

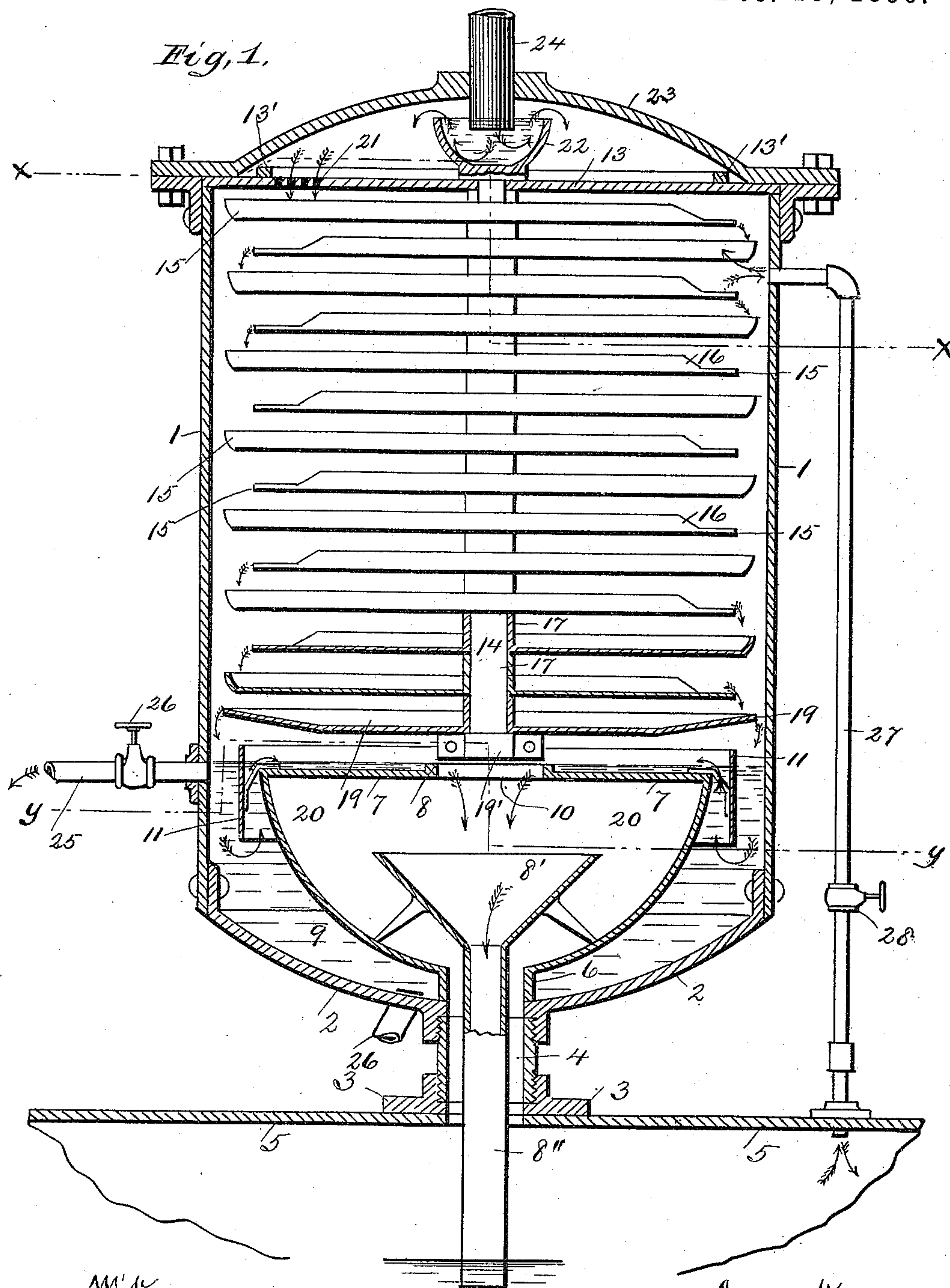
(No Model.)

2 Sheets—Sheet 1.

J. BONAR.
COMBINED HEATER AND PURIFIER.

No. 572,955.

Patented Dec. 15, 1896.



Witnesses:
Geo. W. Loun
J. A. Hervey.

Inventor,
James Bonar
by his attorney,
M. E. Harrison.

(No Model.)

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Fig. 2.

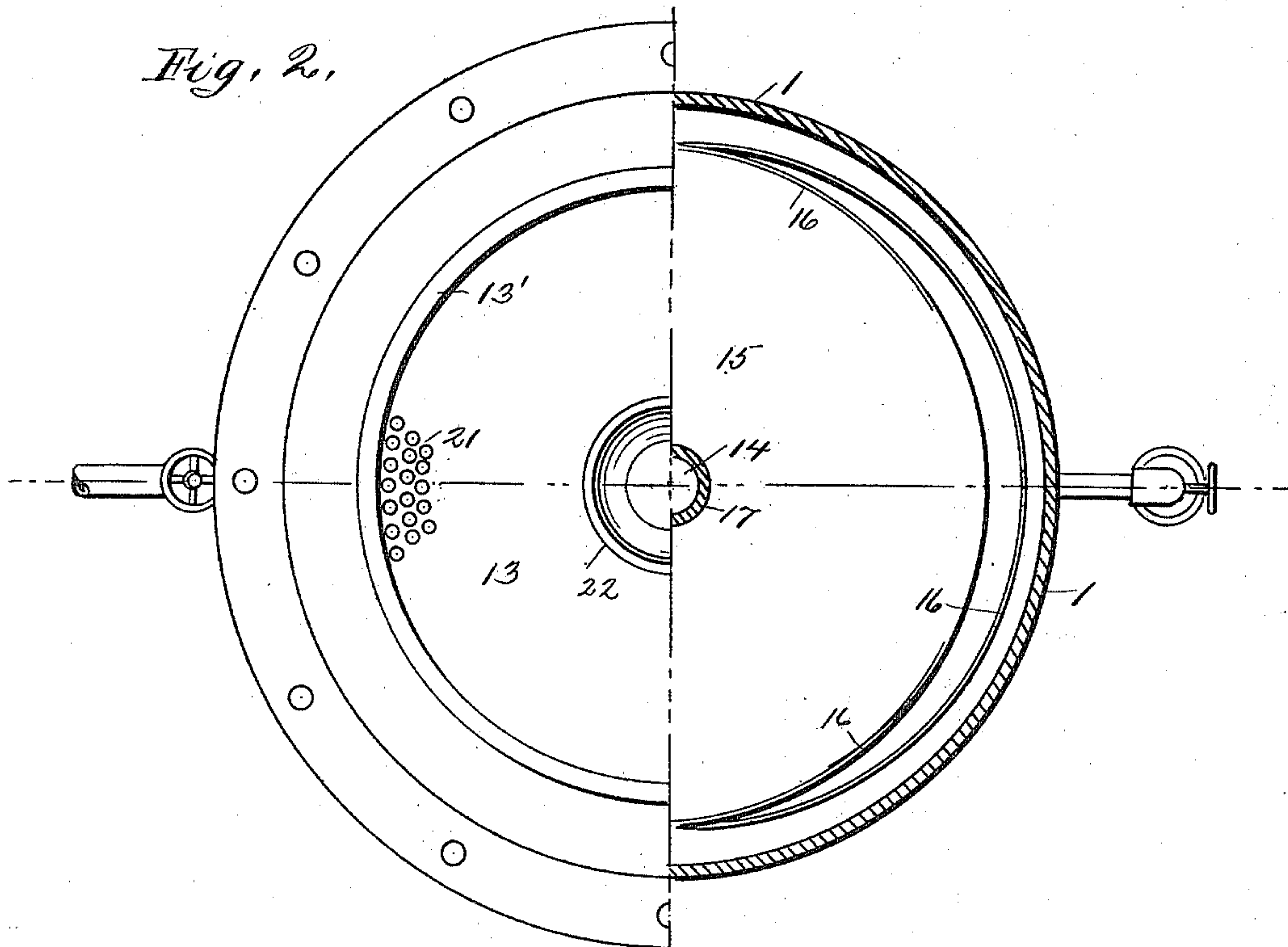
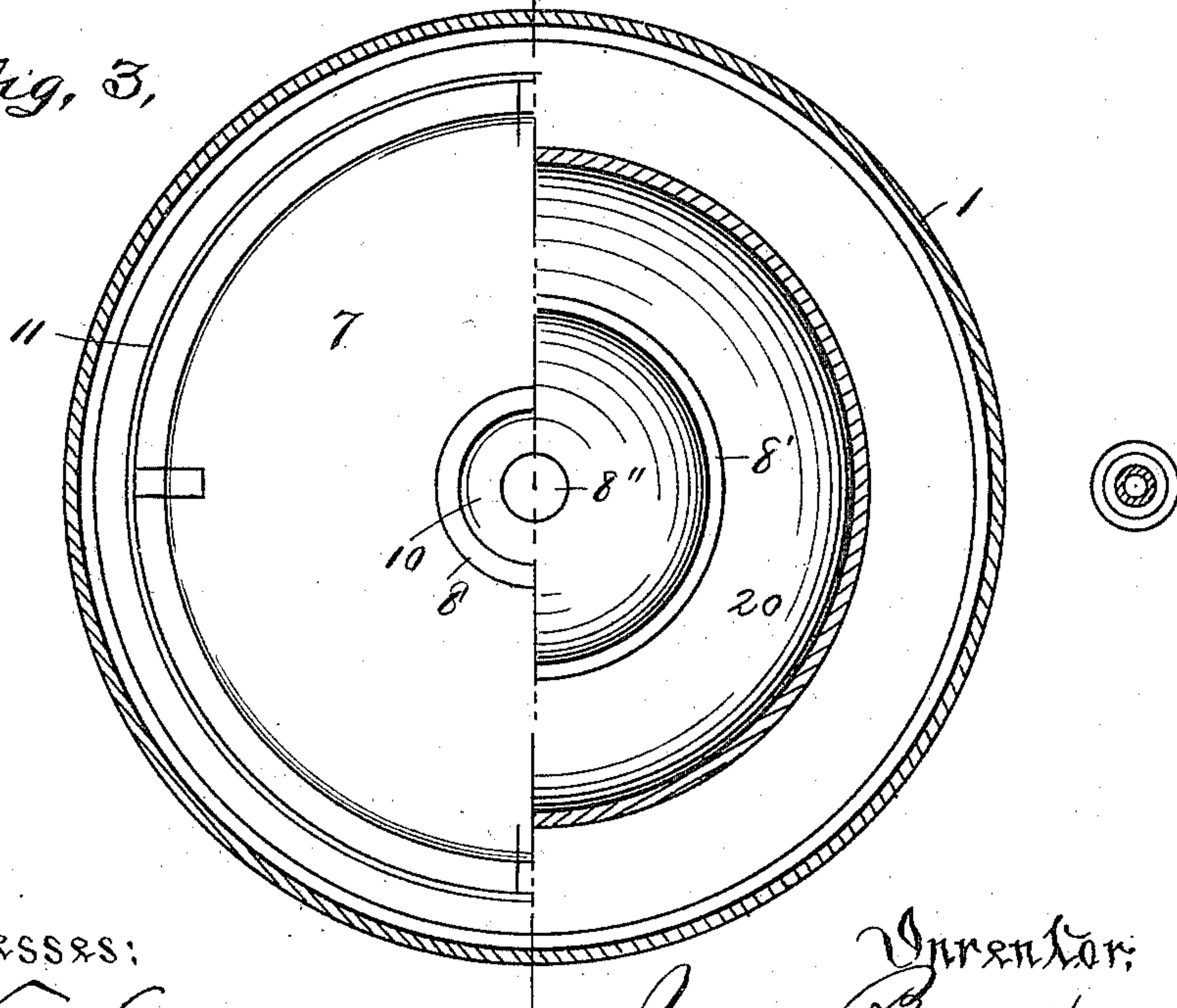


Fig. 3.



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UNITED STATES PATENT OFFICE.

JAMES BONAR, OF PITTSBURG, PENNSYLVANIA.

COMBINED HEATER AND PURIFIER.

SPECIFICATION forming part of Letters Patent No. 572,955, dated December 15, 1896.

Application filed October 4, 1895. Serial No. 564,635. (No model.)

To all whom it may concern:

Be it known that I, JAMES BONAR, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in a Combined Heater and Purifier for Steam-Generators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to an improved feed-water purifier and heater for steam-generators; and it consists of a device arranged upon the top of the boiler or generator and in communication therewith, having arranged therein a series of removable pans attached in a horizontal position to a central shaft, a sediment-chamber at the base below the said pans, a skimming-ring arranged around a central settling and heating chamber, a water-inlet at the top and a steam water-outlet at the bottom, a means for separating the purified water from the steam while passing through the opening to the boiler, together with certain other details and the construction and combination of parts, as will be fully described hereinafter.

The object of my invention is to provide a simple, inexpensive, and durable device for purifying the water before entering the boiler by removing all sediment and foreign substance contained therein, and at the same time bring the water to a temperature equal to that of the live steam.

In the accompanying drawings, Figure 1 is a central sectional elevation of my improved feed-water purifier and heater, showing the same connected to the top of a boiler, the said purifier and heater being constructed and arranged in accordance with my invention. Fig. 2 is a sectional plan view of the same, taken on the line X X of Fig. 1. Fig. 3 is a sectional plan view of the combined purifier and heater, said section taken on the line Y Y of Fig. 1.

To put my invention into practice, I provide a cylindrical shell 1, of a suitable diameter, and provide the same with a dish-plate

2, securely riveted about the lower periphery of the said shell 1. This base 2 is formed with an orifice at the center, which is connected by a passage 4 to the interior of the boiler 5 by means of a suitable flanged casting 3, attached to the said base 2 and the top of the boiler by rivets, which also serve as a means of supporting and connecting the device in position. Arranged over this passage 4 to the boiler is a chamber 20, formed of metal, having an annular open base and attached in position in a manner that the same may be removed, if so desired. This chamber 20 is formed with a closed top 7, having a central opening 10, provided with a slightly-elevated flange 8 about its periphery to keep a slight depth of water at all times over the top of the chamber 20, in order that it may increase the temperature of the same before finally passing into the boiler 5. Centrally located within the heating-chamber 20 is a funnel-shaped receptacle 8', which receives the purified and heated water from the opening 10 and conducts the same, by means of an integral pipe 8'', beneath the surface of the water in the boiler 5, thereby retaining the high temperature of the water and keeping the same from contact with the comparatively cold base of the apparatus and the pipe 4, connecting the apparatus with the boiler. This device will be found particularly useful when it is necessary to arrange the apparatus some distance above or away from the boiler.

Surrounding the heating-chamber 7 is an annular ring 11, the top periphery of which is slightly above the top of the flanged opening 10 and the lower edge extending some distance below into the water collected in the bottom of the device. This ring 11 acts as a skimmer to prevent any light substance in the water from passing into the opening 10. To remove this light foreign substance from the top of the water, a surface blow-off pipe 25, fitted with a valve or cock 26, is passed through the shell 1 on a level slightly below the surface of the water in the settling-chamber 9. Arranged at the top of the shell 1 is a circular plate 13, which is supported in a groove formed in the top flanges of the casing or shell 1 and serves as a means of supporting and centering a series of circular sediment-pans 15, connected thereto. These

sediment-pans 15 are formed from circular plates of metal having a flange 16, formed almost about the entire periphery of the same, leaving an open space at one point, from which the water may escape to the next pan below. Formed at one side of the center of these sediment-pans 15 are flanged openings 17, said flange projecting some distance above the surface to separate the one pan from the other when in position. These pans 15 are attached to the plate 13 by means of a shaft 14, passing through the flanged openings 17 and through a slightly-dished circular receptacle 19 at the bottom, and the whole held in position by a clamp 19. The arrangement of these sediment-pans 15 is such as shown in Figs. 1 and 2 of the drawings, the one above the other, with alternate long and short sides in a manner that the water from the one will fall to the other and lengthen the time of the passage of the same to the boiler 5. Attached to the top of the rod 14 is a basin 22 to receive the end of the water-inlet pipe 24 and form a seal to prevent the live steam from the boiler 5 passing into said pipe. The plate 13, suspending the pans 15, is provided at one side with perforations 21, through which the water passes to the first of the series of pans 15 below. This plate 13 is provided on its top surface with an annular flange 13', located outside of the openings 21, which serves as a means of preventing the water from leaking through the bearing formed by the said plate and the top periphery of the shell 1, thereby avoiding the necessity of packing. Communicating with the sediment-chamber 9, at the base of the apparatus, is a blow-off pipe 26, which, together with the feed-pipe 24 at the top, are fitted with suitable valves or cocks (not shown in the drawings) to properly operate the device. Connected to the top of the apparatus is a pipe 27, fitted with a three-way valve and communicating with the interior of the boiler 5. This pipe 27 will give a free circulation for the live steam direct from the boiler to the top of the heater and thereby keep the pans 15 at the top of the apparatus about the same temperature as those below, and at the same time permit any dangerous gases to escape by opening the cock 28 at intervals. This cock 28 also serves to cut off the connection with the boiler 5, if desired.

In operation the water from the injector or pump is forced into the apparatus through the feed-pipe 24, into the basin or seal 22, and, overflowing from this to the plate 13, which is heated from the live steam from the boiler 5, will deposit a portion of the sediment on the top of the same and then pass through the openings 21 to the first pan 15 below. While passing over this first pan 15 the water will be distributed over the entire surface in a thin sheet, gradually gathering heat from the said pan and depositing a portion of its impurities upon the same. From this first or top pan the water drops to the pan below

and flows in a reverse direction and is discharged to the third pan below. This zigzag course of the water is continued over the entire series of pans 15 in a thin sheet, giving the same an opportunity to deposit its impurities upon the said pans and at the same time gathering heat from the live steam which fills the chamber and from the high temperature of the pans. From the last or lower pan 15 of the series the water is discharged into the circular settling-pan 19 and separates into small diffused streams about the entire periphery of the said pan 19 and falls to the settling-chamber 9 below outside of the skimming-ring 11. The water is now almost purified and brought to a high temperature, as in passing over the pans 15 the sediment, with the exception of such light foreign matter usually found floating upon the top, which may be removed at intervals through the blow-off pipe 25. This light foreign matter will be prevented from entering the boiler 5 by the skimming-ring 11, as the purified water, in order to reach the opening 10 of the heating-chamber 20, must necessarily pass beneath the lower periphery of the said ring and then ascend between the exterior wall of the heating-chamber 20 and the interior wall of the skimming-ring. The water, now free from all foreign substance, passes in a thin sheet over the top of the heating-chamber 20, where the same gathers in a high temperature from contact with the interior walls of the said chamber equal to the live steam in the boiler. The water entering the opening 10 falls into the funnel 8' and enters the boiler 5 through the pipe 8'', thus retaining its high temperature. The space between the walls of the heating-chamber 20 and that of the shell 1 forms a settling-chamber 9, where the water may be kept comparatively quiet, for the reason that the area and volume of the top surface of the water is much less than that about the lower edge of the skimming-ring 11, giving the water an opportunity to settle and the sediment to gather in the bottom of the settling-chamber. This high temperature of the water is due to the live steam kept constantly circulating in the interior of the apparatus, said steam entering through the opening 4 as that surrounding the water-inlet pipe 8''. This steam is constantly being replenished for the reason of the condensation of the same at the top of the apparatus and mingling with the cold water entering through the feed-pipe 24.

To clean the sediment-chamber 9 at the bottom of the apparatus, it is only necessary to open the valve (not shown) of the blow-off pipe 26 and permit the pressure of steam and water to freely circulate through the several compartments.

The pans 15 may be partially cleaned by opening the blow-off; but in order to thoroughly clean the scale and other sediment from said pans it is necessary to release the bolts and remove the top or cover 23 and lift

the entire series of pans 15, together with the top plate 13 and settling plate or pan 19, at the base. After removing this part of the apparatus the same may be easily scraped or
5 otherwise cleaned.

The top plate 13, while acting as a settling-pan, serves as a means of centering and sustaining the pans 15.

It will be noted that various changes may
10 be made in the details of construction of my device without departing from the general spirit of my invention.

Having fully described my invention, what I claim as new, and desire to secure by Letters
15 Patent, is—

1. In a device of the character described, a casing having suitable connections, a plate near the top of the casing provided with a flange or upwardly-projecting portion and settling-pans having flanges, as and for the purpose described.
20

2. In a device of the character described, a casing having suitable connections, a plate near the top of the casing provided with a

flange or upwardly-projecting portion settling-pans having annular flanges and means for controlling the flow of water, as and for the purpose described. 25

3. In combination with an apparatus such as described, the pipe 27, in communication with the boiler and with the top of the apparatus and a three-way cock connected to said pipe whereby live steam may be introduced into the top of the heater and dangerous gases withdrawn from the same, as described. 30

4. In an apparatus such as described, the plate 13, suspending the settling-pans having an annular flange 13' or other means for confining the flow of water over the surface of the same, as and for the purpose set forth. 35 40

In testimony that I claim the foregoing I hereunto affix my signature this 28th day of September, A. D. 1895.

JAMES BONAR. [L. s.]

In presence of—

JOHN W. LANDIS,
GEO. B. MOTHERAL.