

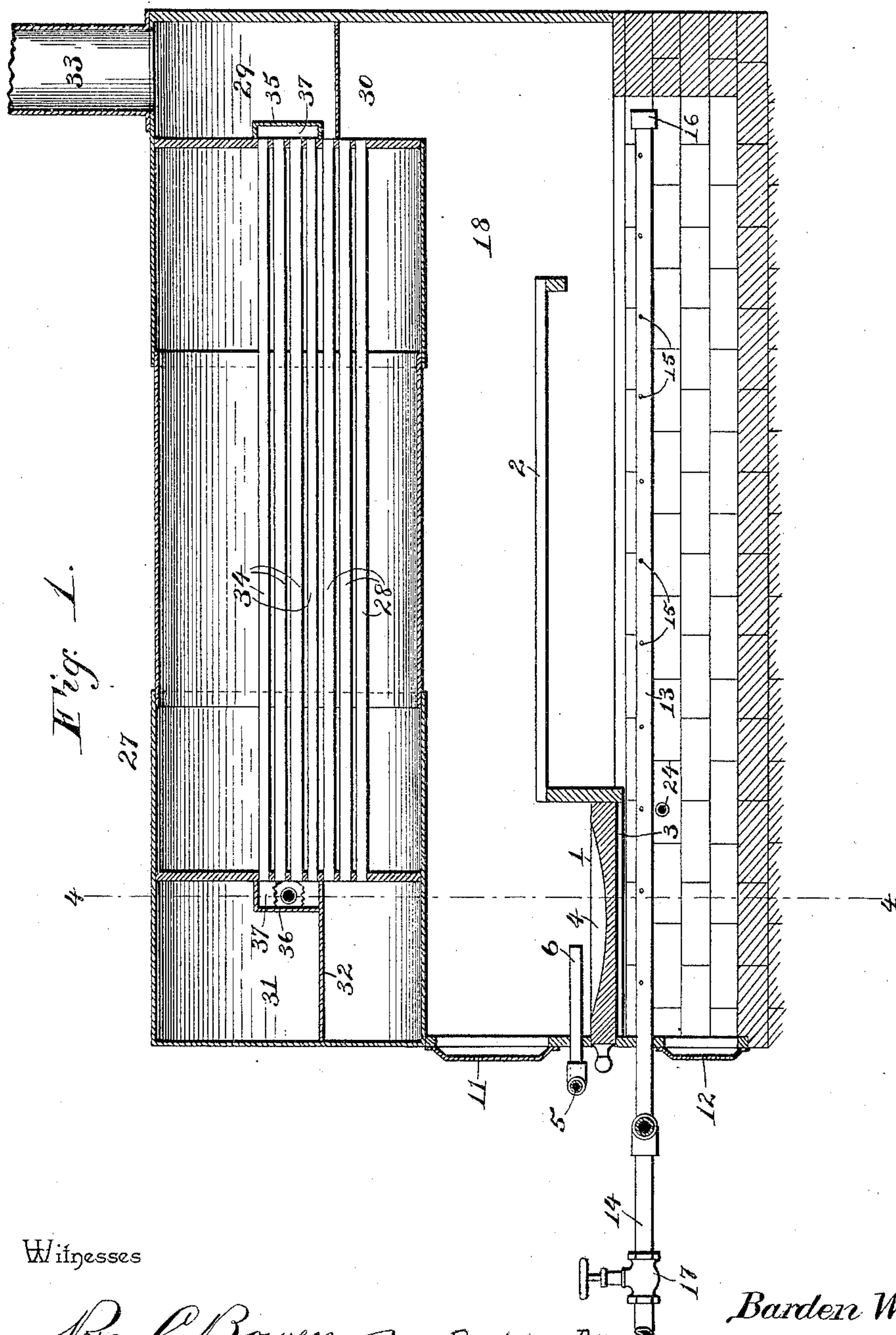
(No Model.)

3 Sheets—Sheet 1.

B. W. TAYLOR.  
FEED WATER HEATER.

No. 458,698.

Patented Sept. 1, 1891.



Witnesses

Wm. Bagger

By his Attorneys,

Inventor:

*Barden W. Taylor,*

CA Snow & Co

(No Model.)

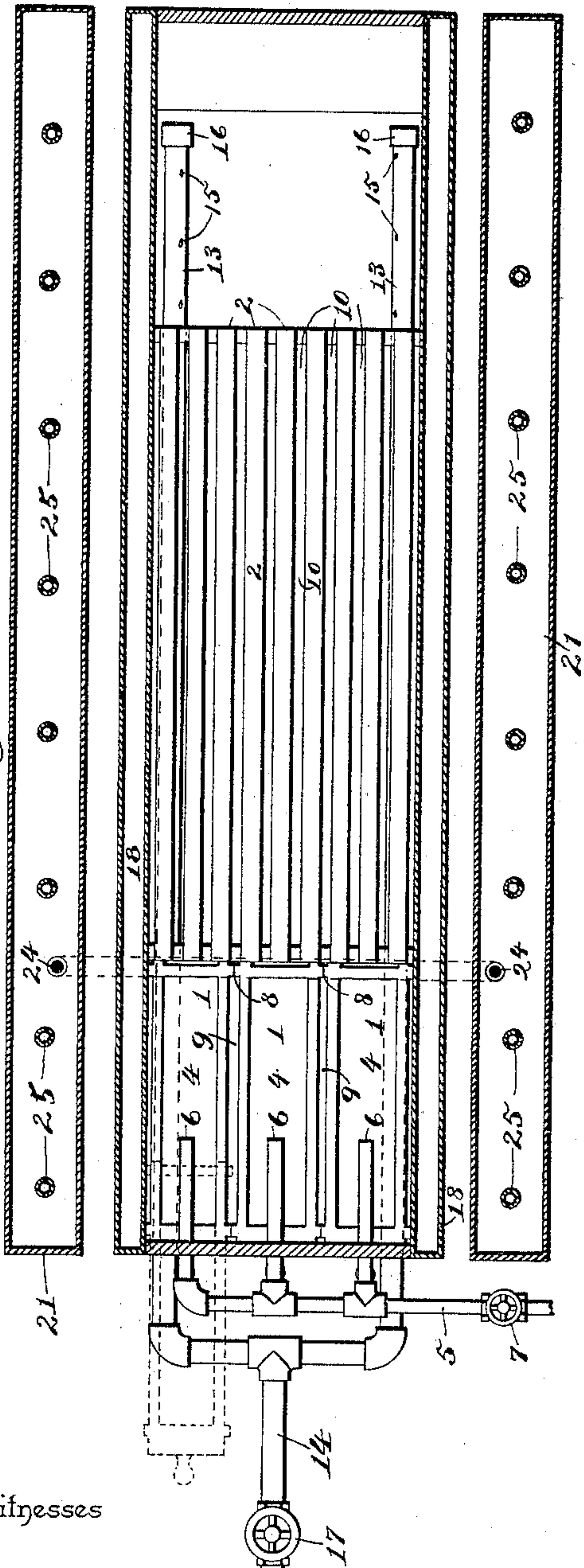
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Fig. 2.



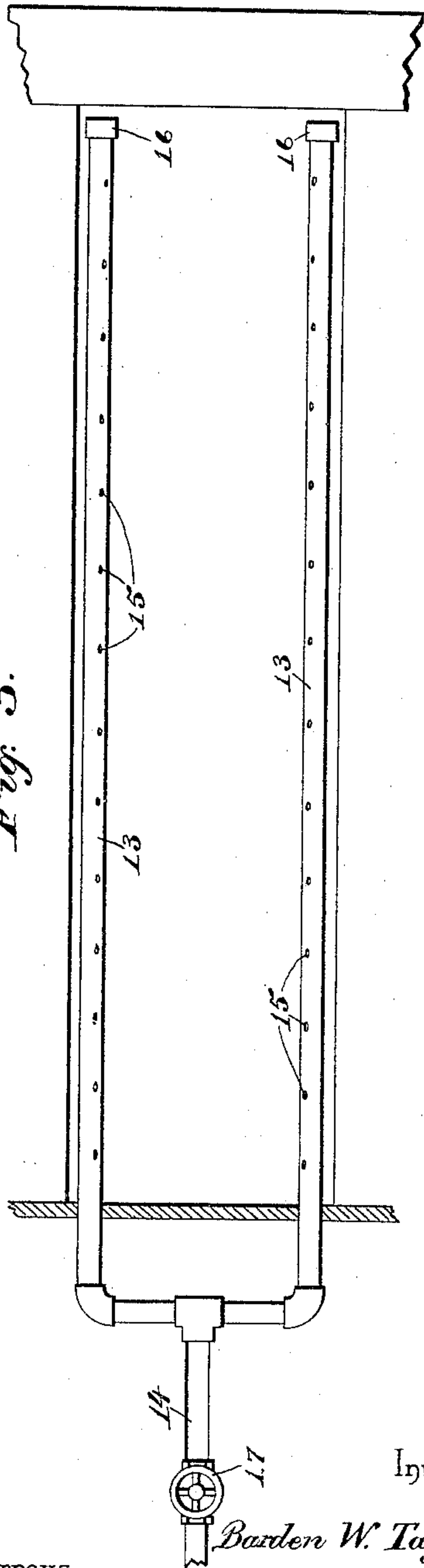
Witnesses

*Percy C. Bowen,*  
*Wm. Baggett*

By his Attorneys,

*C. A. Snow & Co.*

Fig. 3.



Inventor

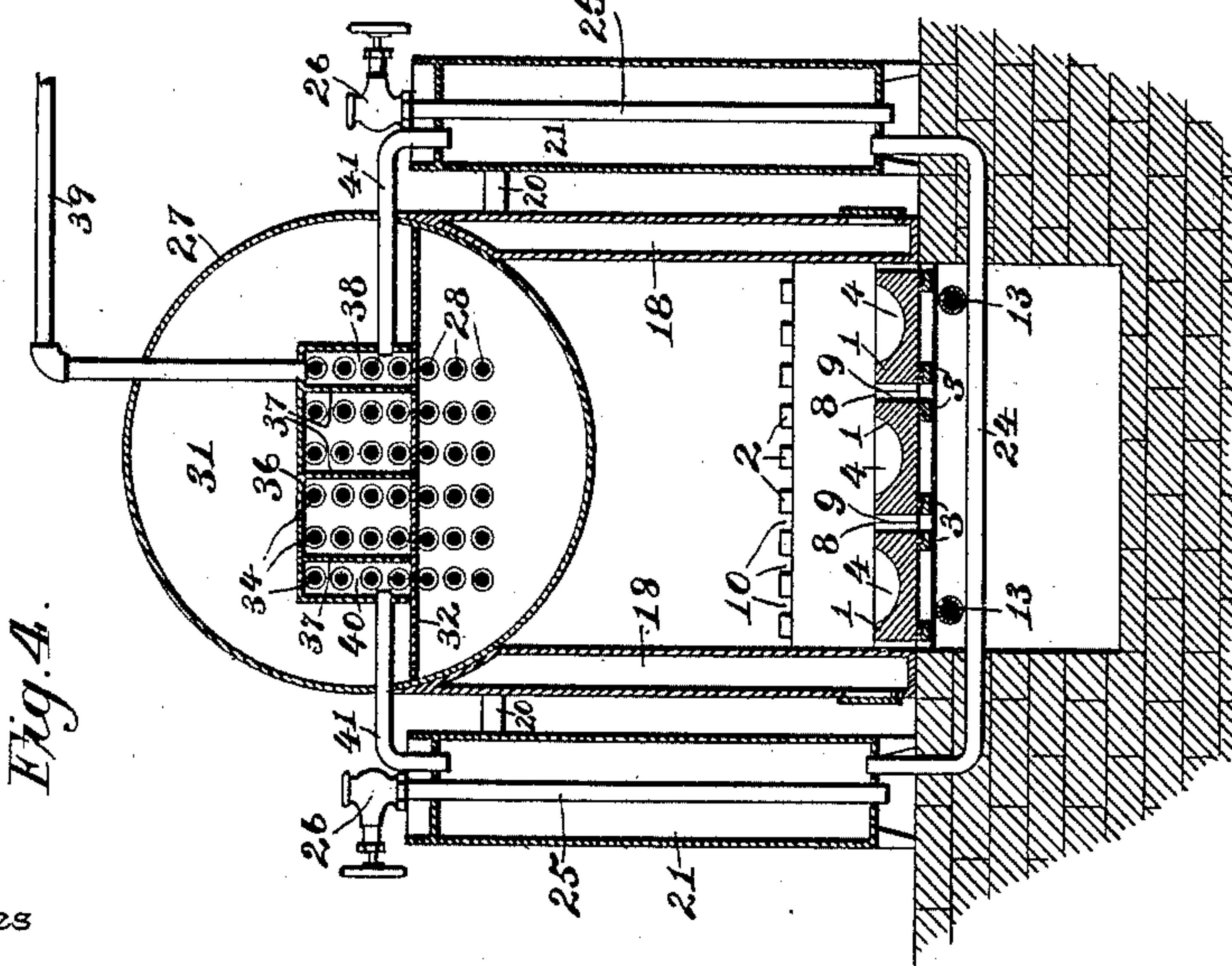
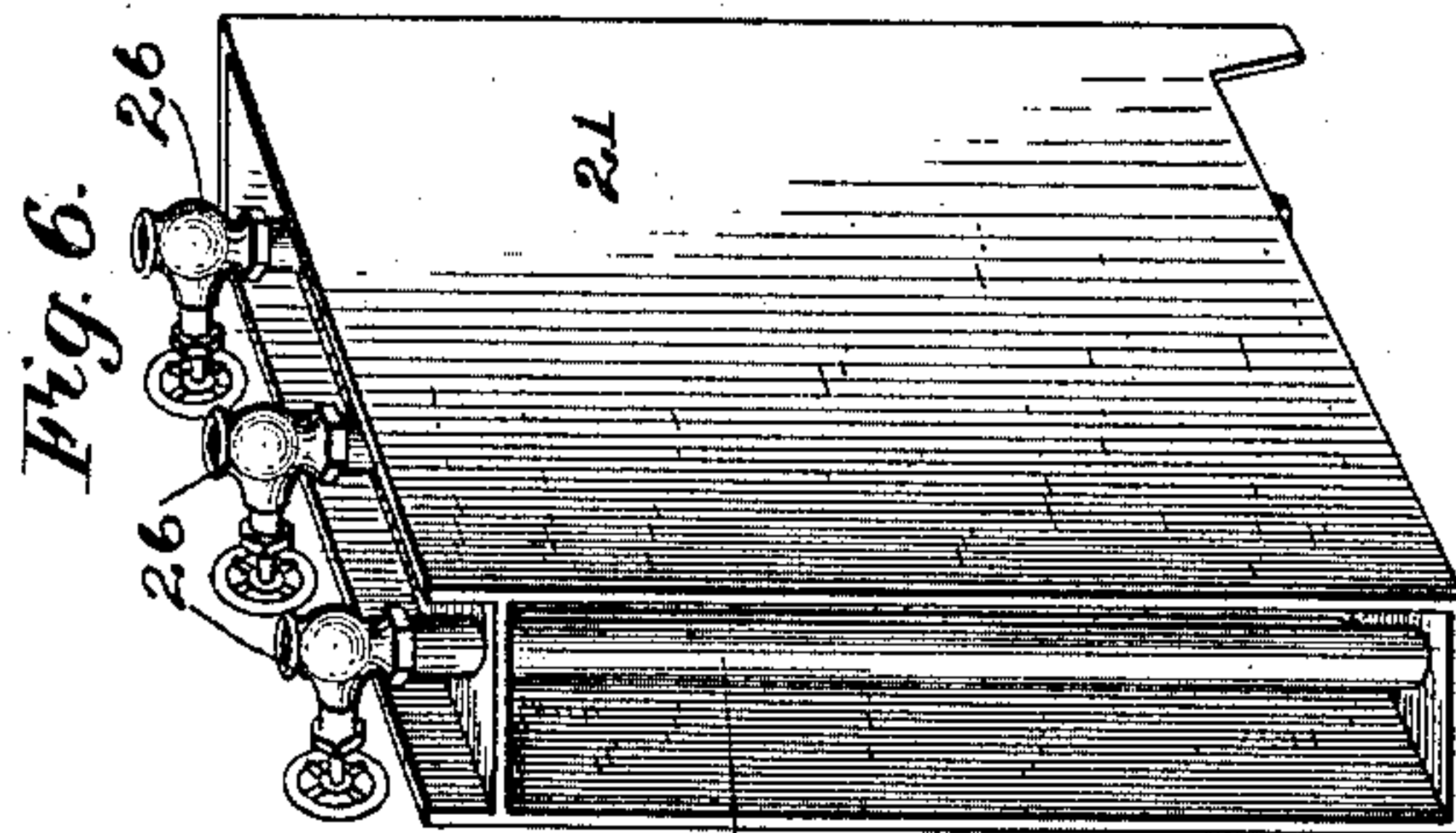
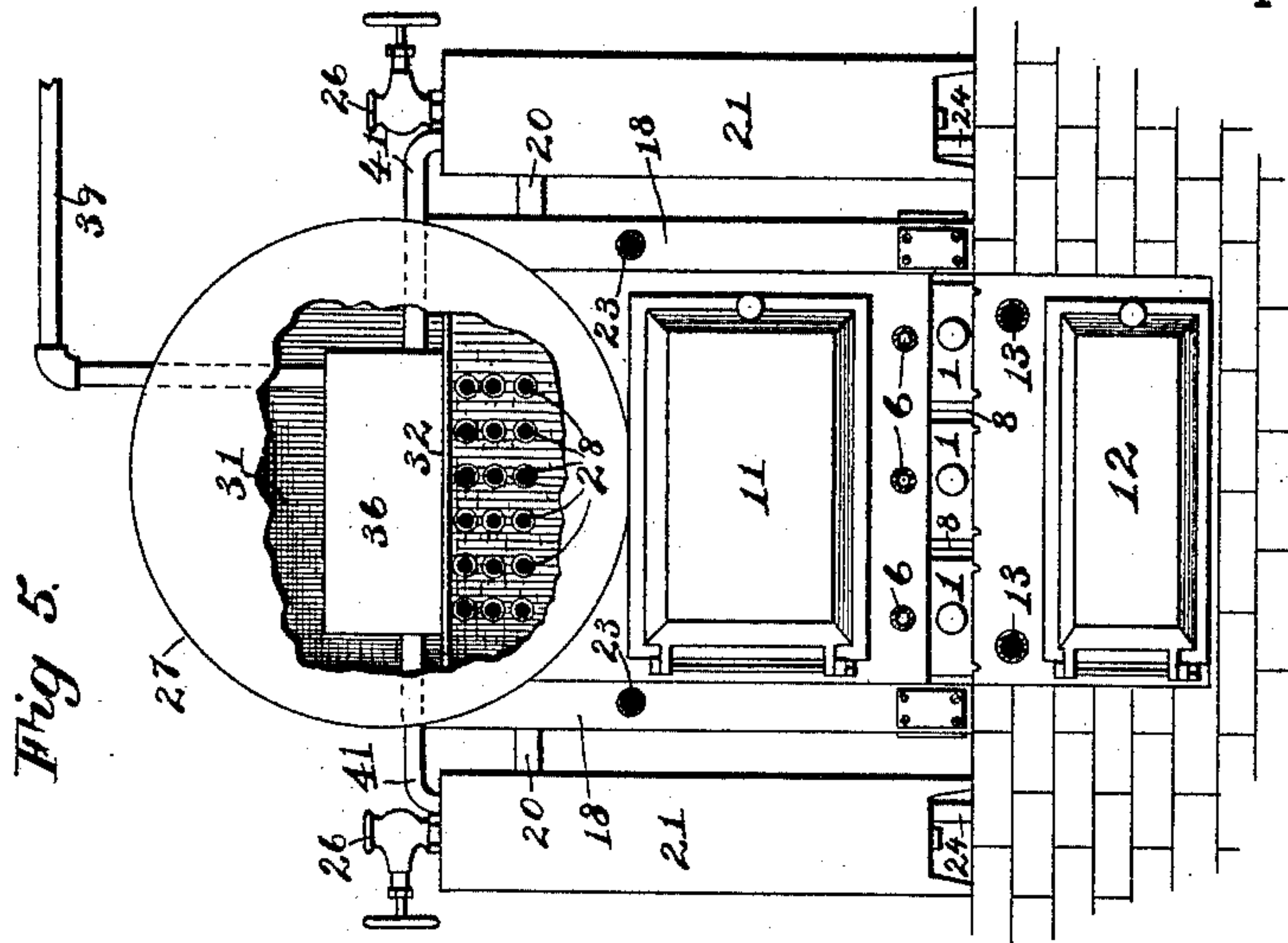
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# UNITED STATES PATENT OFFICE.

BARDEN WALTON TAYLOR, OF LOS ANGELES, CALIFORNIA.

## FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 458,698, dated September 1, 1891.

Application filed October 7, 1890. Serial No. 367,308. (No model.)

*To all whom it may concern:*

Be it known that I, BARDEN WALTON TAYLOR, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Feed-Water Heater and Steam-Generator, of which the following is a specification.

This invention relates to feed-water heaters and steam-generators; and it has for its object to provide a device which shall be simple in construction and easily managed, and by means of which fuel may be economized and steam produced in a more rapid and economical manner than heretofore.

The invention further has for its object to heat and purify the feed-water and to utilize the heat contained in the exhausted steam.

A further object of the invention is to effect a thorough consumption of the fuel and smoke, thereby avoiding all waste of heat which is usually carried with the products of combustion.

With these ends in view the invention consists in certain improvements in the construction and arrangement of the component parts of the device, which will be hereinafter fully described, and particularly pointed out in the claims.

In the drawings hereto annexed, Figure 1 is a longitudinal sectional view of the steam-generator constructed in accordance with my improvements. Fig. 2 is a horizontal sectional view of the same, taken above the furnace-grate. Fig. 3 is a horizontal sectional view taken below the grate of the furnace. Fig. 4 is a transverse sectional view taken on the line 4 4 in Fig. 1. Fig. 5 is a front view with parts broken away to show the construction more clearly. Fig. 6 is a perspective detail view of one of the condensers.

Like numerals of reference indicate like parts in all the figures.

The furnace of my improved feed-water heater and steam-generator is built in the usual manner upon and over a suitable bed of fire-brick or other suitable material and is provided with two separate sets of grate-bars, which are designated, respectively, by 1 and 2, suitable supports being provided for said grate-bars. The front grate-bars 1 are comparatively short and wide, and they are

mounted upon supporting cleats or flanges 3 in such a manner as to be capable of being drawn in a forward direction and out of the furnace, as will be seen in Fig. 2 of the drawings. Said front grate-bars have recesses or concavities 4 in their upper sides adapted to hold liquid fuel, which may be supplied from a suitable reservoir through a pipe 5, having branches 6, that extend through the front of the furnace and terminate directly above the said cup-shaped grate-bars. The supply-pipe 5 has a globe-valve 7, by means of which the supply of fuel may be regulated and cut off when desired. The fuel employed may be any of the hydrocarbon oils that are usually employed for heating purposes. The sides or edges of the grate-bars 1 are provided with lugs 8, abutting against each other, so as to form between said grate-bars slots or openings 9 to create the necessary draft.

The grate-bars 2, which are comparatively long and narrow, are mounted upon suitable cleats or flanges directly in rear of the grate-bars 1, and are likewise spaced to form the intermediate slots or openings 10 for the passage of the draft. The grate-bars 2 are preferably mounted several inches above the grate-bars 1, thus bringing them nearer to the bottom of the boiler. The grate-bars 2 are not necessarily extended entirely to the rear wall, but are preferably made of such length as to leave about one-fourth of the ash-pit uncovered.

The grate-bars constructed as herein described are adapted equally well to the use of solid and liquid fuel, and when the former is used the furnace may be readily cleaned of accumulations of cinders and the like by drawing the grate-bars 1 in a forward direction and raking the cinders down into the ash-pit underneath.

The foregoing description refers to the preferred construction of the furnace, which has been illustrated in the accompanying drawings, but may be changed, when desired, without departing from the invention, and which, although described as a construction preferably used in connection with the devices claimed, does not form subject-matter of the claims in the application.

The front wall of the burner is provided with doors 11 and 12, communicating, respect-



ively, with the furnace and with the ash-pit. The door 12 may be provided with suitable dampers, or it may be left open, when desired, for the admission of atmospheric air to support combustion. It is, however, a well-known fact that oxygen, which alone is useful in supporting combustion, constitutes only one-fifth of the bulk of atmospheric air, while four-fifths of the bulk is nitrogen, which is not only incombustible, but which carries off large quantities of the heat generated. I therefore propose to utilize the atmospheric draft only when fires are started in the furnace, and to supply the place thereof I arrange directly under the grate-bars at opposite sides of the furnace the longitudinal pipes 13, which are connected at their front ends with a steam-pipe 14, which latter may take steam either direct from the boiler or from the exhaust. The pipes 13 are provided in their inner sides with perforations 15, serving to diffuse the steam under the grate-bars, from whence it passes upwardly through the slots or openings 9 and 10 and serves to support the combustion of the fuel and smoke, which is in this manner thoroughly consumed. The rear ends of the steam-pipes 13 are closed by caps 16, and the supply-pipe 14 is provided with a valve 17, by means of which the supply of steam may be regulated.

At the sides of the furnace and forming the walls thereof are arranged the longitudinal tanks 18, which support the boiler 27. The tanks 18 are riveted on the sides of the boiler, but there is no water communication between the tanks and boilers. The tanks 18 receive the impure water. This water is raised to steam heat by the lateral heat of the furnace, and the steam is passed through the pipes 20 and condensed in the tank 21, and from tank 21 it is pumped as purified feed-water at 212° Fahrenheit into the boiler. The exhausted steam is also condensed in this tank and is used as feed-water for boilers. At the ends and along the sides of the tanks 18 there are openings suitable to remove sediments. The condensing-tanks 21 are set off at any suitable distance from the side tanks 18. It will be observed that the tanks 18 are practically distilling-tanks, the feed-water being distilled from said tanks into the condensers 21, and thus rendered absolutely pure before it passes to the boiler. The tanks 18 are provided with suitable openings 23 for the admission of the feed-water, and suitable means are to be provided for regulating the admission of feed-water to replace the loss by evaporation.

The condensing-tanks are connected with each other by means of a pipe 24, connected with the bottom of each of said tanks. In this manner the water is always kept at the same height in the two condensing-tanks, and only a single pump or injector is required to force the feed-water from the condensers into the boiler instead of two, which would be necessary if the condensers were not connected.

The condensing-tanks are provided with vertical ventilating-pipes 25 for the passage of cold air to assist in the condensation of the contents, and said ventilating-pipes are provided at their upper ends with valves 26 to regulate the passage of air.

27 designates the boiler, which is supported, as described, upon the longitudinal tanks 18, forming the side walls of the furnace. The lower part of the boiler is provided with several tiers of flues 28, and in the smoke-chamber 29 at the rear end of the boiler is arranged a horizontal partition or deflector 30, which separates the said flues. The products of combustion will thus be forced to pass in a forward direction through the lower flues 28. At the front end of the boiler is formed a box or chamber 31, in which is arranged a horizontal plate or deflector 32, above the upper tier of pipes 28, which are thus made to serve as return pipes or flues to carry the products of combustion back into the smoke-box 29, and thence out through the chimney or smoke-stack 33.

Extending longitudinally through the boiler above the smoke-flues 28 is a series of horizontal flues 34, which are connected with boxes 35 and 36, arranged, respectively, in the smoke-box 29 and in the chamber 31 at the front end of the boiler. The boxes 35 and 36 are provided with vertical partitions 37, by means of which the said horizontal pipes 34 are connected at their front and rear ends, so as to form a tortuous course, the ends of which are at the front end of the boiler. To one of the end compartments 38, formed in the box 36 by means of the partitions 37, is connected the exhaust-steam pipe 39. The end compartments 38 and 40 are both connected by suitable pipes 41 with the condensing-tanks 21.

From the foregoing description, taken in connection with the drawings hereto annexed, the operation and advantages of my invention will be readily understood by those skilled in the art to which it appertains. First of all I am enabled to utilize either solid or liquid fuel, or both combined. By the use or application of steam I insure perfect combustion of the fuel and avoid the loss of heat which in furnaces of ordinary construction is carried off by the nitrogen of the atmospheric air supplied for the purpose of supporting combustion. By turning the exhaust-steam through the flues of the boiler to the condensing-tanks the excess of heat contained in said exhaust-steam is utilized and no waste is permitted to take place. The feed-water is not merely heated, but actually distilled, and is thus supplied to the boiler in an absolutely pure state, thus preventing incrustations and deposits of any kind, and consequently increasing the life of the boiler.

The general construction and combination of devices constituting this invention is simple and effective. It does not increase the origi-



nal cost of the plant, and when the heat is once generated it is retained and reused to generate steam as long as the device is kept at work, making a great saving of fuel.

5 Having described my invention, what I claim is—

1. The feed-water tanks forming the side walls of the furnace and supporting the boiler, in combination with the condensing-tanks  
10 holding the purified feed-water and the connecting-pipes, substantially as set forth.

2. The combination of the feed-water tanks forming the side walls of the furnace, the condensing-tanks holding the purified feed-  
15 water, the connecting-pipes connected with the bottoms of said tanks, and the pipes connecting the condensing-tanks with the feed-water tanks forming the side walls of the furnace, substantially as set forth.

20 3. The condensing-tanks having the vertical ventilating-pipes provided with gage-valves at their upper ends, substantially as set forth.

25 4. The combination, with the boiler, of the boxes or chambers arranged at the front and rear ends of said boiler, the longitudinal exhaust-flues extending through said boiler and opening into the said chambers, the vertical

partitions arranged in the latter and connecting the front and rear ends of adjacent flues, 30 the exhaust-steam pipe connected with the chamber at one end of the tortuous series of pipes thus formed, the condensing-tanks, and pipes connecting said tanks with the chambers at both ends of the tortuous series of  
35 exhaust-steam flues, substantially as set forth.

5. In a steam-generator, the combination of the furnace, the boiler, the feed-water tanks forming the side walls of the furnace and supporting the boiler, condensing-tanks  
40 holding the purified feed-water connected with each other and with the feed-water tanks supporting the boiler, exhaust-steam flues extending through the boiler and connected with the condensing-tanks, and smoke-flues  
45 and return-flues extending through the lower part of the boiler and conveying the products of combustion from the furnace to the stack or chimney, substantially as set forth.

In testimony that I claim the foregoing as  
50 my own I have hereto affixed my signature in presence of two witnesses.

BARDEN WALTON TAYLOR.

Witnesses:

DAVID P. WOLHAUPTER,  
JOHN A. SAUL.