

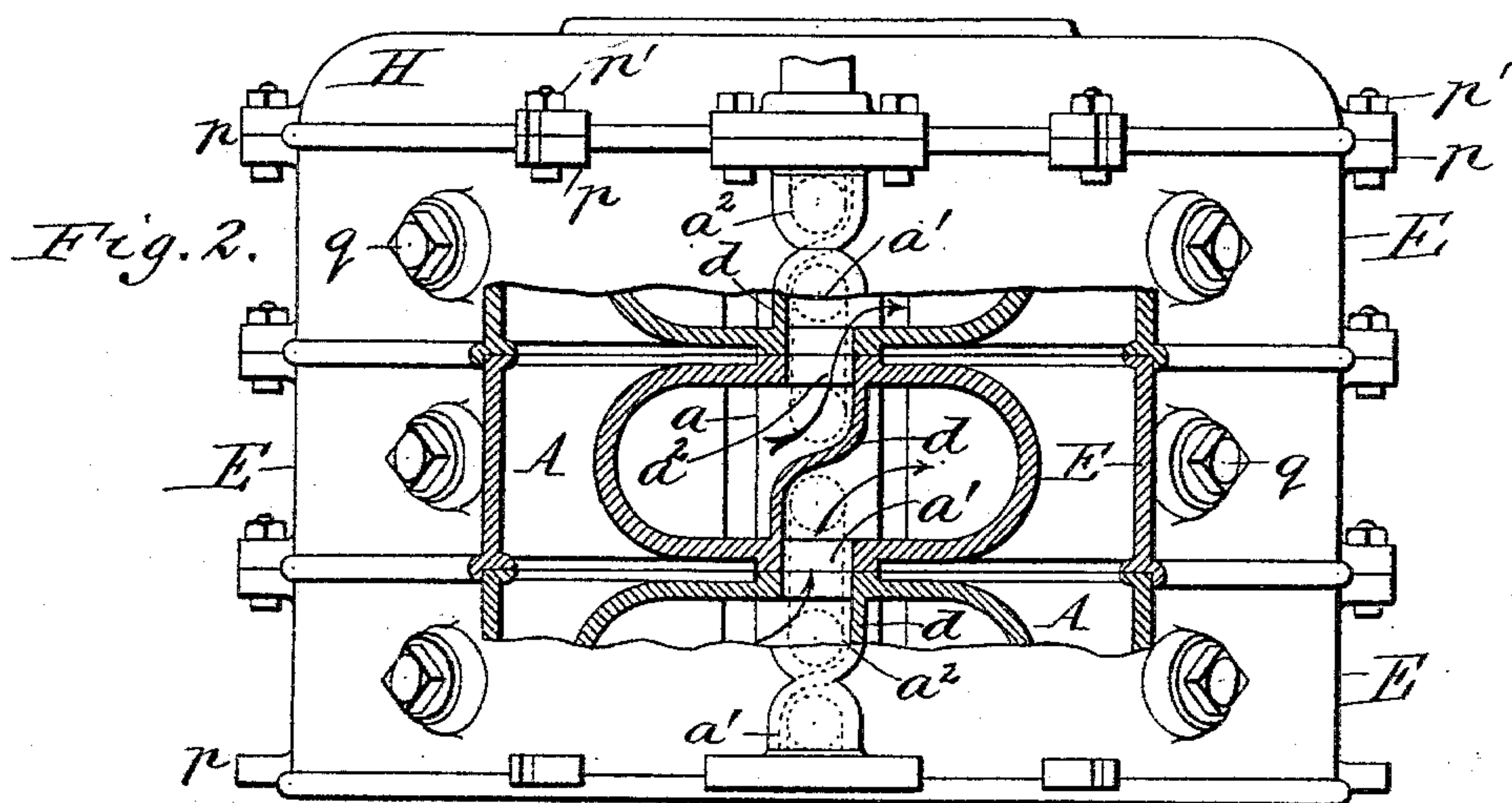
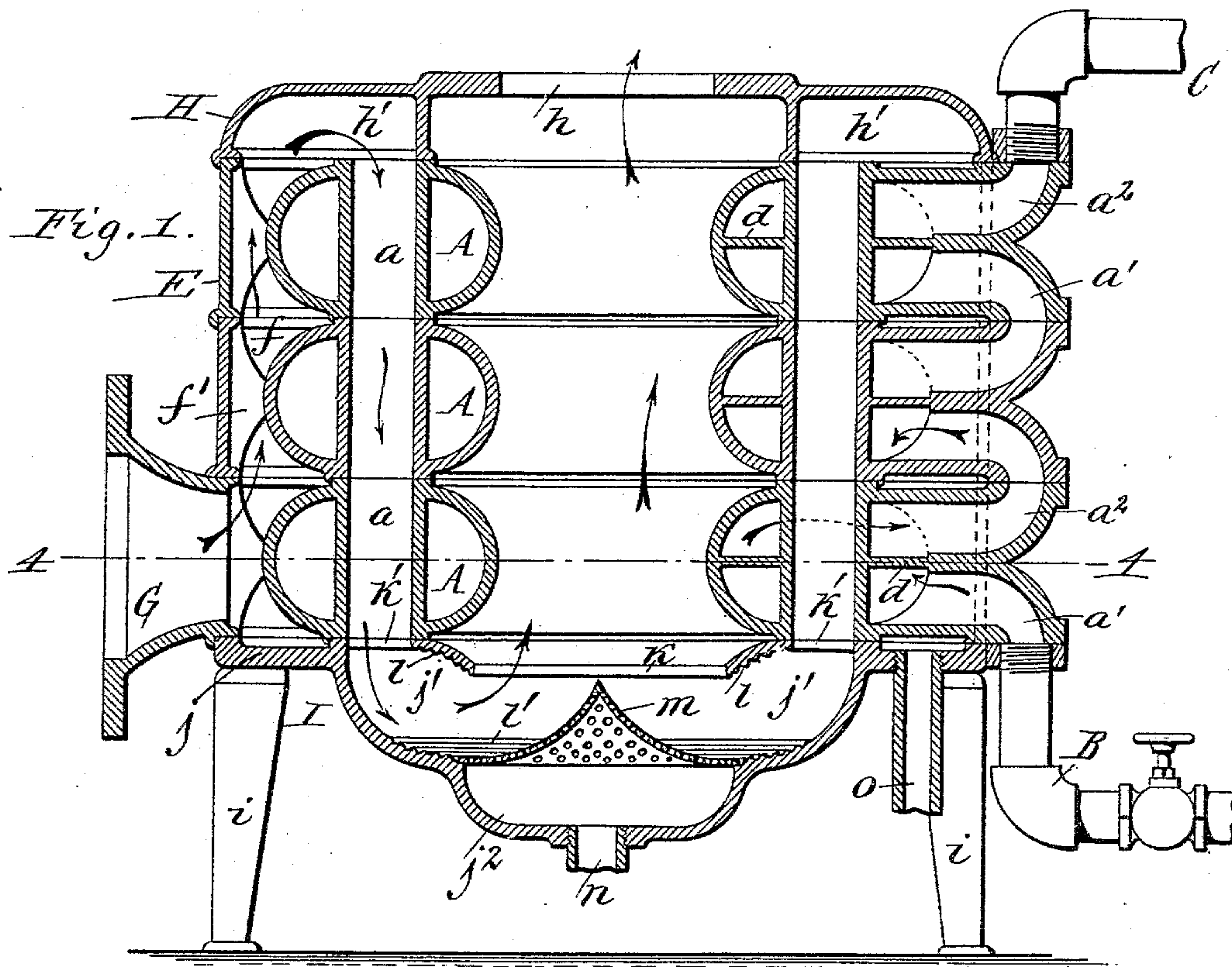
(No Model.)

2 Sheets—Sheet 1.

D. P. STEWART.
FEED WATER HEATER.

No. 545,181.

Patented Aug. 27, 1895.



WITNESSES:

Chas. F. Burkhardt.
Thos. L. Popp.

David P. Stewart INVENTOR.

By Wilhelm Hornum.

ATTORNEYS.

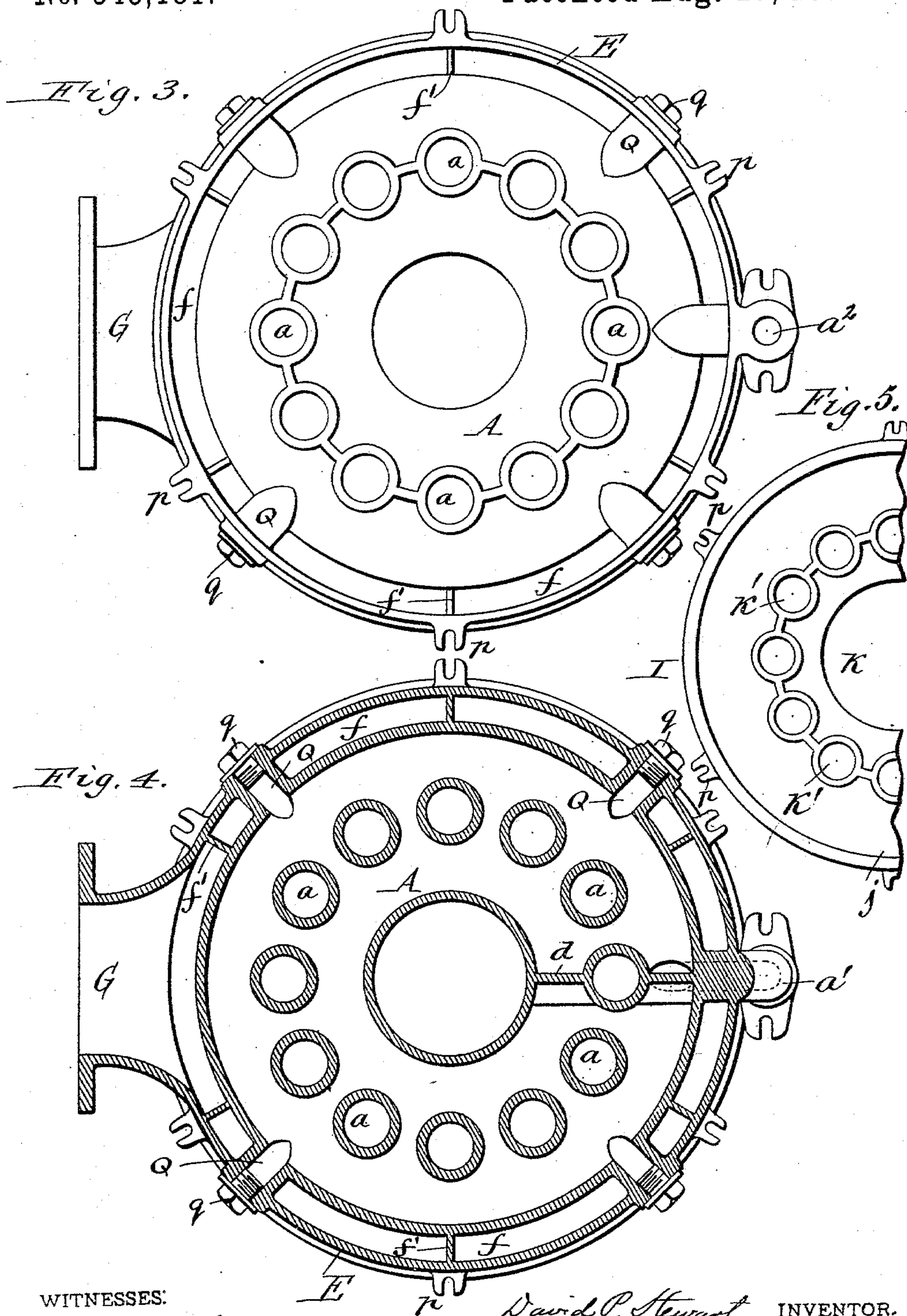
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By Wilhelm Bonner.

ATTORNEYS.

UNITED STATES PATENT OFFICE.

DAVID P. STEWART, OF BUFFALO, NEW YORK.

FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 545,181, dated August 27, 1895.

Application filed November 24, 1894. Serial No. 529,815. (No model.)

To all whom it may concern:

Be it known that I, DAVID P. STEWART, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Feed-Water Heaters, of which the following is a specification.

This invention relates to surface feed-water heaters; and the objects of my invention are to produce a feed-water heater which is composed of a number of similar sections, whereby a heater of any desired capacity can be readily produced by assembling the necessary number of sections, also to produce a simple and compact heater which can be readily constructed of cast metal and which is effective in operation and easily kept in good working condition.

In the accompanying drawings, consisting of two sheets, Figure 1 is a vertical section of my improved feed-water heater. Fig. 2 is a fragmentary side elevation of the same, partly in section, the view being taken at right angles to Fig. 1. Fig. 3 is a top plan view of one of the sections of the heater. Fig. 4 is a horizontal section through the lowermost section of the heater in line 4-4, Fig. 1. Fig. 5 is a fragmentary top plan view, on a reduced scale, of the base or bottom of the heater.

Like letters of reference refer to like parts in the several figures.

The body portion of the heater is composed of a number of superposed sections, each of which contains a water-chamber in which the water is exposed to the exhaust-steam.

A represents the annular water-chamber of each section; a , an annular row of flues extending vertically through the water-chamber; a' , the water-inlet nipple communicating with the lower portion of the water-chamber, and a'' the outlet-nipple arranged above the inlet-nipple. The several sections are placed one upon the other, so that the corresponding flues in all of the water-chambers coincide, and the outlet-nipple of one chamber opens into the inlet-nipple of the chamber next above the same. The inlet-nipple of the lowermost water-chamber is connected with a water-pipe B, and the outlet of the uppermost water-chamber is connected with the water-delivery pipe C. The cold water from the supply-pipe B passes successively through

the several water-chambers and is heated by the exhaust-steam surrounding the same and delivered by the pipe C to a boiler or other place where the heated water is to be utilized.

In order to prevent the water entering the water-chamber through the inlet-nipple from immediately passing out again through the adjacent outlet-nipple, each water-chamber is provided with a partition d , which extends obliquely across the water-chamber between its inlet and outlet nipples, as represented in Figs. 1, 2, and 4. This compels the water entering the inlet-nipple to pass completely around the annular water-chamber before it can escape through the outlet-nipple, thereby subjecting the water as long as possible to the action of the exhaust-steam surrounding the water-sections.

Each of the water-chambers is surrounded by a cylindrical shell-section E, which is separated from the chamber so as to form an annular heating flue or space f between the water-chamber and shell-section. The shell-section is preferably formed integrally with the heating-section and connected therewith by vertical webs f' . The edges of the adjacent shell-sections fit against each other, so that the several heating-spaces form one continuous heating chamber or passage, which surrounds the outer sides of the several water-chambers.

The inlet and outlet nipples of the water-chambers preferably project outwardly from the chambers and through the shell E, as shown. By this construction leaks in the joints can occur only at the external inlet and outlet nipples, where they can be readily observed and repaired.

The exhaust-steam or other heating medium is delivered into the lower portion of the outer heating-passage f through an inlet G, formed in the shell of the lowermost section, and it then passes upwardly around the water-chambers, thereby heating the outer sides of the chambers.

H represents a cap or top plate resting on the top heating-section and provided with a central exhaust-opening h , which communicates with the central space inclosed by the annular water-chambers and with an annular chamber h' , which connects the upper end of the outer heating-passage f with the upper

ends of the flues *a* of the water-chambers. The exhaust-steam issuing from the upper end of the outer heating-passage *f* enters the connecting-chamber *h'* and passes thence downwardly into and through the flues of the water-chambers, whereby the central portions of the water-chambers are heated.

I represents the base or bottom of the heater, upon which the lowermost section rests and which is supported by legs *i*. This base consists, essentially, of a horizontal marginal flange *j*, which closes the lower end of the outer heating-passage *f*, a dish-shaped separating-chamber *j'*, arranged within the marginal portion, and a central dish-shaped collecting-chamber *j''*, arranged in the bottom of the separating-chamber. The top of the separating-chamber is provided with a central opening *k*, whereby it communicates with the space in the center of the water-chambers and around said central opening with an annular row of openings *k'*, which register with the lower ends of the flues *a* and establish communication between the latter and the separating-chamber. The exhaust-steam issuing from the lower ends of these flues enters the separating-chamber, and passes thence upwardly into the central space of the water-chambers, whereby the inner sides of the water-chambers are heated. The remaining exhaust-steam finally passes out through the central opening *h* in the top plate *H*. The upper and lower sides of the separating-chamber are preferably provided with corrugations *l* and *l'*. As the steam issues from the lower ends of the flues *a*, it expands and strikes these corrugations, thereby separating the water of condensation from the steam and also any oil which may be carried over from the engine-cylinder by the exhaust. The top of the collecting-chamber *j''* is separated from the separating-chamber by a perforated conical cover or diaphragm *m*, which permits the oil and water separated from the steam to pass into the collecting-chamber, but prevents steam in passing upwardly through the central spaces of the water-chambers from sucking or lifting the water and oil out of the collecting-chamber.

n represents a drip-pipe connected with the bottom of the collecting-chamber, and *o* is a similar pipe passing through the marginal flange of the bottom and opening into the lower end of the outer heating-passage *f*, whereby the water and oil which collect in said passage and the collecting-chamber are drawn off.

The several sections and the top and bottom plates of the heater may be secured together in any suitable manner, preferably by providing the adjacent edges of these parts with lugs *p*, which are connected by bolts *p'*.

Q represents radial cleaning-nipples extending from the outer side of the shell-sections into the water-chambers and having their outer ends closed by screw-plugs *q*. Upon removing these plugs the interior of

the water-chambers can be thoroughly cleaned by spraying water into the same through the cleaning-nipples.

I claim as my invention—

1. The combination with an inclosing shell, of superposed annular water chambers arranged in said shell and connected by water inlet and outlet nipples, each chamber being separated from the inclosing shell forming an outer heating passage or space around the chamber and provided with a central heating passage or space, and with heating flues formed integrally with the chamber and extending through the water space of the chamber between the central and outer heating passage or spaces, substantially as set forth.

2. The combination with the water chambers forming a central heating passage and having flues extending through the water spaces, of a separating chamber connecting the flues with the central heating passage and provided on its inner side with corrugations, whereby the liquid particles are separated from the steam, substantially as set forth.

3. The combination with the annular water chambers forming a central heating passage and having flues extending through the water spaces, of a separating chamber provided with a central opening communicating with the central heating passage and with surrounding openings communicating with the flues, substantially as set forth.

4. The combination with the superposed annular water chambers forming a central heating passage and having flues extending through the water spaces, of a separating chamber connecting the lower ends of the flues with the central heating passage, a collecting chamber arranged underneath the separating chamber, and a perforated diaphragm arranged between the separating and collecting chambers, substantially as set forth.

5. The combination with an inclosing shell, of superposed annular water chambers forming a central heating passage and separated from the surrounding shell by an outer heating passage, each water chamber being provided with flues extending through the same and with external inlet and outlet nipples projecting through the shell, the nipples of adjacent chambers communicating with each other, substantially as set forth.

6. A heating section consisting of an annular water chamber forming a central heating passage, inlet and outlet nipples connected with the water chamber, flues extending through the water chamber, and a shell section surrounding the water chamber and formed integrally therewith, substantially as set forth.

7. In a feed water heater, the combination with superposed annular water chambers, each provided with a surrounding shell section formed integrally with the water chamber and separated therefrom by a heating passage, and each provided with flues extending through the water space of each chamber

and with inlet and outlet nipples, of connecting chambers connecting respectively the outer heating passage with the flues and the latter with the central heating passage, substantially as set forth.

8. A heating section consisting of an annular water chamber, flues extending through said water chamber, inlet and outlet nipples formed on the water chamber adjacent to each other and projecting outwardly there-

from, and a partition extending across the water chamber between the inlet and outlet nipples, substantially as set forth.

Witness my hand this 5th day of November, 1894.

DAVID P. STEWART.

Witnesses:

JNO. J. BONNER,
THEO. L. POPP.