No. 743,488. PATENTED NOV. 10, 1903.

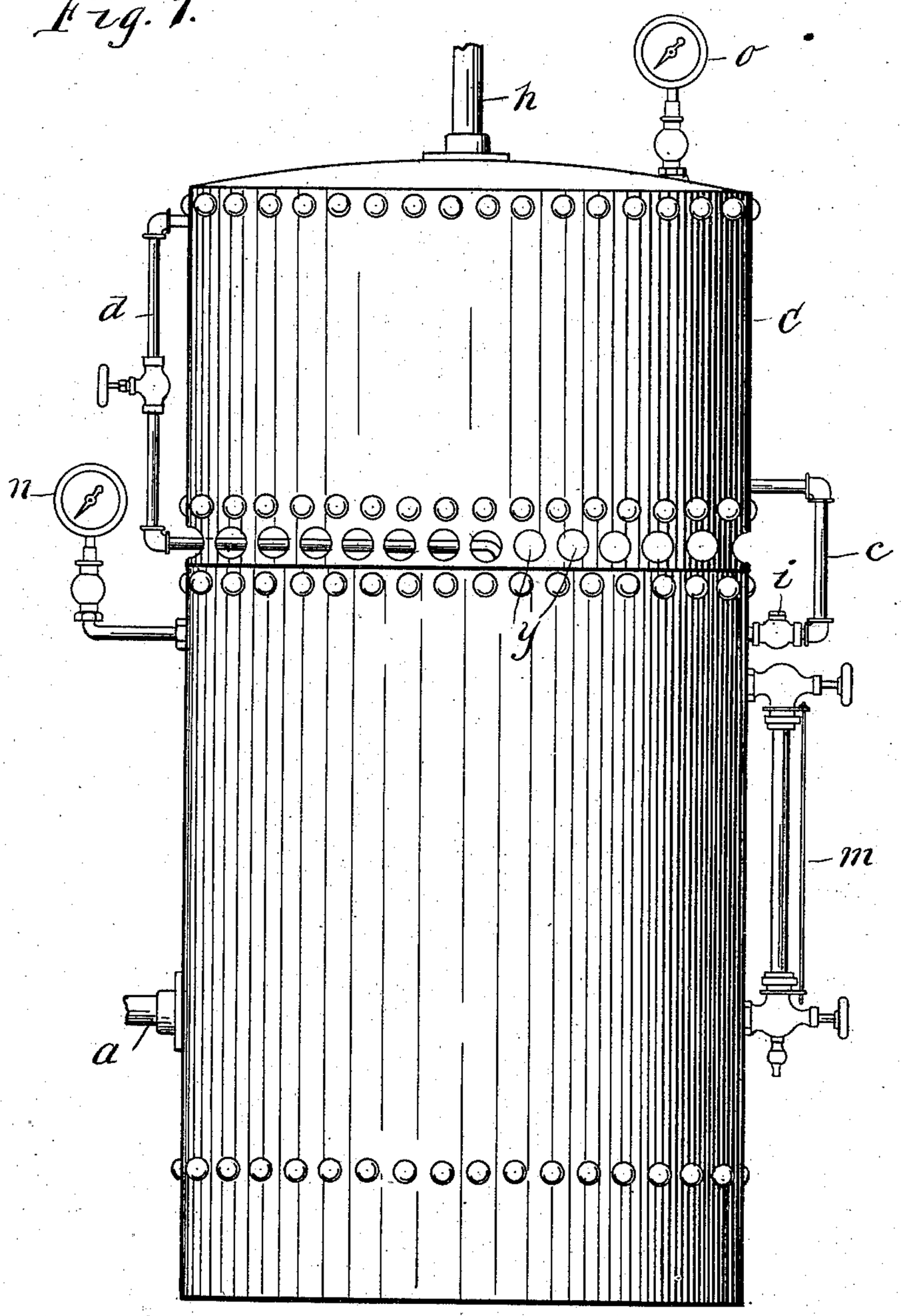
W. B. GREGG.

STEAM BOILER.

APPLICATION FILED JAN. 5, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 1.



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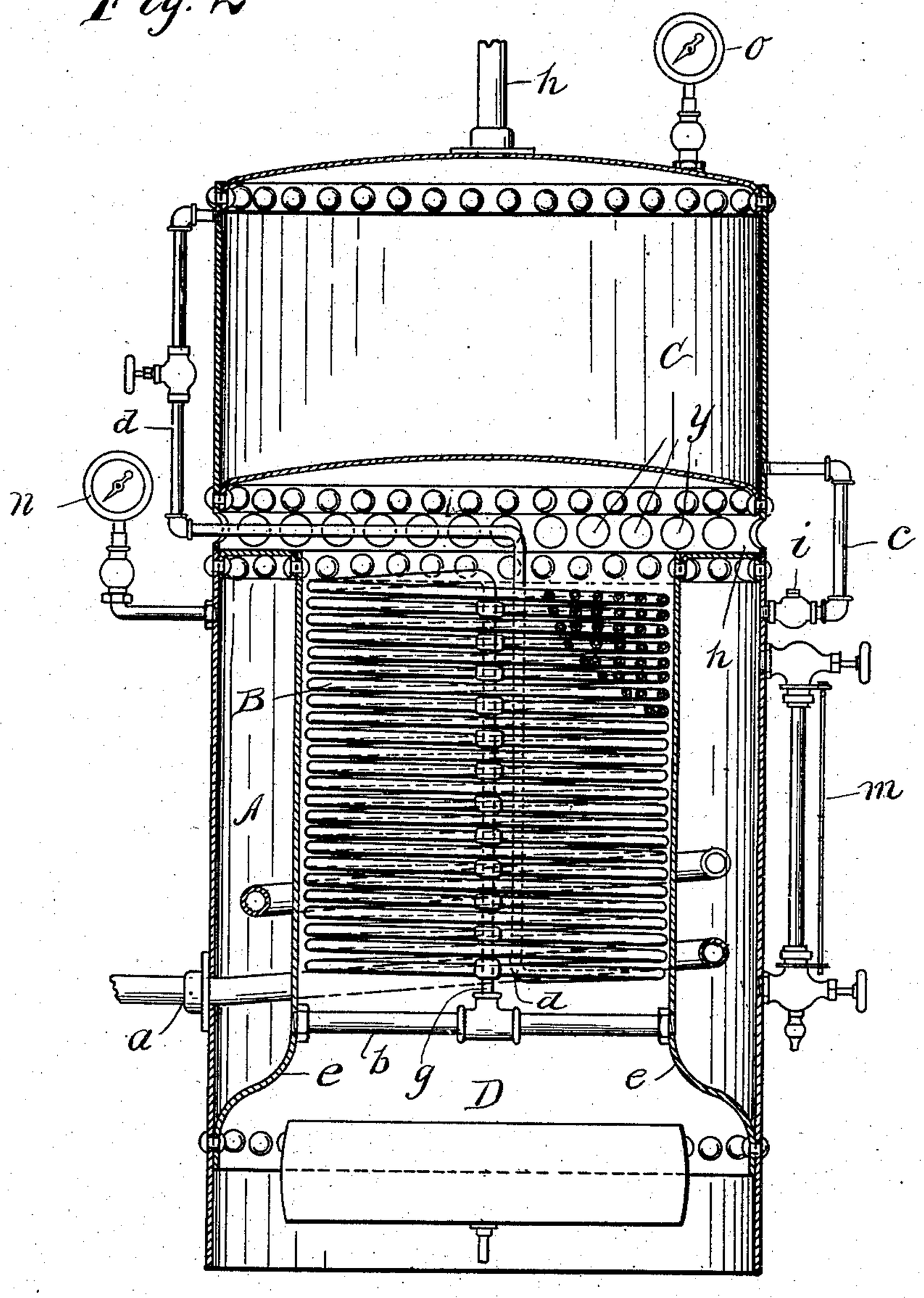
NO MODEL. 3 SHEETS—SHEET 2.

Fig. 2



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NO MODEL. 3 SHEETS—SHEET 3.

Fig. 3.

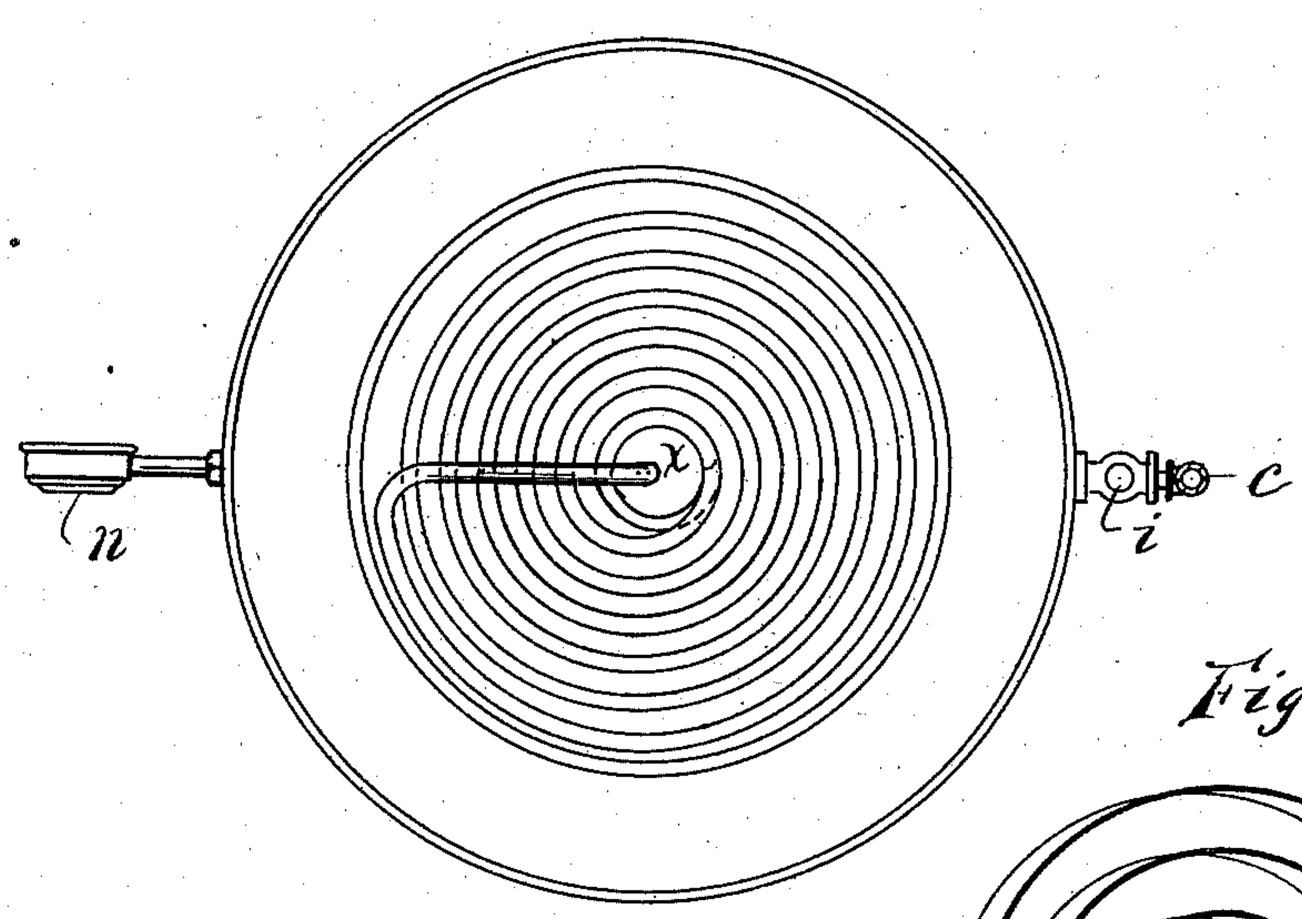


Fig. 4

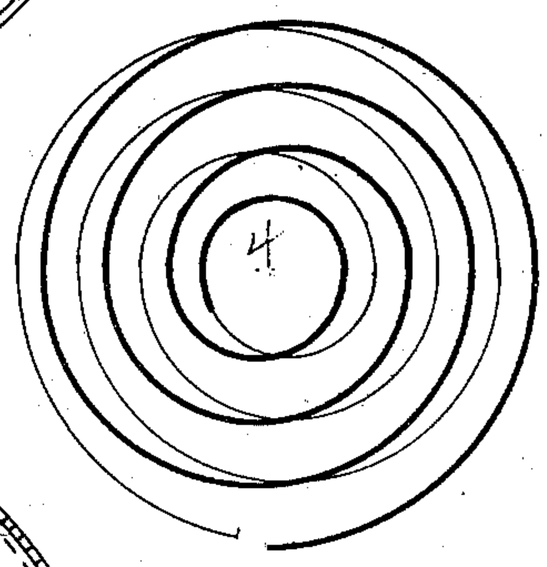
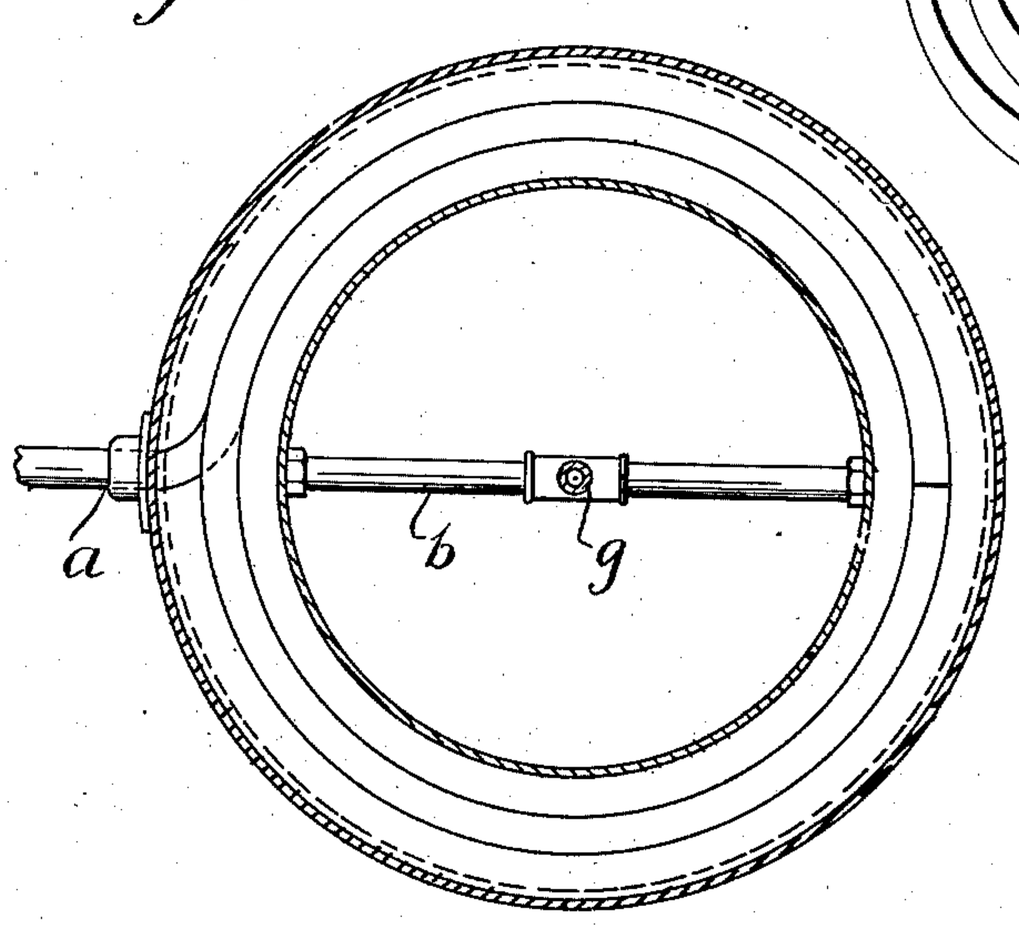


Fig. 5



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No. 743,488. Patented November 10, 1903.

UNITED STATES PATENT OFFICE.

WILKS BOOTH GREGG, OF CHICAGO, ILLINOIS.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 743,488, dated November 10, 1903.

Application filed January 5, 1903. Serial No. 137,970. (No model.)

To all whom it may concern:

Be it known that I, WILKS BOOTH GREGG, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented a new and useful Improvement in Steam-Boilers, of which the following is a specification.

The objects of my invention are to secure the maximum of efficiency with a minimum of fuel and to provide a boiler that may be utilized either for heating or power purposes. To accomplish these objects, I use tubes or pipe coiled in flat sections and connected together one above the other, forming a column, with a circular open space extending upward from the fire-chamber through the center of the column, providing a means for the upward draft from the combustion-chamber under the column and permitting a close contact of the heat with the coiled pipe. The flat pipe-sections are coiled, so that the free ends of the pipe extend from the outer coil, or largest perimeter, and then are connected with the free ends of the section next to it, except the upper and lower sections, which having one free end not so connected one end of the uppermost coil is connected with the water-supply, while the free end of the lowermost coil in the column is connected with a steam-discharge flue. A water-jacket surrounds the coiled pipe column, and a dome surmounts the water-jacket and column, with an intervening chamber to receive and discharge the gases from the combustion-chamber. The water is introduced into the upper end of the column of coiled pipe. The steam is discharged from the bottom of the column and carried up through the center of the column to the dome surmounting the jacket. The application of the heat into the chamber inclosed by the water-jacket through the center of the column and about the coiled pipe causes the water to circulate and a very rapid conversion of the water into steam. A pipe connecting the water-jacket with the dome is provided with a check-valve, which equalizes the pressure of steam between the dome and jacket; but when the steam is withdrawn from the dome, releasing the pressure there, the valve automatically retaining the pressure in the jacket stimulating the circulation in the pipe column and increasing the production of steam. The water from the jacket entering the head of the column circulating downward by the time it reaches the point of extreme heat is converted into steam, thereby deriving the maximum results with a limited application of heat.

In the drawings, Figure 1 is a view, partly in perspective, of a vertical boiler surmounted with a dome. Fig. 2 is a vertical longitudinal section of the same. Fig. 3 is a horizontal cross-section of the boiler, disclosing one of the coiled pipe-sections. Fig. 4 is a top view of coil, showing method of construction or coiling. Fig. 5 is a horizontal cross-section of the lower portion of the water-jacket, showing the means for introducing the water-supply.

Similar letters of reference indicate similar parts throughout the drawings.

In the construction, A is a water-jacket surrounding a column B of pipe of small caliber coiled in flat sections, as shown in Fig. 3, the jacket and column surmounted with a dome C, and a combustion-chamber D underneath the column B. The water-jacket is inclosed and has a water supply pipe *a*, a discharge *b*, extending diametrically across the lower portion and entering the jacket at each end through the inner shell *e*. From the middle of this pipe *b* extends a pipe *g* vertically through the center of the column B to the top, where it connects with the pipe in the upper coiled section. A pipe *c* connects the jacket with the dome C. In coiling the pipe in the flat sections, as shown in Figs. 3 and 4, the free ends of the pipe extend from the outer or largest perimeter in the section. One of these free ends as the sections are erected in the column connects with the flat section placed above it until all are connected, leaving one free end at the top and another at the bottom of the column. The water-supply for the coiled column is taken in at the upper end of the column by connecting-pipe *g*, as explained above, while to the lower free end of the coil in the column is connected the steam-discharge pipe *d*, which extending upward through the center of the column enters the dome C. The water-supply pipe *a* enters the lower portion of the water-jacket and is carried around the inner shell a sufficient length to raise the

temperature of the water before it is delivered, as shown in Fig. 5. Steam is withdrawn from the dome C by the outlet *h*. A check-valve *i* in the pipe *c* operates automatically to equalize the pressure between the dome C and the head of the jacket and also to retain the steam-pressure in the jacket when the steam is withdrawn from the dome. When the pressure in the dome is low, the valve closes; when high it opens. The closing of the valve *i* causes a rapid circulation in the coiled column and an increased volume of steam. A water-gage *n* indicates the water-level in the jacket, and steam-gages *n* and *o* indicate the pressure in the jacket and dome, respectively. The heat from the combustion-chamber D passes upward through the column B, the open center serving as a flue to carry the heat upward along the coiled pipe and in heating the supply-pipe *g*, superheating the steam in the discharge-pipe *d* and disposing of the gases through the orifices *y* in the chamber *z* over the head of the column B and jacket A.

In operation I fill the water-space in the water-jacket to the height wanted, then light the fire in the combustion-chamber. The water becomes heated in the jacket, forming more or less pressure in the head of the jacket, when the check-valve *i* closes, retaining the steam in the jacket. As the pressure in the jacket increases the water is forced through the feed-pipe *g* to the top of the column of coiled pipe and downward through the coil until it comes in contact with a sufficient degree of heat to convert it into steam, when it is discharged through the pipe *d* and carried up into the dome C. When the pressure of steam in the dome exceeds that in the head of the jacket, the check-valve opens and establishes an even pressure in both compartments. While this pressure remains equal there is no circulation in the coiled pipe column. If the steam is withdrawn from the dome through the outlet *h*, releasing the pressure in the dome, the valve *i* closes automatically, causing a resumption of the circulation through the column and increasing the production of steam.

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

1. In a tubular boiler, a vertical column built up of pipe coiled in flat sections radiating from a circular open center to bring the free ends to the outer perimeter of the coiled section and connect with the section next above, a water-jacket surrounding said column, a dome surmounting said jacket, a pipe connection between said dome and the remaining free end of the bottom coil in said column, and a connection between the remaining free end of the top coil of said column with the water-jacket substantially as specified.

2. In a tubular boiler, a column of pipe coiled in flat sections, a water-jacket surrounding said column, a supply-pipe for said water-jacket, a dome surmounting said jacket and column, a steam-pipe connecting said water-jacket with said dome, a check-valve in said steam-pipe and means for connecting said column of coiled pipe with said dome substantially as specified.

3. In a steam-boiler in combination, a column of coiled pipe consisting of coiled flat sections as above described, a water-jacket surrounding said column, a dome surmounting said jacket, a supply-pipe for said water-jacket, a feeding-pipe from said jacket extending up through the center of said column and connected with the uppermost coil in said column, a pipe connecting with the lowermost coil and extending vertically up through the center of said column and discharging into said dome, a steam-pipe connecting said jacket with said dome, a check-valve in said pipe to retain the pressure of steam in said jacket, substantially as specified.

4. In a steam-boiler, in combination a column of flat sections of coiled pipe as above described, a water-jacket surrounding said column, a water-supply connection between the jacket and the uppermost coil in said column, a steam-discharge pipe extending from the lowermost coil in said column up through the center of said column into a dome surmounting said jacket, a water-supply pipe for said jacket adapted to raise the temperature of the water when discharging into said jacket, and a means to apply heat advantageously to said column of coiled pipe, substantially as specified.

5. In a steam-boiler in combination, a column of flat sections of coiled pipe having a circular open space vertically through the center, a water-jacket surrounding said column, a dome surmounting said jacket and column, a chamber beneath said dome having draft-orifices adapted to receive and discharge smoke and gases from the combustion-chamber under said column, means for feeding water into the head of said pipe column from said jacket, and for the escape of steam from the foot of said pipe column into said dome, a water-supply for said water-jacket, a means for raising the temperature of the water-supply before delivery into said water-jacket, a steam-pipe connecting said dome with said water-jacket, an automatic cut-off in said pipe, and a means for supplying heat underneath said pipe column, substantially as specified.

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

WILKS BOOTH GREGG.

Witnesses:
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S. P. MCKELVEY.