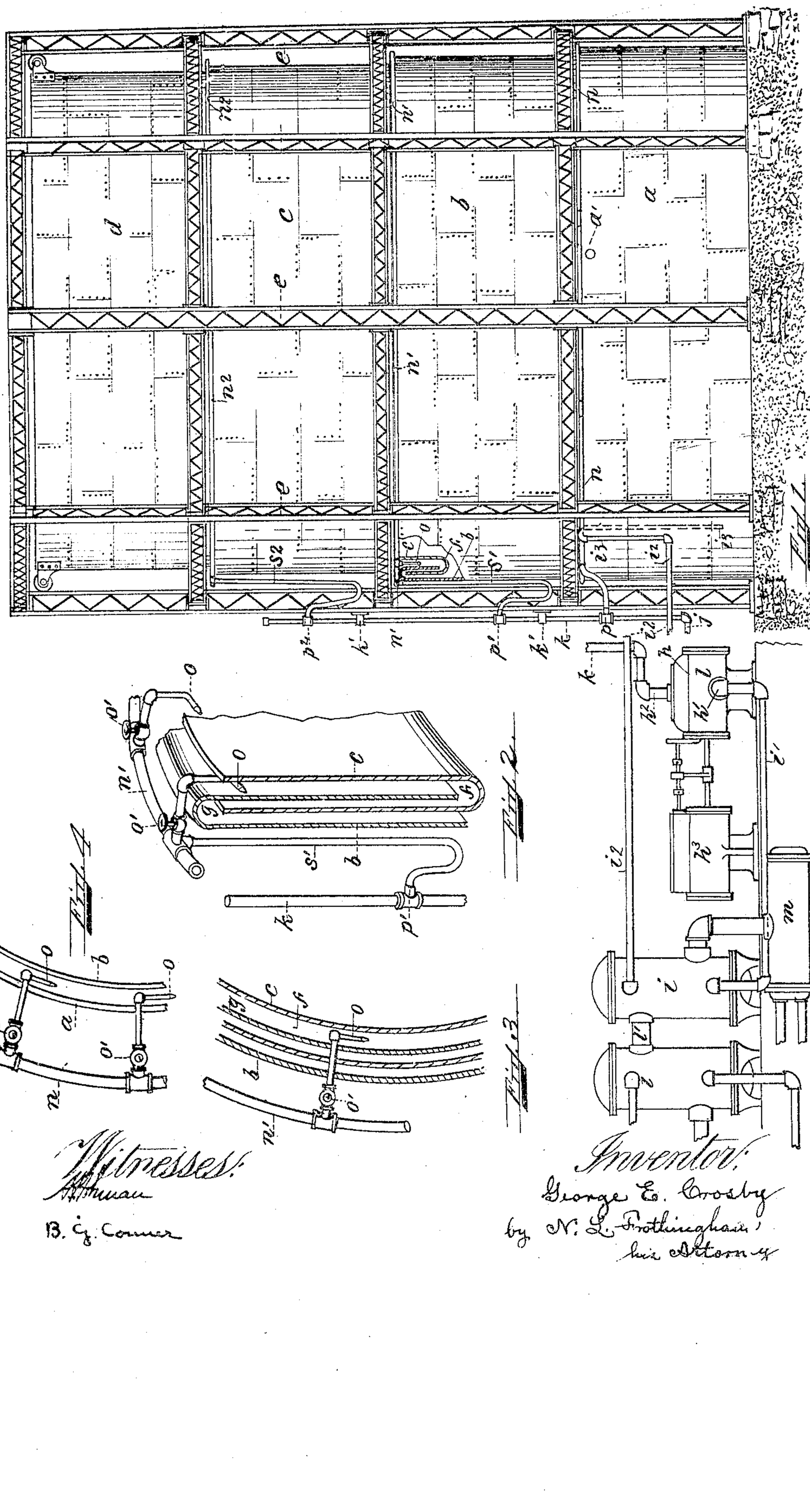
No. 865,480. PATENTED SEPT. 10, 1907.

# G. E. CROSBY.

## GAS HOLDER.

APPLICATION FILED APR. 11, 1907.



Witnesses:
H. Hinman
B. G. Conner

Inventor:
George E. Crosby
by N. L. Frothingham
his Attorney

# UNITED STATES PATENT OFFICE.

GEORGE E. CROSBY, OF ALLSTON, MASSACHUSETTS.

## GAS-HOLDER.

No. 865,480. Specification of Letters Patent. Patented Sept. 10, 1907.

Application filed April 11, 1907. Serial No. 367,665.

*To all whom it may concern:*

Be it known that I, GEORGE E. CROSBY, a citizen of the United States, residing at Allston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Gas-Holders, of which the following is a specification, reference being had therein to the accompanying drawings, which form a part thereof.

The invention relates to gas holders and more particularly to that class thereof employing a bell and tank and a water seal therebetween.

The main object of the invention is to provide a tank and bell wherein the water in the water seal or seals between the tank and the bell, or between adjoining bell sections, will, during the winter season, be prevented from freezing by means of an apparatus which may be economically installed, maintained and operated:

A further object is to provide a tank and bell wherein the water seals, during the winter season, will not only have the temperature of the water therein raised and maintained above the freezing point, but will have a substantially constant supply of fresh flowing water of a temperature higher than the freezing point, discharged thereinto.

A still further object is to provide the water seals of a bell and tank with a feed water supply system which will automatically adapt itself to the change in the altitude of the bell or bell sections.

A still further object is to provide a feed water supply system which will utilize the exhaust steam from the power plant, or other part of the producer plant, for heating the feed water prior to its discharge into the seals, thus not only insuring great economy in keeping the seals open, but also in bringing the feed water to the desired temperature without waste.

A still further object is to provide a feed water supply system which will cause a substantially constant circulation of warm water in each water seal thus causing the constant agitation or flow of water to aid in preventing the formation of ice.

A still further object is to provide in a bell and tank gas holder, a feed water system which will not only cause the various water seals to overflow, but will also impart a rotary impulse to the water contained in each seal in a manner to cause it to flow continuously about the bell. And a still further object is to provide a bell and tank gas holder wherein the various appliances supplying water to the water seals will be so positioned and arranged as to not obstruct the ascent and descent of the bells, or be disarranged thereby.

The invention consists primarily in a gas holder embodying in combination a tank, a bell, a water seal between said tank and said bell, and means whereby water may be constantly discharged into said seal to set up a continuous circulation of water therein; and in such other novel features of construction and combination of parts as are hereinafter set forth and described and more particularly pointed out in the claims hereto appended.

Referring to the drawings: Figure 1 is a side elevation of a gas holder and feed water system for the water seals embodying my invention, one of the seals between adjoining bell sections being shown in section; Fig. 2 is a cross section of a water seal between the bell sections on a larger scale; Fig. 3 is a plan view partly in elevation and partly in section of a part of one of the said water seals on a larger scale, and Fig. 4 is a plan view of a part of the water seal between the tank and adjoining bell section on a large scale.

Like letters refer to like parts throughout the several views.

In the embodiment of my invention shown in the drawings, I have indicated at *a*, a tank of ordinary construction in connection with which are shown three interlocking bell sections, *b*, *c* and *d*, also of the usual construction and arrangement, which are inclosed by suitable braced guide pillars *e*. The tank *a* is provided with a suitable overflow outlet, as *a'*, to limit the volume of water accumulated therein.

Between the tank *a* and the lowermost bell, *b*, and between the adjoining bell sections is what is termed a water seal. Between the adjoining bell sections each seal comprises a trough *f* formed about the lower part of the bell section by means of the outwardly and upwardly turned bottom plates, and of a pendent flange *g* formed by the inwardly and downwardly turned top plates of the bell sections; and between the tank *a* and the bell *b* the water itself constitutes the seal, the sides of the top of the tank and of the bottom of the bell *b* being substantially straight, a construction and arrangement which is now in general use.

The tank *a* being normally filled with water, the space between the tank and its bell is consequently filled with water, thereby constituting a seal. The trough *f* is filled with water in which the flange *g* is so submerged as to form a perfectly gas tight joint between these parts, when they become interlocked as hereinafter stated. The dimensions of the trough and the distance of the flange from the bell are such as to afford the clearance necessary to make the device operative, thus causing said trough to always carry a considerable volume of water.

It is essential for the water seal to be always free, and to avoid the freezing of the water therein various expedients have heretofore been adopted. To keep the water at a desired temperature by the most approved of these expedients, it has heretofore been found necessary to maintain separate boilers, thus resulting in considerable expense. To obviate this expense, and at the same time effectively prevent the

freezing of the water in the troughs, I provide a feed water system which, during the cold weather, may be used to constantly discharge water into each water seal, thus setting up a constant circulation of water and utilizing to a certain extent the principle that flowing waters do not readily freeze. Preferably, however, I supplement this with heating means whereby the water being constantly placed in circulation, is brought to a temperature which will preclude its freezing, and at the same time raise the temperature of the water contained in the trough to a point above freezing. This system comprises a force pump $h$, the inlet $h'$ of which is in communication, preferably through a feed water heater $i$ and pipes $i'$, $i^2$ and $i^3$ with the interior of the tank $a$, the pipe $i^3$ extending to a point near the bottom of said tank. The outlet $h^2$ of said pump is in connection with a stand pipe $k$ by the pipe $j$. The pump $h$ is driven from any source of power, as the engine $h^3$.

The feed water heater is of the usual and well known construction embodying a closed casing. In the interest of economy, however, I couple the heater $i$ to a second feed-water heater $l$ with the pipe $l'$, which heater supplies the boiler, and causes the exhaust steam to pass through said heaters successively. It not being requisite for the water passing through the heater $i$ to be brought to a very high temperature to fit it for use, I cause the steam to pass through it last, thus heating the feed water for the water seals, by what would otherwise be a waste steam, and at the same time partially or totally condense said steam. After the steam has passed through the heater $i$ it may be discharged into the open, or into a condenser $m$, as desired.

Encircling the top outer edge of the tank $a$, and of each bell, $b$ and $c$, excepting the topmost bell, such having no seal at the top thereof, I extend a pipe $n$, $n'$ and $n^2$ disposed about the water seal and having a plurality of jet nozzles $o$ extending over the top of the turned portion of the plate forming the flange $g$ and over the top of the tank $a$, and directed and projecting diagonally downwardly into the water or just under the surface thereof, all such nozzles in a trough being given the same direction. The volume of water passing through the nozzles is regulated by the valves $o'$. By positioning said pipes $n$ on the curve of the top edge and within the edge of the bell proper they are readily accessible, are convenient for the arrangement of the nozzle $o$ and are not in the way of the bells or tanks as the same rise and fall.

Each pipe $n'$ and $n^2$ is connected with a nozzle $p'$, $p^2$, respectively, of the stand pipe $k$ by a flexible hose $s'$ and $s^2$, which are of a sufficient length to permit the necessary range of movement of the bells $b$, $c$. The pipe $n$ is rigidly connected with a nozzle $p$ of the stand pipe $k$. While the nozzles $o$ are carried by the bells adjacent to the pendent flange $g$, they are nevertheless always properly positioned when the seal is formed by the trough $f$ and said flanges. The stand pipe $k$ may be supported in any desired manner, clamps $k'$ mounted on one of the standards $e$ being preferably employed.

The operation of the heretofore described tank and bell gas holder, or gasometer, is substantially as follows: The tank $a$ is normally filled with water, the supply thereof being replenished by rain, or melted snow. When the water contained in the tank reaches the highest desired level, any excess is carried away through the drain $a'$. It will thus be observed that there is always a sufficient supply of water in said tank. Before the bells are filled with gas, and as the volume of the gas therein contained diminishes, the sections $b$, $c$, $d$ of the bell descend and telescope within said tank $a$. With such action the flexible hose $s$, $s^2$ rise and fall with their respective bells, and the pipe $n'$, $n^2$ being positioned within the greatest diameter of their respective bell sections $b$, $c$ pass freely within the tank $a$ and bell $b$ respectively. It will thus be seen that the operation of my feed water system for the water seal to be described hereinafter, is not interfered with by this movement of the bell or bell sections of the gasometer. As the bell sections $d$, $c$, $b$ ascend in the order named, the trough $f$ is filled with water from the tank $a$ and interlocks with the flange $g$ forming a sinuous channel, the elbow of which is filled with water, in the usual manner, to form the water seal. In cold weather the water is apt to freeze, and to avoid such, the feed water heater $i$ is put in circuit with the boiler feed water heater $l$ and the pump $h$ started drawing water from the tank $a$ through the pipe $i^2$ to the feed water heater $i$ where it is heated by the exhaust steam passing through said heater, and through the pipe $i'$ to the pump. It is then forced through the pipe $j$ to the stand pipe $k$, and through the nozzles $p$, $p'$, $p^2$ thereof and the connections $s$, $s'$, $s^2$ to the pipes $n$, $n'$, $n^2$. The nozzles $o$ of each said pipe, discharge the water at a downward angle into the water seal in a plurality of small, strong jets which sets up a circulation of water, more or less rapid, about each bell section. This constant movement of the water will, in itself, tend to avoid the formation of ice, but the heating of the water maintains the entire volume of water in the trough at a temperature which precludes any possibility of its freezing. The jets of freshly heated water, in addition to setting up a local circulation as described, mix this water thoroughly with that already in the trough. This constant discharge of water into the troughs cause them to overflow, but this overflow merely passes from trough to trough or to the tank $a$, thus setting up a general circulation of water from the tank, to the pump, to the trough and back to the tank $a$. Thus it will be seen that the water is always changing either in a local or in a general circulative system and additionally, that freshly heated water is being constantly discharged into the water seals which, by reason of their exposed position and the small volume of water therein, are most likely to freeze. It will also be observed that my entire heating system is maintained without added cost of maintenance, thus insuring great economy, tests having demonstrated that the cost of maintenance of my system is but 5% of that of ordinary systems, with as high a degree of efficiency, under similar conditions.

The use of waste steam has been found satisfactory as it is not necessary to raise the temperature of the water to a high degree, and a secondary heater meets all the requirements of the use of the apparatus.

It is not my intention to limit the invention to the details of construction heretofore referred to and shown in the drawings, it being apparent that such may be varied without departing from the spirit and scope of the invention.

13

Having described the invention, what I claim as new and desire to have protected by Letters Patent is:

1. A gas holder embodying in combination a tank, a bell, a water seal between said tank and said bell, means whereby water may be discharged into said seal means constantly forcing water through said first mentioned means to said seal, to set up a continuous circulation of water therein and connections between said last mentioned means and a source of water supply.

2. A gas holder embodying in combination a tank, a bell, a water seal between said tank and said bell, means whereby water may be discharged into said seal, means constantly forcing water through said first mentioned means to said seal to set up a continuous circulation of warm water therein, a water heater, and connections between said heater and said last mentioned means, and a source of water supply respectively.

3. A gas holder embodying in combination a tank, a bell, and a water seal between said tank and said bell, and a feed water system comprising a distributing pipe discharging into the surface water of that in said seal whereby water therefrom will set up a surface circulation in said seal, a force pump and pipes between said pump and said distributing pipe, and between said pump and a source of supply.

4. A gas holder embodying in combination a tank, a telescopic bell and a plurality of water seals between said tank and the lowermost section of said bell and between adjoining sections of said bell, and a feed water system comprising a stand pipe, a distributing pipe carried by said tank, and by said bell sections adjacent to and discharging into the surface water of that in each said water seal, a suitable pipe connection between said stand pipe and each said distributing pipe, a force pump, and pipes between said pump and said stand pipe, and between said pump and a source of supply.

5. A gas holder embodying in combination a tank, a bell and a water seal between said tank and said bell, and a feed water system comprising a distributing pipe discharging into said water seal, a feed water heater, means whereby exhaust steam is passed through said heater, a pipe between said heater and a source of water supply, a force pump and pipes between said pump and said feed water heater and between said pump and said distributing pipe.

6. A gas holder embodying in combination a tank, a bell and a water seal between said tank and said bell, and a feed water system comprising a distributing pipe discharging into said water seal, a boiler feed water heater, a water seal feed water heater, means whereby exhaust steam is passed successively through said boiler feed water heater and said water seal feed water heater, a pipe between said water seal feed water heater and a source of water supply, a force pump and pipes between said pump and said feed water heater, and between said pump and said distributing pipe.

7. A gas holder comprising in combination a tank, a bell and a water seal between said tank and said bell and a feed water system comprising a distributing pipe discharging into said seal, a force pump, and pipes between said pump and said distributing pipe and between said pump and said tank.

8. A gas holder comprising in combination a tank, a bell and a water seal between said tank and said bell, and a feed water system comprising a distributing pipe, a discharge nozzle therefor directed at an acute angle into said seal, a force pump, and pipes between said pump and said distributing pipe, and between said pump and a source of water supipy.

9. A gas holder comprising in combination a tank, a bell and a water seal between said tank and said bell, and a feed water system comprising a distributing pipe encircling said tank about the outer top edge thereof, and having a plurality of jet nozzles disposed about said water seal and directed diagonally downwardly into said seal, all at substantially the same angle, and in the same direction, a force pump and pipes between said pumps and said distributing pump, and between said pump and a source of water supply.

10. A gas holder comprising in combination a tank, a telescopic bell, and a plurality of water seals between said tank and the lowermost section of said bell and between adjoining sections of said bell, and a feed water system comprising a stand pipe, a distributing pipe encircling said tank and each said bell sections about the outer top edge thereof adjacent to the water seal and having a plurality of jet nozzles disposed about said seal and directed diagonally downwardly into said seal, all at substantially the same angle and in the same direction, suitable connections between said stand pipe and said distributing pipes respectively, a feed water heater, a pump and pipe connections between said heater and said tank, and between said pump and said stand pipe.

11. A gas holder embodying in combination a tank, a bell and a water seal between said tank and said bell, and a feed water system comprising a distributing pipe discharging into said water seal, a closed feed water heater, means whereby exhaust steam is passed through said heater, a pipe between said heater and a source of water supply, a force pump and pipes between said pump and said feed water heater, and between said pump and said distributing pipe.

12. A gas holder embodying in combination a tank, a bell and a water seal between said tank and said bell, and a feed water system comprising a distributing pipe discharging into said water seal, a closed feed water heater, means whereby exhaust steam is passed through said heater, a pipe between said heater and a source of water supply, a force pump and pipes between said pump and said feed water heater, and between said pump and said distributing pipe, and a condenser.

In witness whereof, I have hereunto affixed my signature this fifth day of April, 1907, in the presence of two witnesses.

GEORGE E. CROSBY.

Witnesses:
N. L. FROTHINGHAM,
A. A. ASHMAN.