

No. 713,068.

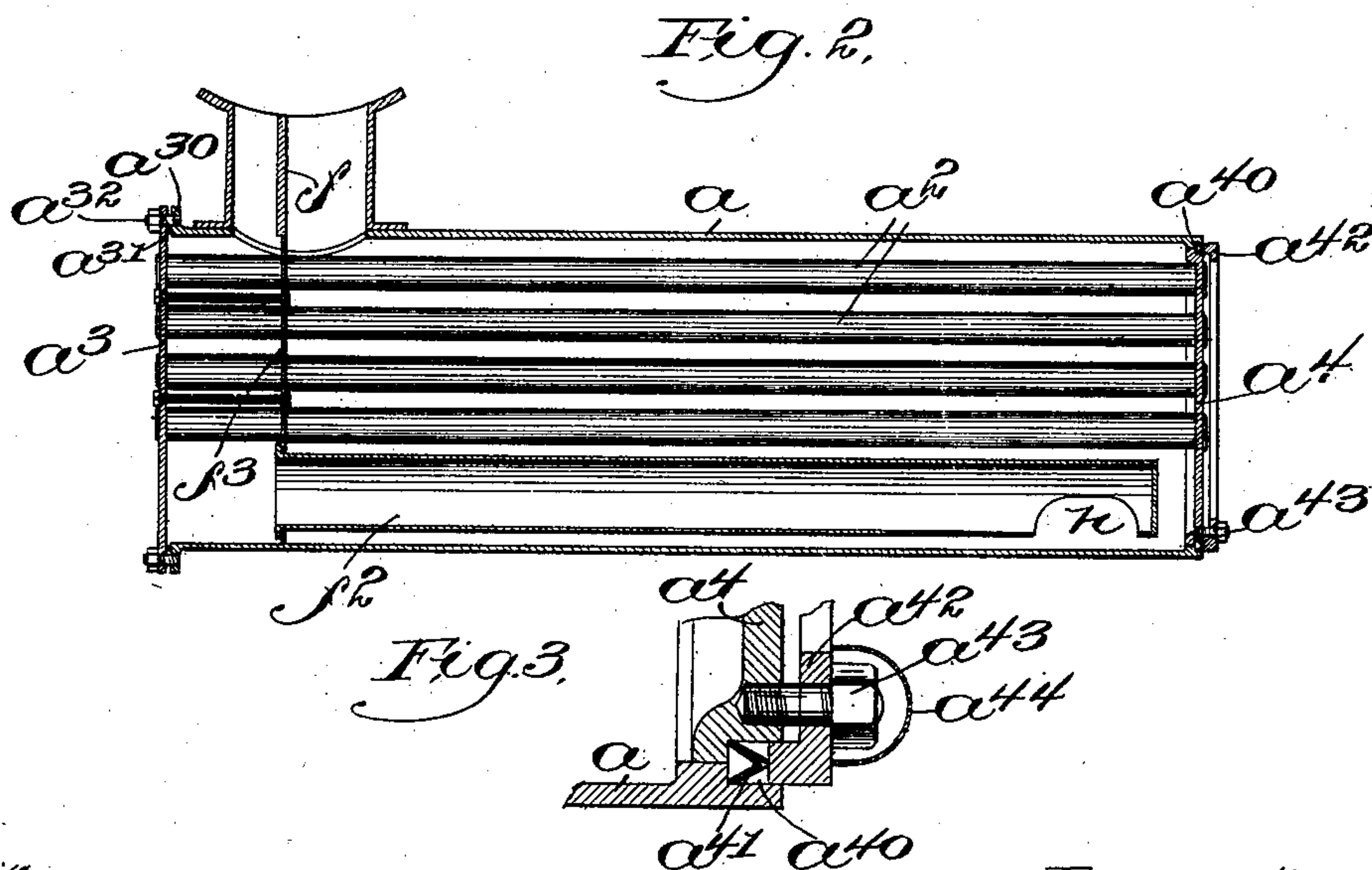
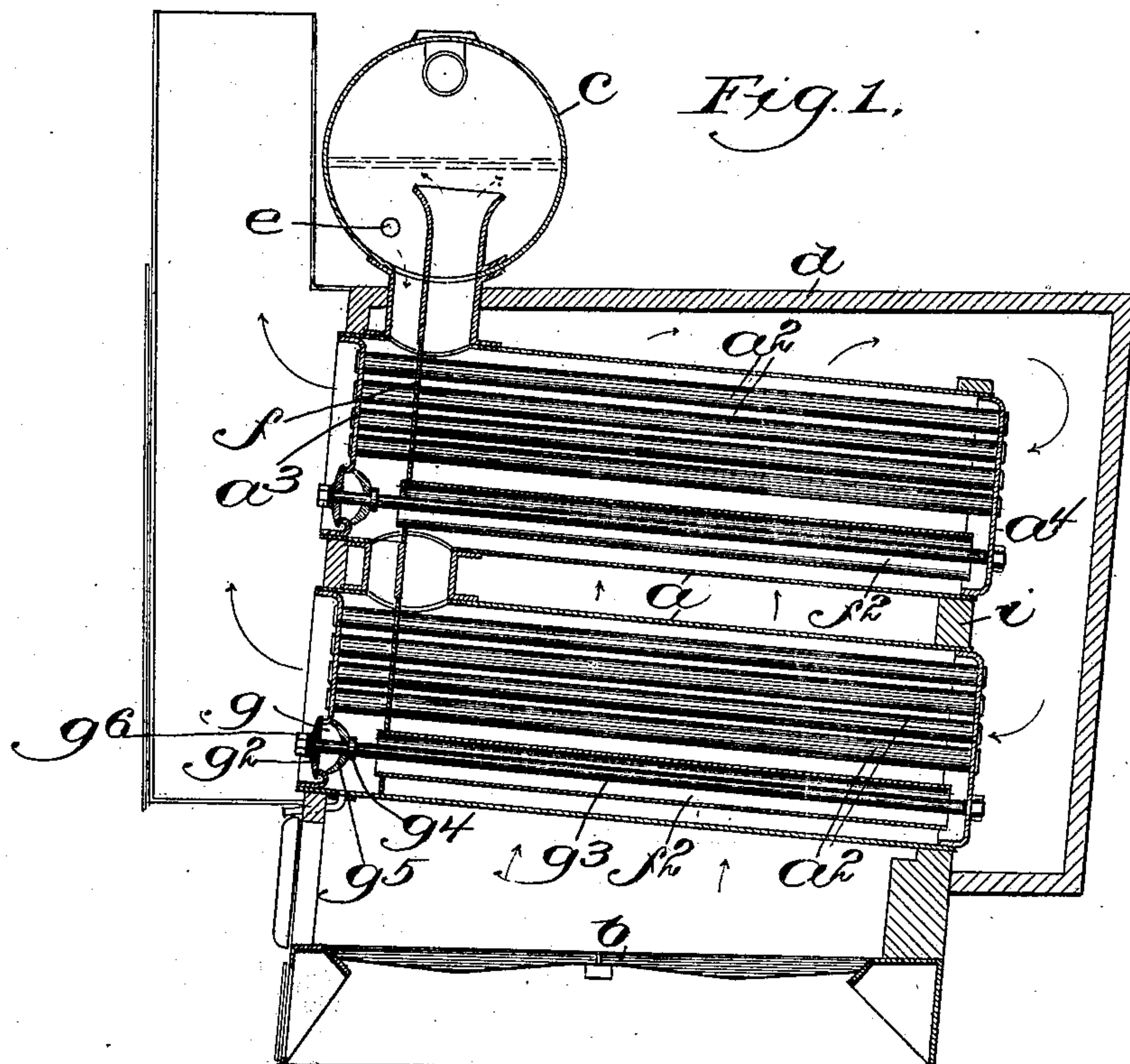
Patented Nov. 11, 1902.

C. R. COWLEY & H. C. COOPER.

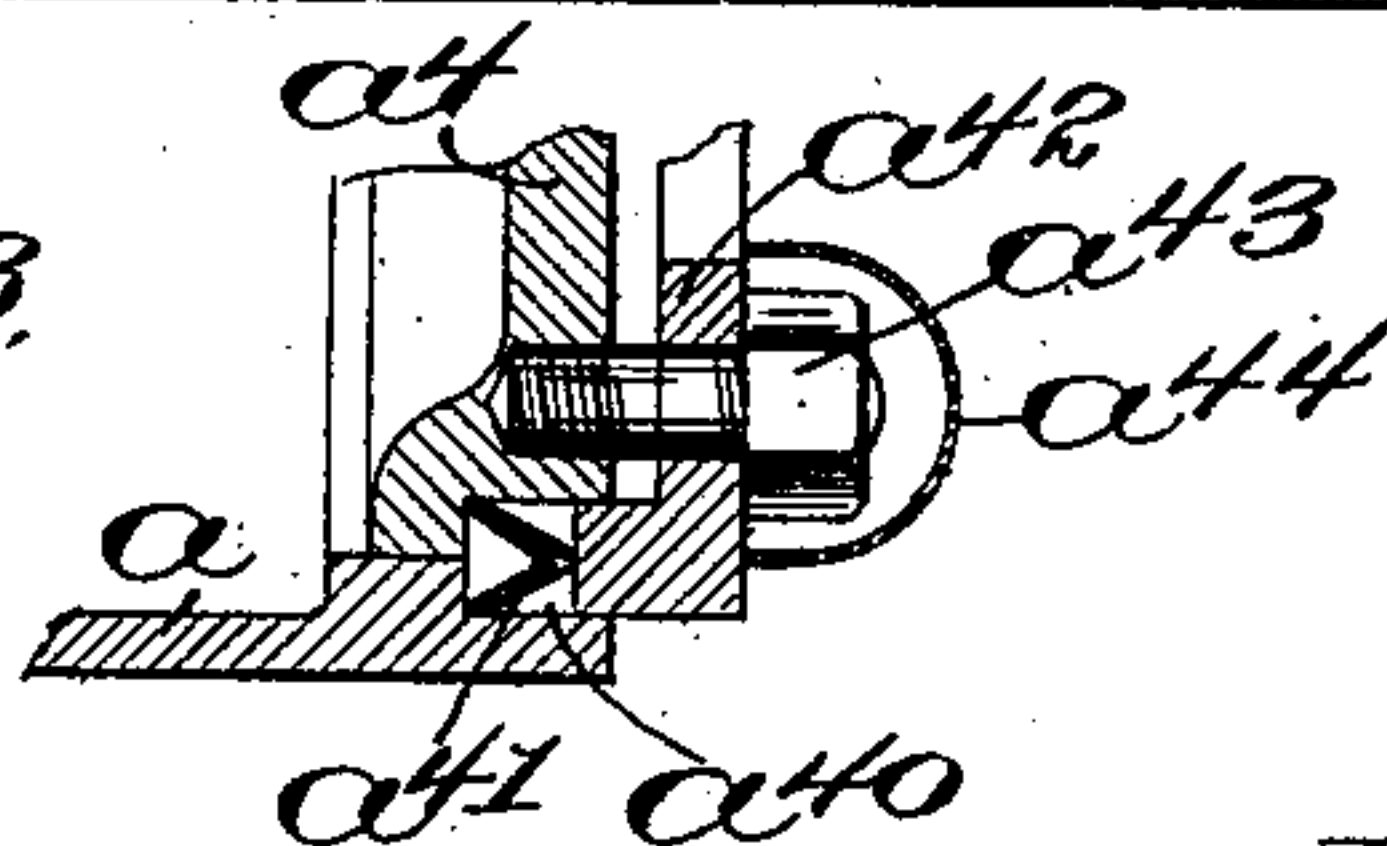
BOILER.

(Application filed Apr. 1, 1901.)

(No Model.)



*Fig. 3.*



Witnesses:

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# UNITED STATES PATENT OFFICE.

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## BOILER.

SPECIFICATION forming part of Letters Patent No. 713,068, dated November 11, 1902.

Application filed April 1, 1901. Serial No. 53,913. (No model.)

*To all whom it may concern:*

Be it known that we, CHARLES R. COWLEY, of Everett, county of Middlesex, and State of Massachusetts, and HOWELL C. COOPER, of Oil City, county of Venango, and State of Pennsylvania, have invented an Improvement in Boilers, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

Our invention relates to that class of boilers combining the fire-tube and water-tube types in which the water tubes or shells containing the fire-tubes receive upon their exterior surfaces the direct radiant heat from the fire, which next passes at a somewhat lower temperature through the fire-tubes and is finally liberated into the uptake at a reduced temperature. The object of this class of boilers being to provide a construction that may be safely worked at the high pressures now required for multiple-expansion engines and still retain, as they do, the use of fire-tubes, it is important that the pressure-bearing joints and connections be made as few as possible. To this end we have designed a type of boiler having one or more water tubes or shells containing fire-tubes and certain directing passage-ways forming the "generating" portion of the boiler, a steam and water drum with contained baffle and directing passage-ways forming the "disengaging" portion of the boiler and placed above the generating portion, and communicating passages between the said generating portion and steam and water drum at or near one end only of the generating portion containing deflecting and controlling walls. It is evident that all of these deflecting and controlling walls, being internally disposed, are not subject to the boiler-pressure and merely provide passage-ways to direct the outflow and inflow of the water and steam from the generating portion to the drum.

Figure 1 is a vertical section of the "fixed-fire-tube" type of boiler embodying the invention; Fig. 2, a section of one water-shell with its contained fire-tubes of the "removable-fire-tube" type, constituting one of the generating elements; and Fig. 3 is a sectional detail on an enlarged scale.

In either the fixed-fire-tube type or the removable-fire-tube type the general arrange-

ment of the generating portion, steam and water drum, and communicating passages is the same.

Referring to Fig. 1, the generating elements  $a$ , of which there may be any number desired, are shown as placed one above the other in a slightly-inclined position over the grate  $b$ , and communicating at one end only of each with a disengaging element or steam and water drum  $c$ , mounted above them, the whole being inclosed in a casing  $d$ . The direction of movement of the products of combustion and the currents of fluid are indicated by the arrows.

The communicating passages are shown as provided with deflecting-walls, whereby the separated water from the drum  $c$ , together with the feed-water entering at the pipe  $e$ , are guided and deflected to the lowest points of each generating element, and the steam-laden water is deflected and guided from the generating-shells into the drum  $c$ . As herein shown, a deflecting-wall  $f$  is extended through the generating elements into the drum  $c$ , near one end of the former, and said wall is supplemented by a duct  $f^2$ , leading to the opposite end of the generating element, the cooler water passing down at one side of the wall and passing through the ducts, while the heated water and steam rise into the drum at the other side of said wall, the circulation thus set up being indicated by the arrows.

A hand-hole  $g$  is provided in each generating element by removing the cover  $g^2$ , of which the duct or tube  $f^2$  may be withdrawn and the interior of the generating element inspected, cleaned, &c. A blow is also provided, as shown at  $h$ , whereby the lime, sediment, &c., may be removed. A drain-plug at the lowest exterior point of each generating-shell is also provided. The lower ends of the generating-shells are supported by the baffle-wall  $i$ .

In Fig. 2 the fire-tubes  $a^2$  and heads  $a^3$   $a^4$  and the portions  $f^3$  of the deflecting-walls  $f$  are arranged to be removed as a unit from the generating-shell  $a$  for the purpose of inspection, cleaning, repairs, &c. The joint between the head  $a^3$  and the water-shell flange  $a^{30}$  is made with a suitable gasket, such as a copper ring  $a^{31}$ , adjusted by bolts  $a^{32}$ , and the head is firmly seated and rigid.



In order to compensate for variations in expansion and contraction, the head  $a^4$  at the opposite end of the shell is provided with a packing device of novel construction, which forms a feature of the present invention.

As shown in Fig. 2 and on a larger scale in Fig. 3, the shell  $a$  and fire-tube head  $a^4$  are bored out to form a channel  $a^{40}$  along the line of junction between the said shell and head, and in the said channel is placed an annular gasket  $a^{41}$ , which is V-shaped in cross-section, the legs or members of the V engaging with the bottom of the channel and spanning the joint between the plate and the cylinder, as clearly shown in Fig. 3. The said gasket is held in position by means of a follower  $a^{42}$ , which is bolted to the fire-tube head  $a^4$ , as by the bolts  $a^{43}$ , which may, if necessary, be provided with a covering  $a^{44}$  (not shown in Fig. 2) to protect the bolts from the heat. The said gasket affords a water-tight packing and at the same time admits of variations in expansion and contraction between the shell and the fire-tubes, since it will yield to pressure and still cover the joint if there is a change in the relative positions of the fire-tube head and the end of the shell due to unequal expansion of the said parts.

The hand-hole  $g$ , Fig. 1, is shown as provided with a removable cover  $g^2$ , the construction being such that the said cover is held in position by means of a stay-rod bolt  $g^3$ , which extends completely through the water-shell and is screwed or otherwise fastened to the opposite end thereof. The said bolt is provided with a flange or shoulder  $g^4$  to engage a spider  $g^5$ , which bears against the inner surface of the shell adjacent to the hand-hole, and the cover  $g^2$  is clamped against the outside of the hand-hole by means of a nut  $g^6$ , in conjunction with the shoulder and spider aforesaid. The said rod-bolt thus not only strengthens the construction, but also affords fastening means for the hand-hole cover, and the bolt may be removed, if desired, or the duct  $f^2$  may be taken out without bodily removing the said stay-rod bolt by merely loosening the said bolt to release the spider, which can then be turned and withdrawn through the hand-hole, leaving the opening clear for the removal of the duct.

We claim—

1. A boiler having a generating portion provided with fire-tubes, and a steam and water drum above said generating portion; communicating passages between said generating portion and said drum; and means for deflecting or controlling the currents through said passages to set up a current in a direction substantially parallel to the fire-tubes.

2. A boiler having a generating portion provided with clusters of fire-tubes, and a steam and water drum above said generating portion; communicating passages between said generating portion and said drum; means for deflecting or controlling the currents through said passages to set up circulation;

and means for removably securing said clusters of fire-tubes.

3. A boiler having a generating portion composed of one or more cylindrical water-shells having fire-tubes passing through said shells; a steam and water drum composed of a cylindrical shell arranged above said generating portion and communicating passages between said portions; and internal walls so arranged as to form two or more passage-ways extending from that part of each of said cylindrical water-shells which is farthest removed from the drum to the interior of said drum.

4. A boiler having a generating portion composed of a cylindrical water-shell having fire-tubes passing longitudinally entirely through it and fastened into suitable fire-tube heads, said boiler being so arranged that said fire-tubes and heads may be withdrawn and replaced at will as a unit; a steam and water drum above said generating portion and communicating passages between said generating portion and said drum; and internal walls so arranged as to form two or more passage-ways extending from the lowest point of said cylindrical water-shell to the interior of said drum, a portion of said walls being arranged to be withdrawn with the fire-tubes and their heads as a unit for the purpose of cleaning and repairs, substantially as described.

5. A boiler having a generating portion composed of a cylindrical water-shell containing fire-tubes extending through it and expanded or otherwise secured at each end into fire-tube heads; a steam and water drum above said generating portion; and communicating passages between said generating portion and said drum provided with internal walls forming ducts or passage-ways extending from that part of each cylindrical water-shell which is farthest removed from the drum to the interior of said drum, parts of said internal walls being removable through hand-holes properly located with respect to said removable parts whereby access to each water-shell is afforded, substantially as described.

6. In a boiler the combination with a water tube or shell of fire-tube heads therefor; one or more fire-tubes extending from one of said heads to the other; a deflecting wall placed inside of said water-shell dividing transversely the interior of said shell; a removable duct extending through said deflecting wall in the shell; a hand-hole to afford access to said water-shell and allow the withdrawal of said duct, said hand-hole being provided with a cover; and a stay-rod bolt to hold said cover closed, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

CHARLES R. COWLEY.  
HOWELL C. COOPER.

Witnesses:

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JAS. J. MALONEY.