters was, that many persons might, through fear of the penalty, limit the use of the water so that their premises would not be kept in cleanliness, and thus commit an offense against the public health. The rate per capita was from 110 to 115 gallons per diem, yet Ball's tables show in some instances where, in families of ten to twelve persons the use of water has not exceeded 42-10 to 4½ gallons each. Such a state of affairs would save the water, but would breed disease and alarmingly increase the doctor's bill.

Mr. Watts thought the greatest objection to the use of meters would be their expense, that to supply the 138,000 taps of St. Louis would cost \$500,000.

Prof. Smith stated that it was not proposed to put in meters everywhere, nor was it necessary. The moral effect of 2,000 meters would be as great as 40,000 and these would not cost any \$500,000. Col. R. H. Hunt was allowed to show U. S. Engineer Furney's patent water monitor or regulator, which is perfectly automatic in action, and which, in the opinion of Mr. Whitman and others, will solve the question of water waste, provided it will stand all the tests.

The hour being past noon, some of the members were anxious

for an adjournment. Mr. Holly moved the session be continued to the close without adjourning. Carried.

On motion of Mr. Holly the remaining topics, as reported by the committee, as well as that of "Duty" be referred to committees, to be appointed by the President or executive committee, and be presented at the next annual meeting.

The claim of W. C. Stripe for printing, postage, etc., incidental to the call of this meeting, amounting to \$19.25, read and on motion ordered paid.

On motion the Secretary was instructed to have proceedings of this convention published and distributed to all water companies in the United States.

On motion adjourned to meet at Columbus, O., the second Thursday in March, 1882.

J. H. DECKER,  
Secretary.