

No. 828,414.

PATENTED AUG. 14, 1906.

H. W. LEGEL.

FEED WATER HEATER.

APPLICATION FILED SEPT. 25, 1905.

Fig. 1

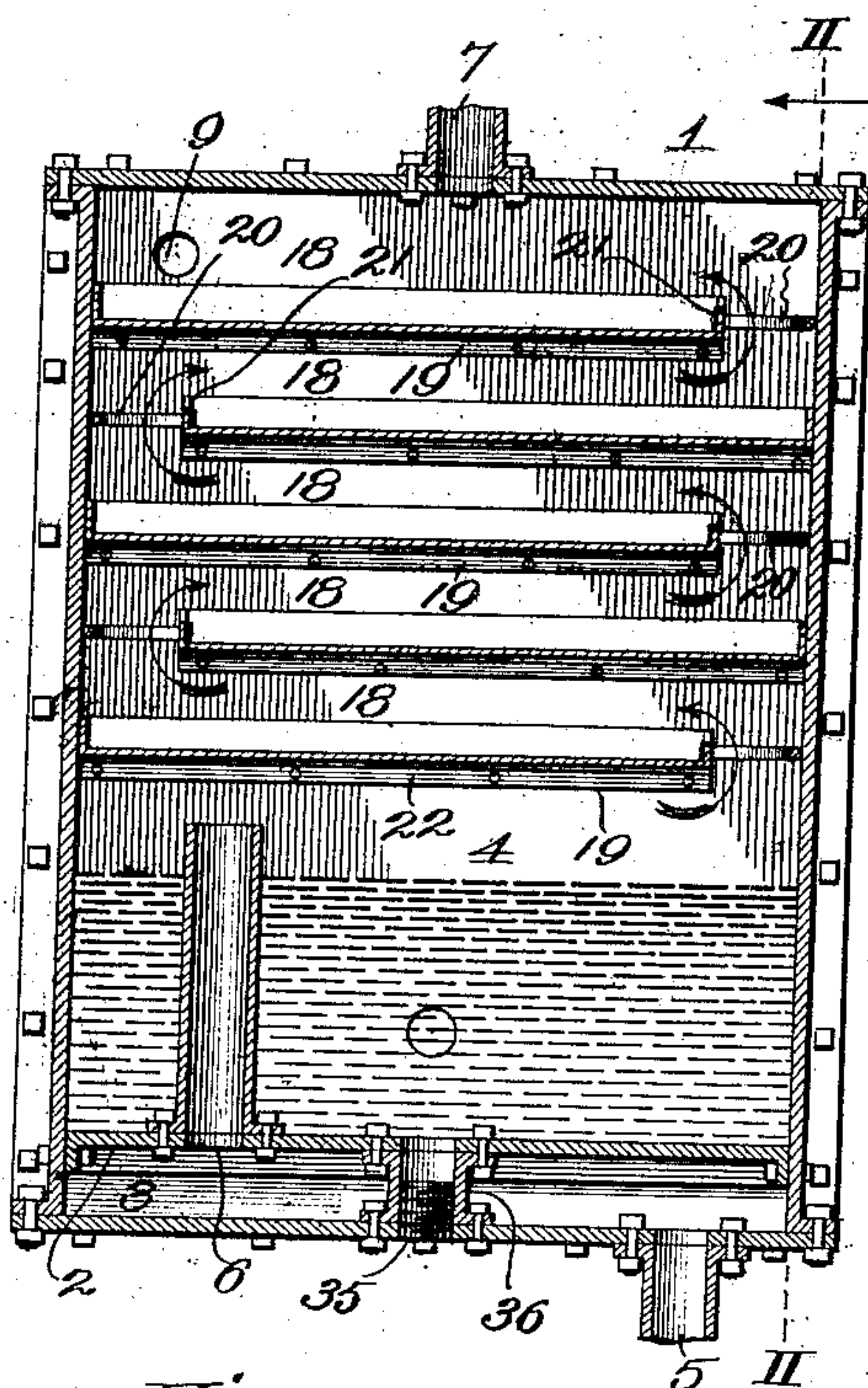


Fig. 2

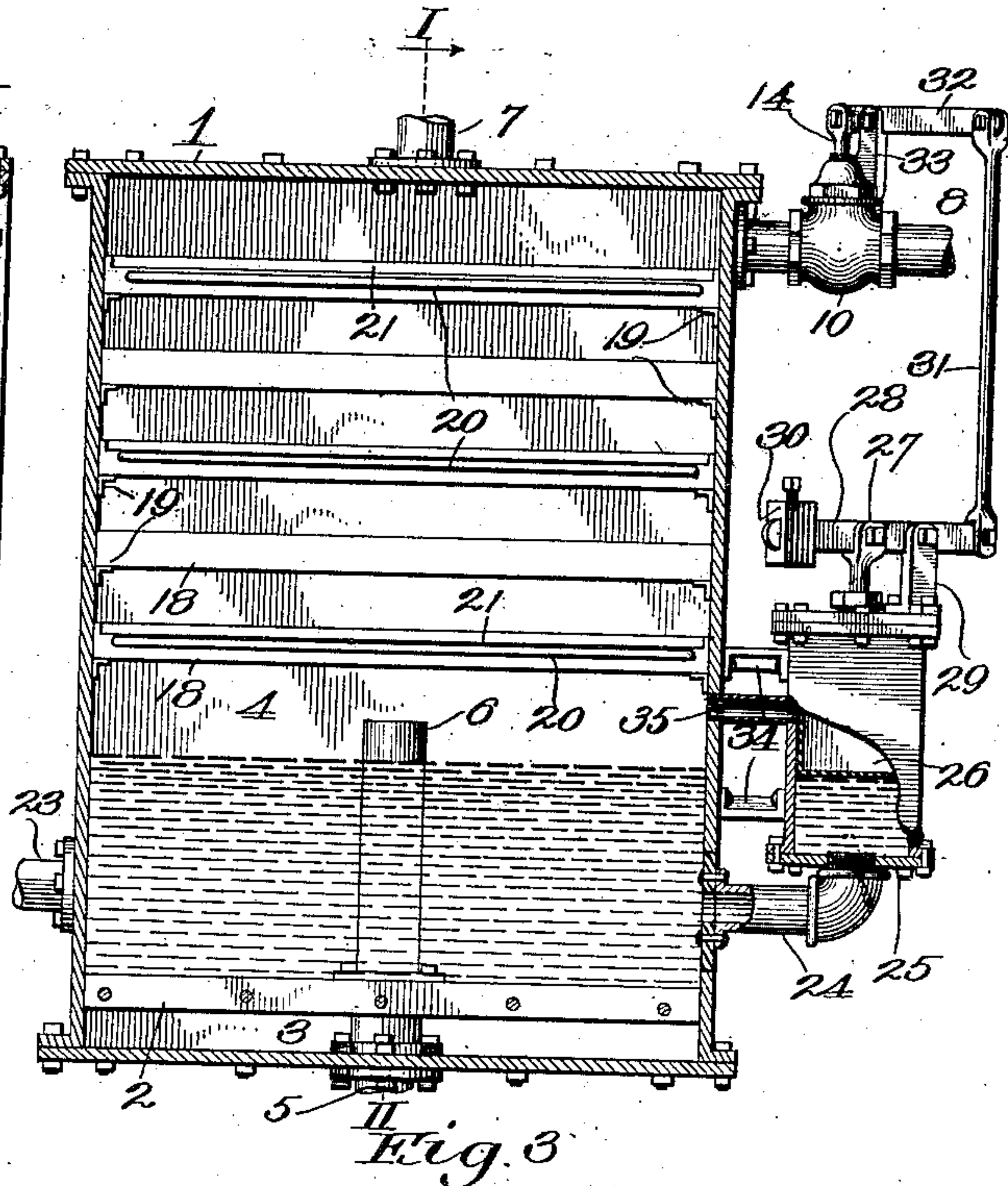


Fig. 4

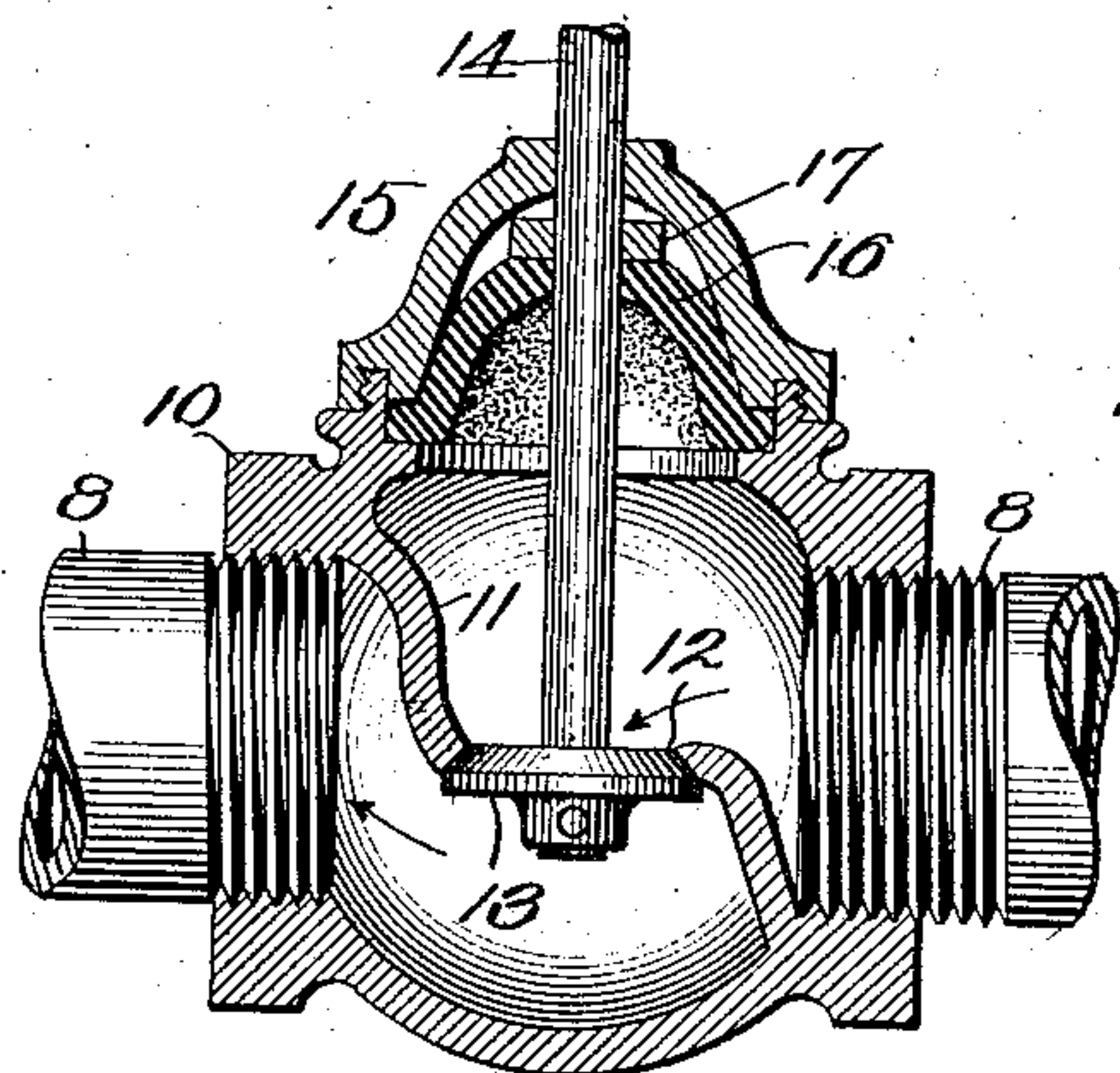
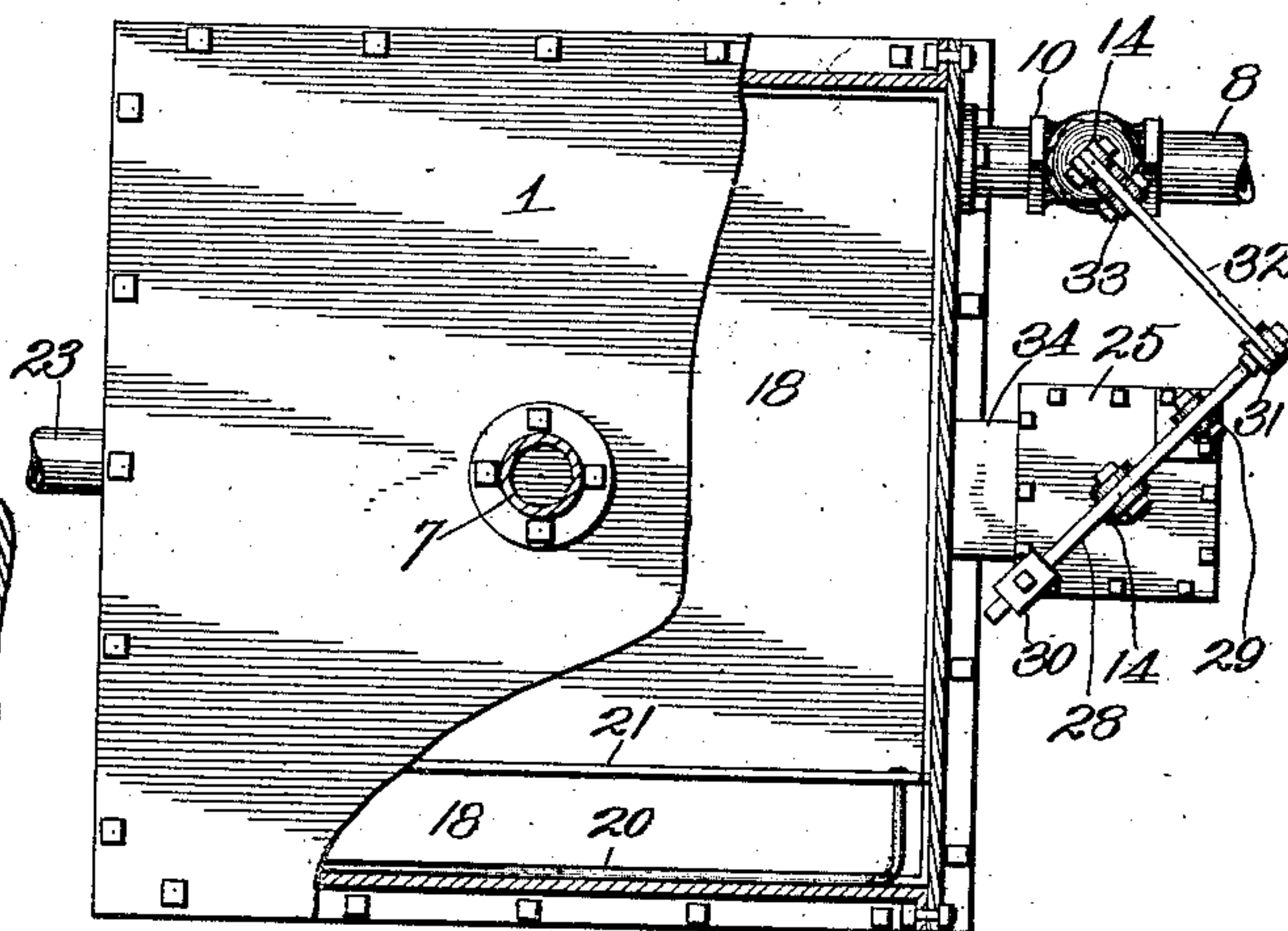


Fig. 3



Witnesses  
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# UNITED STATES PATENT OFFICE.

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## FEED-WATER HEATER.

No. 828,414.

Specification of Letters Patent.

Patented Aug. 14, 1906.

Application filed September 25, 1905. Serial No. 279,965.

*To all whom it may concern:*

Be it known that I, HENRY W. LEGEL, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Feed-Water Heaters, of which the following is a specification.

This invention relates to feed-water heaters, and has for its object to produce apparatus of this character whereby the supply of water fed to the boiler shall be efficiently and expeditiously heated and automatically regulated.

A further object is to produce apparatus of this character of simple, strong, durable, and inexpensive construction.

With these objects in view and others as hereinafter appear the invention consists in certain novel and peculiar features of construction and organization, as hereinafter described and claimed, and in order that it may be fully understood reference is to be had to the accompanying drawings, in which—

Figure 1 is a vertical section, on the line I II of Fig. 2, of a feed-water heater embodying my invention. Fig. 2 is a vertical section on the line II II of Fig. 1. Fig. 3 is a top plan view, partly broken away. Fig. 4 is a vertical section of a valve controlling the supply of water to the heater.

In the said drawings, 1 indicates a suitable water and steam tight casing, preferably rectangular in form and of such construction that its front plate may be readily removed when desired.

2 is a horizontal partition dividing the casing into a lower shallow steam-chamber 3 and an upper compartment 4.

5 is a steam-supply pipe communicating with the steam-chamber 3 and through partition 2 and stand-pipe 6 with compartment 4 a suitable distance above the bottom thereof, an exhaust-pipe 7 for steam communicating with the upper end of said compartment.

8 is a water-supply pipe communicating through opening 9 with the upper rear portion, by preference, of compartment 4, and 10 is a valve-casing mounted on said pipe and provided with a diaphragm or partition 11, provided with an opening 12, normally closed by valve 13, the stem of said valve extending up through a cap 15 and an inverted rubber cup 16, said cup exerting a yielding pressure on the collar 17 on the stem for the purpose of cooperating with the float, hereinafter referred to, in holding the valve seated.

18 indicates a series of superposed shallow pans in the casing resting upon cleats 19 and fitting snugly against the side walls of the casing. Each pan is provided at one end with a handle 20 to bear against the front or back wall, as the case may be, to guard against forward or rearward movement. The pans are disposed so that the first, third, and fifth have their handles projecting forwardly, while the second and fourth have their handles projecting rearwardly. As a result of this arrangement each pan is adapted to discharge the water into pan below it, the undermost pan discharging on the partition of the casing. In order to insure the discharge or overflow of the water at the proper ends of the pans, which is that contiguous to the handles, said ends are of reduced height, so as to provide overflow-passages 21, and in this connection it will be understood that the pans are so arranged that it is impossible for the steam discharged into the lower part of compartment 4 to escape through exhaust-pipe 7 without passing through the sheets of water pouring from the ends of the pans, this arrangement insuring an intimate relation between the water and the steam and resulting in heating the former. It will, furthermore, be obvious that the steam not only has access to the falling water, but also has contact with almost the entire surface of the pan and with the surface of the water in the latter.

23 indicates a pipe communicating with the lower part of compartment 4 and with a pump, (not shown,) whereby water is pumped from the casing to the boiler, and 24 is a pipe also communicating with the lower part of chamber 4 and with a casing 25, containing a float 26, said float having an upwardly-projecting stem 27, to which is pivotally connected a lever 28, fulcrumed on a bracket 29, mounted upon the float-casing. Upon one end of the lever is an adjustable weight or poise 30, and pivotally connected to the opposite end is a link 31, pivotally connected at its upper end to the lever 32, fulcrumed on an arm 33, projecting upward from the valve-casing, the opposite end of said lever being pivotally connected to the stem 14 of valve 13. The float-casing is preferably supported by brackets 34 from casing 1, though it may be supported in any other suitable or preferred manner, and is connected to casing 1 by pipe 35, which establishes communication between the casings



for circulation of steam, so that the pressure above the water-line shall be equalized to permit the float to respond properly to the rise and fall of the water in the float-casing.

5 When it is desired to clean out compartment 4 of the particles foreign to the water which accumulate on partition 2 below pipes 23 and 24, it is effected by removing plug 35 from the drain-pipe 36, communicating at its  
10 upper end with the bottom of compartment 4 and at its lower end with the atmosphere.

When the water is not being pumped from the heater to the boiler, it accumulates to about the level shown in Figs. 1 and 2 and  
15 raises the float 26 and coöperates with cushion 16 in overcoming the yielding resistance of the weight or poise 30 and the pressure of the water on the valve. When the pump begins to operate and draw water from casing 1, and therefore lower the level of the  
20 water in the latter and in the float-casing, the float descends and coöperates with the pressure of the water on the valve and the weight or poise in overcoming the resistance  
25 of the cushion to unseat said valve and permit water to enter the casing and fall into the topmost pan, so as to cause the latter to overflow through opening 21 and fall in a sheet into the pan immediately below, the latter in  
30 turn overflowing at its corresponding or rear end into the pan next below, and so on. It will thus be seen that the steam discharged into compartment 4 above the level of the water therein is caused by the staggered arrange-  
35 ment of the pans to follow a tortuous course before it can escape through pipe 7 and that in such course it passes through thin sheets of water flowing from each pan, as well as having access to the entire bottom of each pan and to  
40 the entire surface of the water therein. By this arrangement it is obvious that the water can be effectually heated before it falls to the bottom of the casing and that the water collected in the bottom of the latter is subjected  
45 to the heat of the steam above it, the heat of the partition from the steam below it, and of the pipe 6 from the steam passing through it.

It will be apparent that the action of the heater is entirely automatic and reliable in  
50 operation and that it is susceptible of modification in minor particulars.

Having thus described the invention, what I claim as new, and desire to secure by Letters Patent, is—

55 1. A feed-water heater, comprising a casing, a series of superposed pans arranged therein and fitting snugly against the side walls thereof with the alternate pans fitting snugly against the back and front walls respectively, of the casing, and their opposite  
60 ends provided with overflow-openings, handles secured to the overflow ends of the pans and engaging a wall of the casing to hold the pans in proper staggered relation, means to  
65 supply water to the topmost pan, means to

withdraw the water falling from the undermost pan, and means for passing steam successively through the sheets of water falling from the overflow-openings of said pans.

2. A feed-water heater, comprising a casing, a partition dividing the same into an upper and a lower compartment, a water-supply pipe communicating with the upper end of the upper compartment, means for withdrawing the water from the bottom of the  
70 upper compartment, a pipe communicating with and projecting upward a suitable distance into the upper compartment, a steam-exhaust pipe communicating with the upper  
75 end of the upper compartment, an exit water-pipe communicating with the upper compartment below the discharge end of the pipe projecting upwardly therein, one or more  
80 superposed pans in the casing between the pipes for supplying water and exhausting the steam and the pipes for supplying the steam and withdrawing the water, a float-casing  
85 communicating with the upper compartment of the first-named casing below the discharge end of the pipe projecting upwardly therein, a float in the float-casing, a valve controlling  
90 the water-supply pipe, and connections whereby the rising of the float a predetermined distance shall close said valve.

3. A feed-water heater, comprising a casing, a partition dividing the same into an upper and a lower compartment, a water-supply pipe communicating with the upper end of the upper compartment, means for withdrawing the water from the bottom of the  
95 upper compartment, a pipe communicating with and projecting upward a suitable distance into the upper compartment, a steam-exhaust pipe communicating with the upper  
100 end of the upper compartment, an exit water-pipe communicating with the upper compartment below the discharge end of the pipe projecting upwardly therein, one or more superposed pans in the casing between  
105 the pipes for supplying water and exhausting the steam and the pipes for supplying the steam and withdrawing the water, a float-casing communicating with the upper compartment of the first-named casing below  
110 the discharge end of the pipe projecting upwardly therein, a float in the float-casing, a valve controlling the water-supply pipe, connections whereby the rising of the float a predetermined distance shall close said  
115 valve, and means whereby the lowering of the water-level in the casings shall positively effect the lowering of the float and the re-opening of the valve.

In testimony whereof I affix my signature in the presence of two witnesses.

HENRY W. LEGEL.

Witnesses:

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G. Y. THORPE.