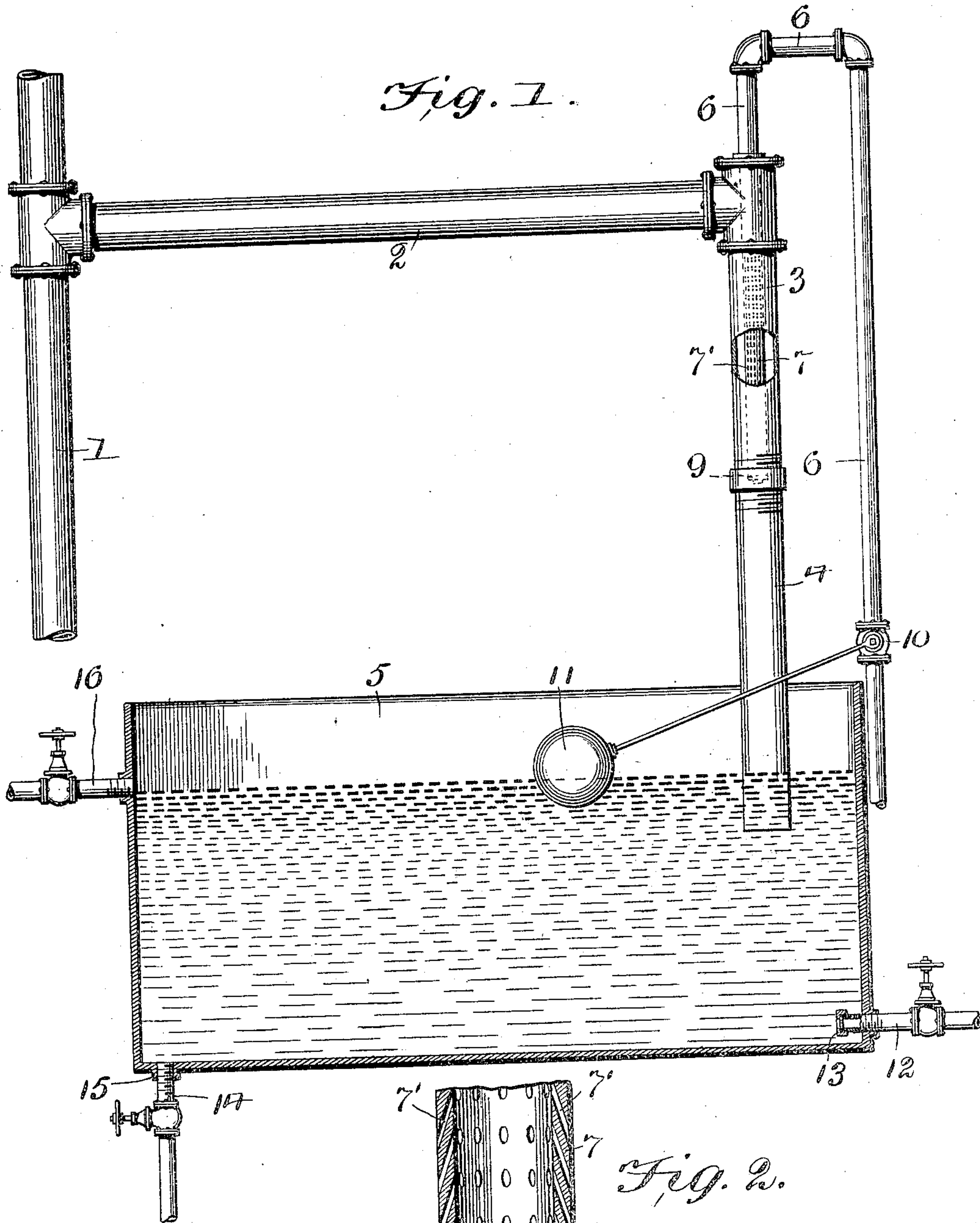


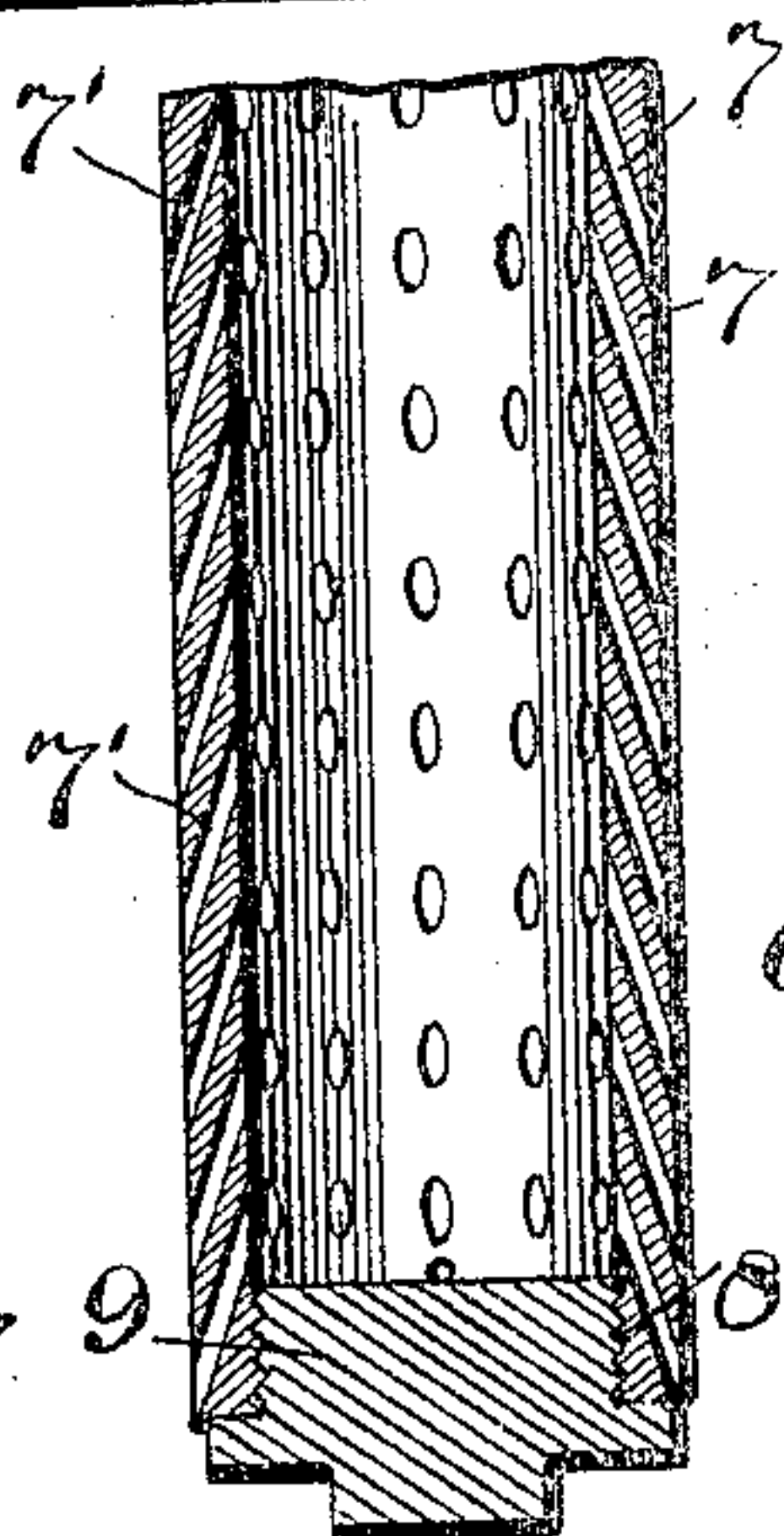
No. 807,669.

PATENTED DEC. 19, 1905.

C. H. GATES.
FEED WATER HEATER.
APPLICATION FILED JULY 1, 1905.



WITNESSES:
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CHARLES H. GATES, OF CARBONDALE, PENNSYLVANIA.

FEED-WATER HEATER.

No. 807,669.

Specification of Letters Patent.

Patented Dec. 19, 1905.

Application filed July 1, 1905. Serial No. 267,874.

To all whom it may concern:

Be it known that I, CHARLES H. GATES, a citizen of the United States, and a resident of Carbondale, State of Pennsylvania, have invented certain new and useful Improvements in Feed-Water Purifiers and Heaters for Steam-Boilers, of which the following is a full, clear, and complete disclosure.

The object of my invention is the production of a simple and effective device of this class by means of which the feed-water for a boiler is not only heated and introduced into a boiler at the required temperature, but is also purified and all grease and other foreign matters that it may contain are effectively removed or prevented from passing over to the feed-pump and thence to the boiler.

For a full, clear, and exact description of my invention reference may be had to the following specification and to the accompanying drawings, in which—

Figure 1 is an elevation of my feed-water purifier and heater, certain parts of which are shown in section; and Fig. 2 is a detailed sectional view of my preferred form of sprayer used in connection with my device.

In carrying out my invention I connect an exhaust-steam pipe by a branch pipe 2 with a water-heating pipe or chamber 3, the latter being provided with an extension 4, which forms a continuation of the chamber 3 and enters a hot-water tank 5, the lower end of said continuation being three or four inches below the normal level of the water in the said tank.

6 represents a cold-water pipe, the discharge end of which extends for a considerable distance into the water-heating pipe or chamber 3, and the end 7 of said water-pipe 6 is provided with perforations 7', which in the preferred form of my invention incline downwardly or lengthwise of the water-heating chamber or pipe 3. The lower end of the pipe 7 is provided with screw-threads 8, into which a plug 9 is securely screwed, thus closing the end thereof. The cold-water pipe 6 is further provided with a valve 10, which is controlled by a float 11, so arranged that when the level of the water in the tank falls below a certain predetermined point the valve 10 will be opened and cold water will be permitted to flow through the pipe 6 and perforations 7' into the water-heating pipe or chamber 3.

The tank 5 is open at its top to atmospheric pressure, and in the preferred form of

my invention the entire top of the tank will be open, although, of course, a screen or foraminous cover might be provided for the top for the purpose of keeping out dirt and foreign bodies without departing from the spirit of my invention. The tank 5 is also provided near its bottom with an opening, into which a pipe 12 is inserted and secured, said pipe leading to the force or feed pump by which the water in the tank is fed to the boiler. The end of the pipe 12 is preferably provided with the screen 13 for the purpose of preventing dirt and foreign matter from being carried through the pipe into the boiler. A valve 14, also connected to the bottom of the tank by means of the pipe 15, provides means for removing the mud and sediment which may settle and accumulate at the bottom of the tank, and 16 is an overflow-pipe, by means of which the water is prevented from rising above a predetermined level in the tank.

The operation of my device is as follows: The water being maintained at an approximately constant level by means of the float 11, steam from the exhaust-pipe will fill the branch 2, water-heating pipe or chamber 3, and the extension 4; but the steam is prevented from passing out of the extension 4 by reason of the fact that the said extension reaches below the level of the water in the tank and is therefore water-sealed. When, however, the level of the water in the tank 5 falls by reason of the supply in the tank having been drawn off through the pipe 12 for the purpose of filling the boilers, the float 11 will also fall, opening the valve 10 and permitting cold water to enter the water-heating chamber 3 through the sprayer 7. Upon issuing from the sprayer the cold water immediately condenses most of the steam in the water-heating pipe or chamber 3, absorbing the heat thereof and forming a partial vacuum in the pipe 2, water-heating pipe or chamber 3, and extension 4. This partial vacuum will draw more steam from the exhaust-steam pipe 1 into the water-heating chamber and so long as the level of the water in the tank remains below the predetermined point will the cold-water pipe continue to discharge into the water-heating pipe or chamber 3 and will more steam continue to be drawn into the said chamber or pipe 3 to heat the cold water which is entering. When the tank 5 is full, then the cold-water supply will be automatically shut off through the action

of the float 11 and there will be practically little or no steam condensed into the water-heating pipe or chamber 3, and consequently only so much steam will be supplied to the water-heating chamber as suffices to keep the chamber 3 filled with steam.

From the above description it will be apparent that only so much steam is consumed as is necessary to heat that amount of cold water which is required to keep the water in the tank at a fixed or constant level.

As the grease and similar impurities will rise to the top of the hot-water tank 5, by my improved construction and arrangement they can be easily removed, as the tank 5 is open at the top and the surface of the water is readily accessible.

In the forms of feed-water heaters now in use considerable difficulty has been experienced in starting the heater, since with a closed tank a considerable amount of back pressure is created in the tank by reason of the accumulation of air liberated from in the water fed into the tank, no means being provided for relieving this back pressure, since the tank itself after the heater has been started is depended upon to maintain the partial vacuum by which the exhaust-steam is drawn over into the water-heating chamber, and must consequently be kept closed. In my improved construction it will be seen that no such difficulty will arise, since any air contained in the water is immediately free to escape from the tank into the atmosphere.

By giving a downward inclination to the opening 7' in my sprayer 7 the starting of the device is also further facilitated, since the downward rush of cold water tends to draw the steam more rapidly over into the water-heating pipe or chamber.

Having thus described my invention, what I claim, and desire to protect by Letters Patent of the United States, is—

1. In a feed-water heater, the combination of an open tank, a water-heating pipe or chamber, the lower end of which is at all times sealed by the water in the said tank, means for maintaining a constant level of water in the tank, means for supplying steam to said water-heating pipe or chamber, and a cold-water pipe provided with a sprayer located within said pipe or chamber.

2. In a feed-water heater, an open tank, a cold-water pipe provided with a sprayer, means whereby the level of the water in the tank is used to regulate the supply of cold water, a steam-pipe surrounding said supply and having its lower end sealed at all times

by the water in the tank and forming a water-heating chamber, and means for supplying steam to said water-heating chamber.

3. In a feed-water heater, the combination of an open tank, the water-heating pipe or chamber having its lower end sealed at all times by the water in the tank, means for supplying steam to said water-heating chamber, means for discharging cold water within said chamber, and means controlled by the level of the water in the tank for regulating the supply of cold water to the chamber.

4. In a feed-water heater, the combination with an exhaust-steam pipe, of an open tank, the water-heating chamber having its lower end sealed at all times by the water in the tank, means for maintaining the constant level of water in the tank, the branch pipe leading from the said exhaust-pipe to the said water-heating pipe or chamber and a cold-water pipe provided with a sprayer, the perforations of which are all arranged to discharge the water delivered to the chamber substantially lengthwise of the water-heating chamber whereby the water entering the chamber tends to draw steam from the exhaust-pipe into the said water-heating chamber.

5. In a feed-water heater, the combination of an exhaust-steam pipe 1, of a water-heating pipe or chamber 3, provided with the extension 4, connected to the said exhaust-steam pipe 1, and having its lower end at all times sealed by the water in the tank, of a cold-water pipe 6 provided with the sprayer 7, located within the said pipe or chamber 3, the tank 5 and the valve 10 controlled by the float 11 in the tank 5.

6. In a feed-water heater, the combination with an exhaust-steam pipe, of an open tank, a water-heating pipe or chamber extending below the surface of the water in said tank, and means for discharging cold water within said pipe or chamber said means consisting of a downwardly-extending cylindrical nozzle, the vertical side walls of which are provided with downwardly - extending perforations whereby all the water passing through said nozzle, is discharged lengthwise of the heating-chamber to draw steam from said exhaust-steam pipe into the said water-heating chamber.

In witness whereof I have hereunto set my hand this 28th day of June, 1905.

CHARLES H. GATES.

Witnesses:

J. O'HEARN,
GEORGE A. KASE.