

(No Model.)

H. H. THORNTON.

# STEAM BOILER.

No. 341,705.

Patented May 11, 1886.

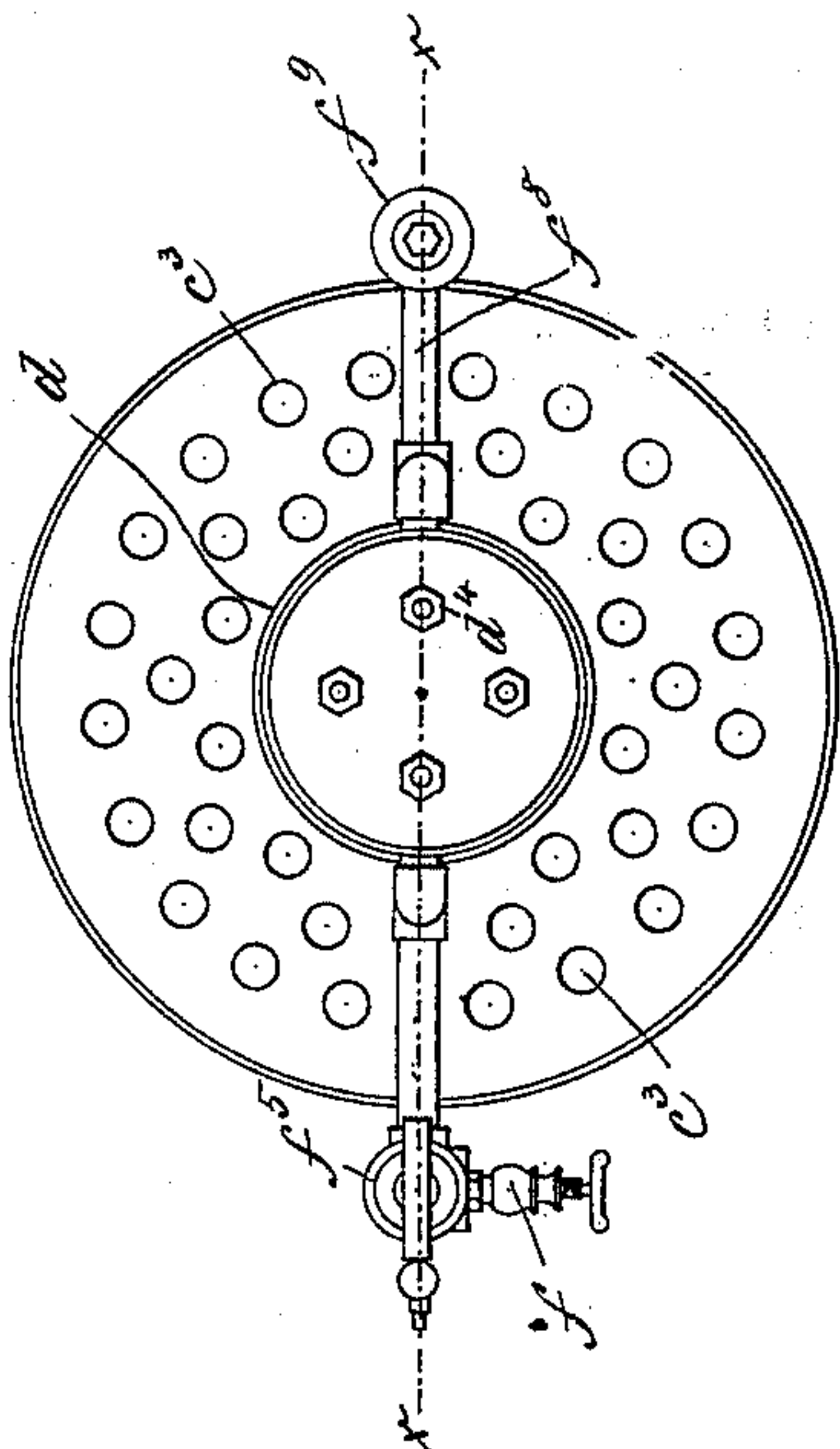


Fig: 3.

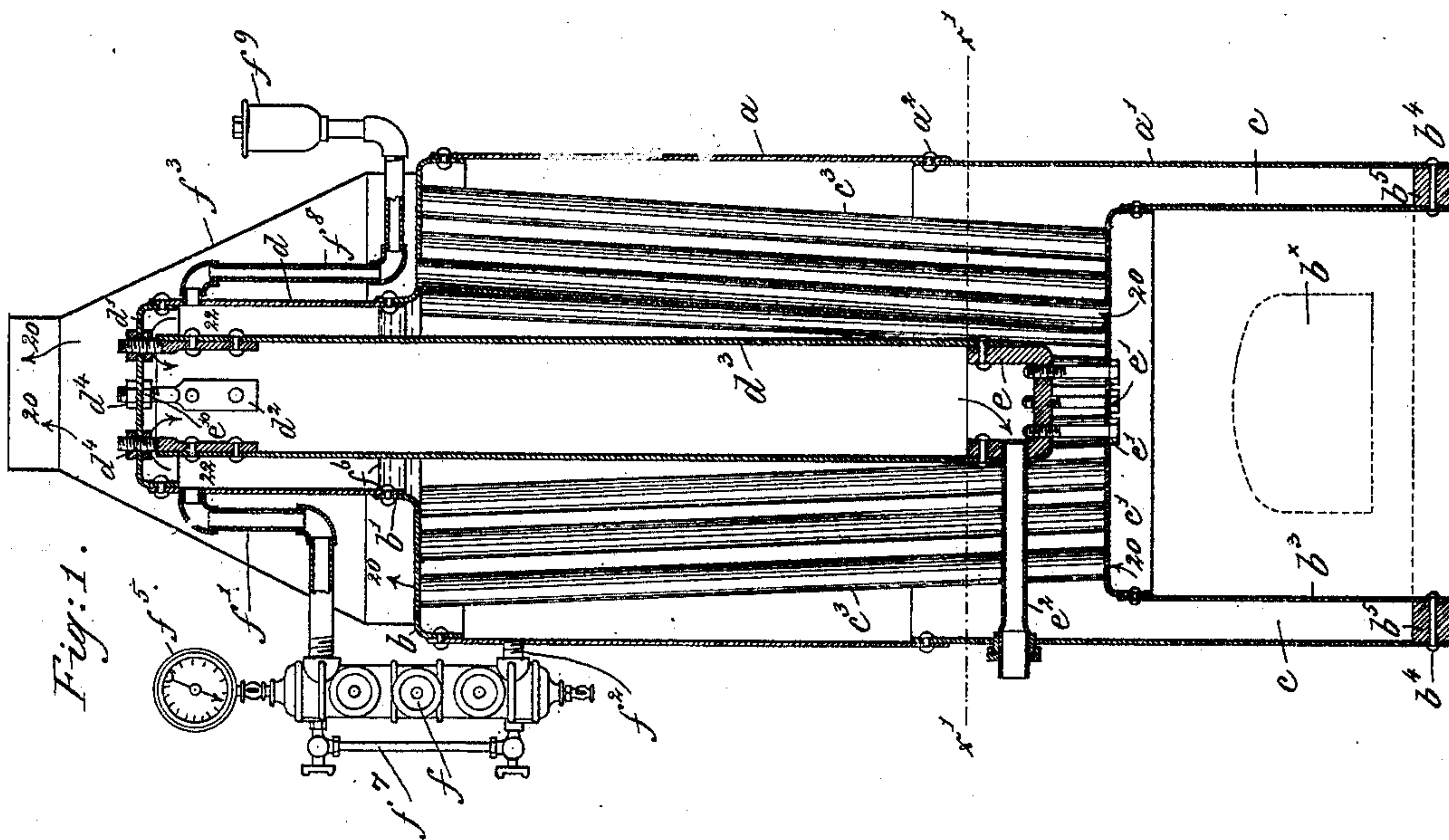
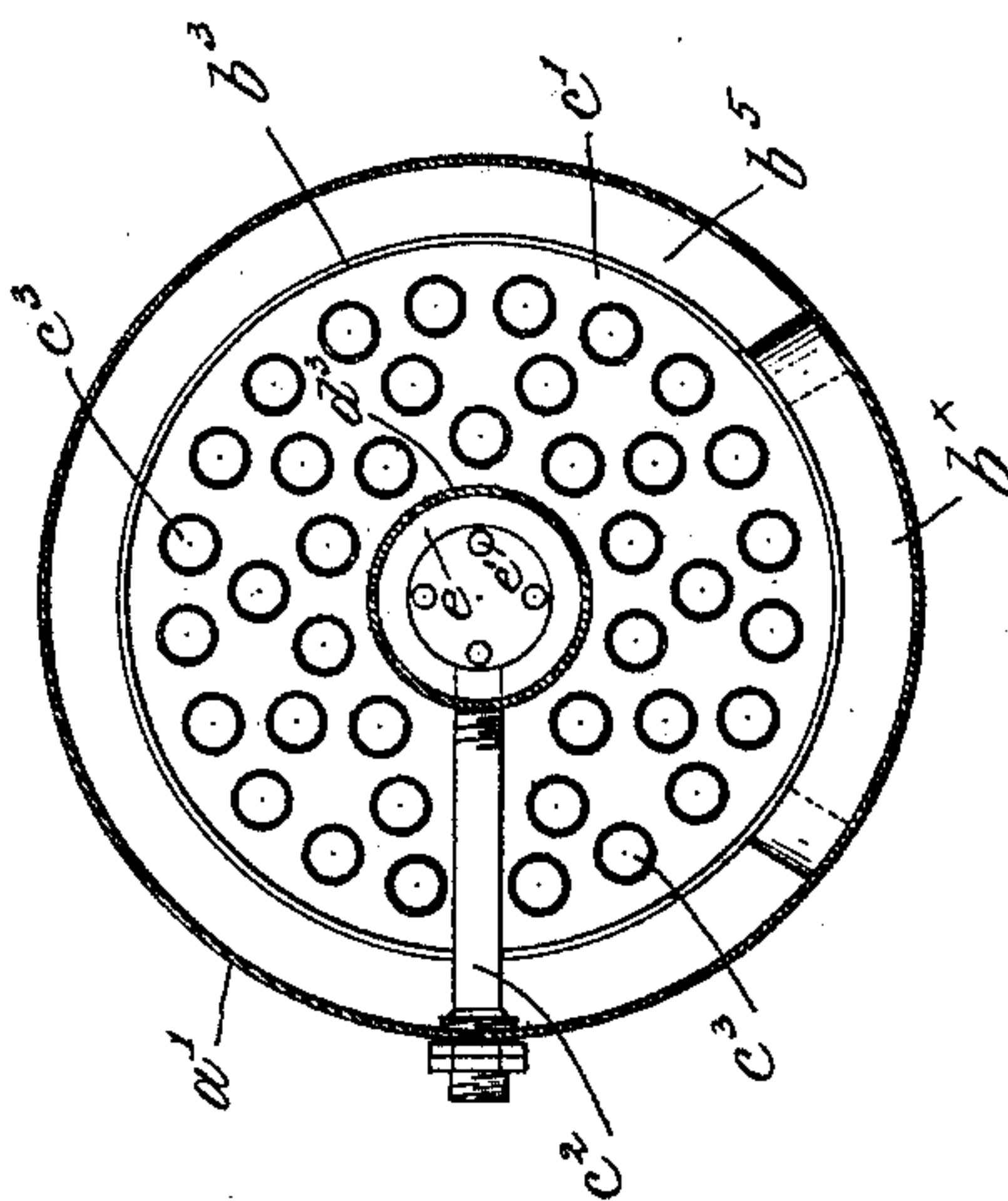


Fig: 1.

*Witnesses.*

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# UNITED STATES PATENT OFFICE.

HENRY H. THORNTON, OF BOSTON, MASSACHUSETTS.

## STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 341,705, dated May 11, 1886.

Application filed November 30, 1885. Serial No. 184,293. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY H. THORNTON, of Boston, county of Suffolk, and State of Massachusetts, have invented an Improvement in Steam-Boilers, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My present invention is shown as embodied in that class of steam-boilers known as "upright tubular boilers," and has for its object to improve the construction of the same.

In upright tubular boilers as now commonly constructed the steam-space is located below the tube-sheet, with which the fire-pipes conducting the products of combustion from the fire-box to the chimney are connected.

Upright tubular boilers constructed as above described are defective, inasmuch as the upper part of the fire tubes and the joints made by the junction of the said tubes with the tube-sheet are exposed to the action of heat without having any cooling or protective medium surrounding them, the long-continued exposure to heat causing the said tube sheet to crack and the said joints to become loosened, which is a most objectionable feature.

My invention has for its object, primarily, to obviate this fault in the class of boilers referred to; and it consists, essentially, of a boiler-shell provided with a tube-sheet open at its center, a fire-box inclosed within the shell, a series of fire-tubes extended from the fire-box to the said tube-sheet and surrounded by water, combined with a steam-dome, and with an internal steam receiver or drum extended through the boiler, and with a steam-outlet pipe connected to the said internal steam receiver or drum, preferably near its lower end, it conveying the steam therefrom to the point where it is to be used.

My invention also consists in details of construction to be hereinafter described, and pointed out in the claims at the end of this specification.

Figure 1 is a partial elevation and section of a steam-boiler embodying my invention, the section being taken in the line  $x x$ , Fig. 2; Fig. 2, a plan view of Fig. 1 with the smoke-bonnet removed, and Fig. 3 a transverse section of Fig. 1 in the line  $x' x'$ , looking down.

The shell of the boiler herein shown is com-

posed of metal plates  $a a'$ , riveted together, as at  $a^2$ , the plate  $a$  having riveted to it the tube-sheet  $b$ , open at its center, and provided with the upturned flange  $b'$ .

Inclosed by the plate  $a'$  is a second plate,  $b^3$ , riveted to the plate  $a'$  by rivets  $b^4$ , passed through the frame  $b^5$ , located between the said plates at the base of the boiler, and leaving the space  $c$  between the said plates to form a water-leg.

The plate  $b^3$  has riveted to it a top plate,  $c'$ , the said plates  $b^3$  and  $c'$  forming the fire-box of the boiler, the said fire box having the usual door,  $b^x$ .

The top plate,  $c'$ , of the fire-box and the tube-sheet  $b$  of the boiler are connected by pipes  $c^3$ , screwed into or otherwise suitably connected to them, and herein shown as "staggered" and placed in an oblique position.

The upturned flange  $b'$  of the tube-sheet  $b$  has riveted to it a metal shell,  $d$ , provided with a head,  $d'$ , riveted to the said plate, the shell  $d$  and its head  $d'$  forming a steam dome, the said steam-dome being located above the tube-sheet  $b$ , as shown in Fig. 1.

Within the shell  $d$ , and extended downward through the steam and water space to near the fire-box, is a cylindrical shell,  $d^2$ , forming an internal steam receiver or drum, which is practically a continuation of the steam-dome. The shell  $d^2$  has attached to its upper end screw-threaded metal braces  $d^3$ , provided with nuts  $e^{10}$ , the said braces being extended through the dome-head  $d'$ , and secured thereto by nuts  $d^4$ , the said braces serving to support the internal steam drum or receiver within the boiler. The shell  $d^3$  at its lower end is riveted to the U-piece  $e$ , which forms a head for the said shell, the said head being securely held by bolts  $e'$ , extended through the top plate,  $c'$ , of the fire-box and screwed into the said head, the said bolts also serving to support the internal steam dome or receiver.

The shell  $d^2$  and the braces  $d^3$ , provided with nuts  $e^{10}$  and  $d^4$  at the upper end of the shell and the bolts  $e'$  at its lower end, all combine to serve as a brace for the dome-head  $d'$  and the top plate,  $c'$ , of the fire-box.

A pipe,  $e^2$ , communicating with the internal steam receiver or drum, is extended outward through the boiler-shell and conveys steam



from the said internal steam receiver or drum directly to the engine, or to any other place where the steam is to be used.

The boiler herein shown is provided with gage-cocks  $f$ , the steam-gage  $f^5$ , and the water-gage 7, all of ordinary construction, the said gage-cocks and said steam and water gages being secured to a stand-pipe of usual construction, the said stand-pipe being connected with the steam-dome by the pipe  $f'$ , and with the boiler by water-pipe  $f^2$ . The pipe  $f'$  is extended through a bonnet,  $f^3$ , forming a smoke-flue, the said bonnet being placed upon the tube-sheet  $b$  and inclosing the steam-dome. The steam-dome has connected to it a pipe,  $f^8$ , extended through the smoke-bonnet  $f^3$ , and provided with a safety-valve,  $f^9$ .

Water admitted to the boiler in usual manner through a pipe (not herein shown) is heated by the pipes  $c^3$ , conveying the products of combustion from the fire-box to the bonnet  $f^3$ , from whence they pass to the chimney, as indicated by arrow 20. The water-line  $f^6$ , being above the tube-sheet  $b$ , prevents undue heating of the upper ends of the fire-tube  $c^3$  and of the tube-sheet, thus obviating the cracking of the tube-sheet and loosening of joints where the said tubes are joined to the said tube-sheet. The steam generated in the boiler passes up into the steam-dome, which has the advantage of being surrounded by escaping gases on their way to the chimney, the said gases serving to dry the steam in said dome. The steam passes from the steam-dome into the internal receiver or drum, as indicated by arrow 22, through the said internal receiver or drum, and out by the pipe  $e^2$ . The steam within the internal receiver or drum, being surrounded by its own temperature and not exposed to any condensing influences, is delivered from the said drum with its full energy.

I claim—

1. In a steam-generator, a cylindrical shell provided with a tube-sheet, a fire-box inclosed within the said shell, a series of fire-tubes connected to the fire-box and the said tube-sheet, combined with a steam-dome, and with an internal steam receiver or drum extended through the boiler and provided with an outlet-pipe connected to the said internal steam receiver or drum and communicating with the outside of the boiler, substantially as described.

2. In a steam-generator, a cylindrical shell provided with a tube-sheet, a steam-dome supported by the said tube-sheet, combined with the internal steam receiver or drum secured to and supported by the steam-dome, the said internal steam receiver or drum communicating with the outside of the boiler near the fire-box, substantially as described.

3. In a steam-generator, a cylindrical shell provided with the tube-sheet  $b$ , and the steam-dome supported by the said tube-sheet, combined with the internal steam receiver or drum secured to and supported by the steam-dome and provided with a head, the said head being supported by bolts  $e'$ , and with the steam-outlet pipe  $e^2$ , substantially as described.

4. In a steam-generator, a cylindrical shell provided with the tube-sheet  $b$ , having an upturned flange,  $b'$ , and the steam-dome secured to the said upturned flange, combined with the internal steam receiver or drum secured to and supported by the steam-dome and provided with the head  $e$ , the said head being supported by bolts  $e'$ , and with the steam-outlet pipe  $e^2$ , substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HENRY H. THORNTON.

Witnesses:

GEORGE B. BIGELOW,  
J. H. CHURCHILL.