

R. JOY.
STEAM BOILER.

No. 574,738.

Patented Jan. 5, 1897.

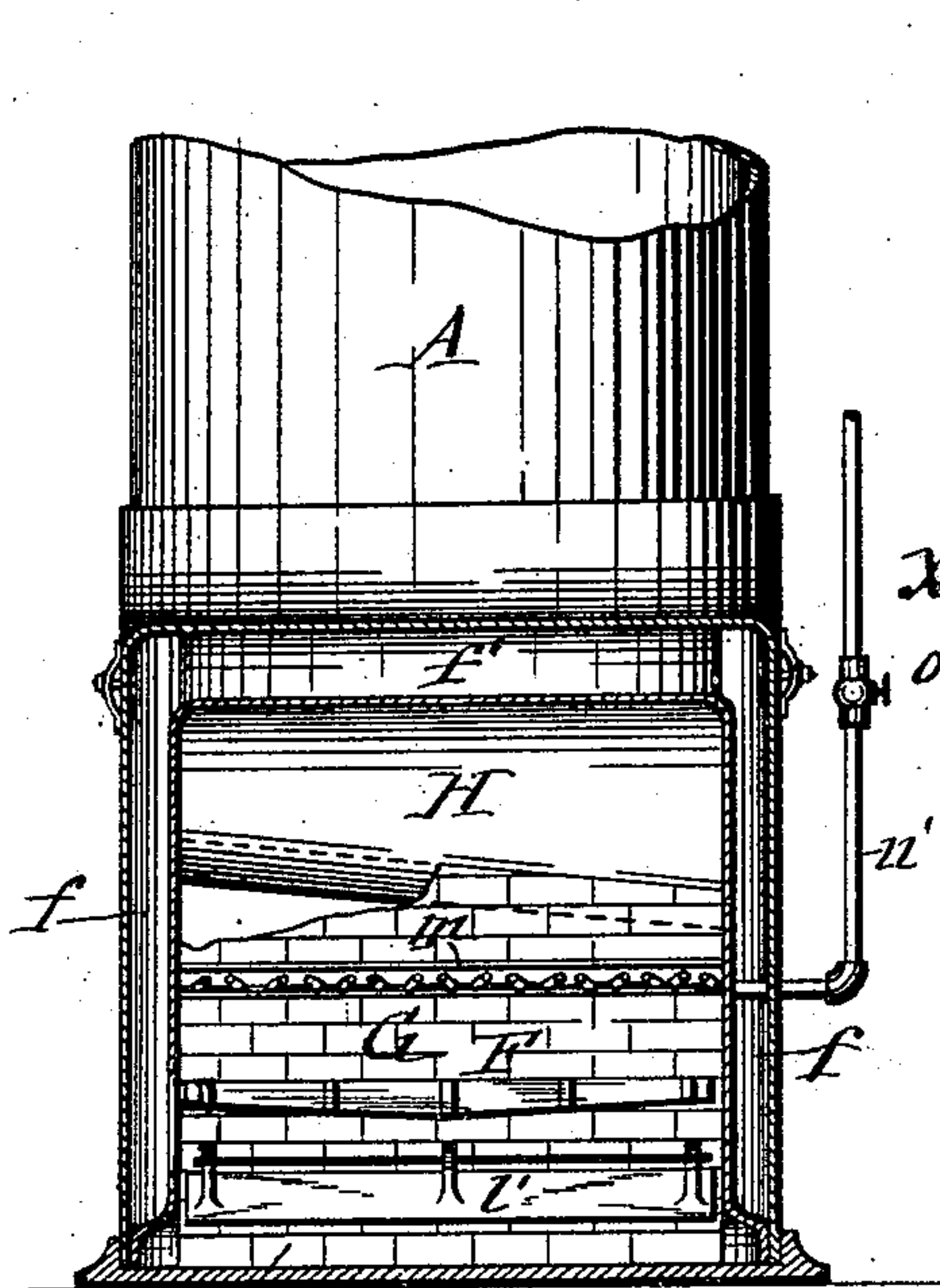


Fig. 8

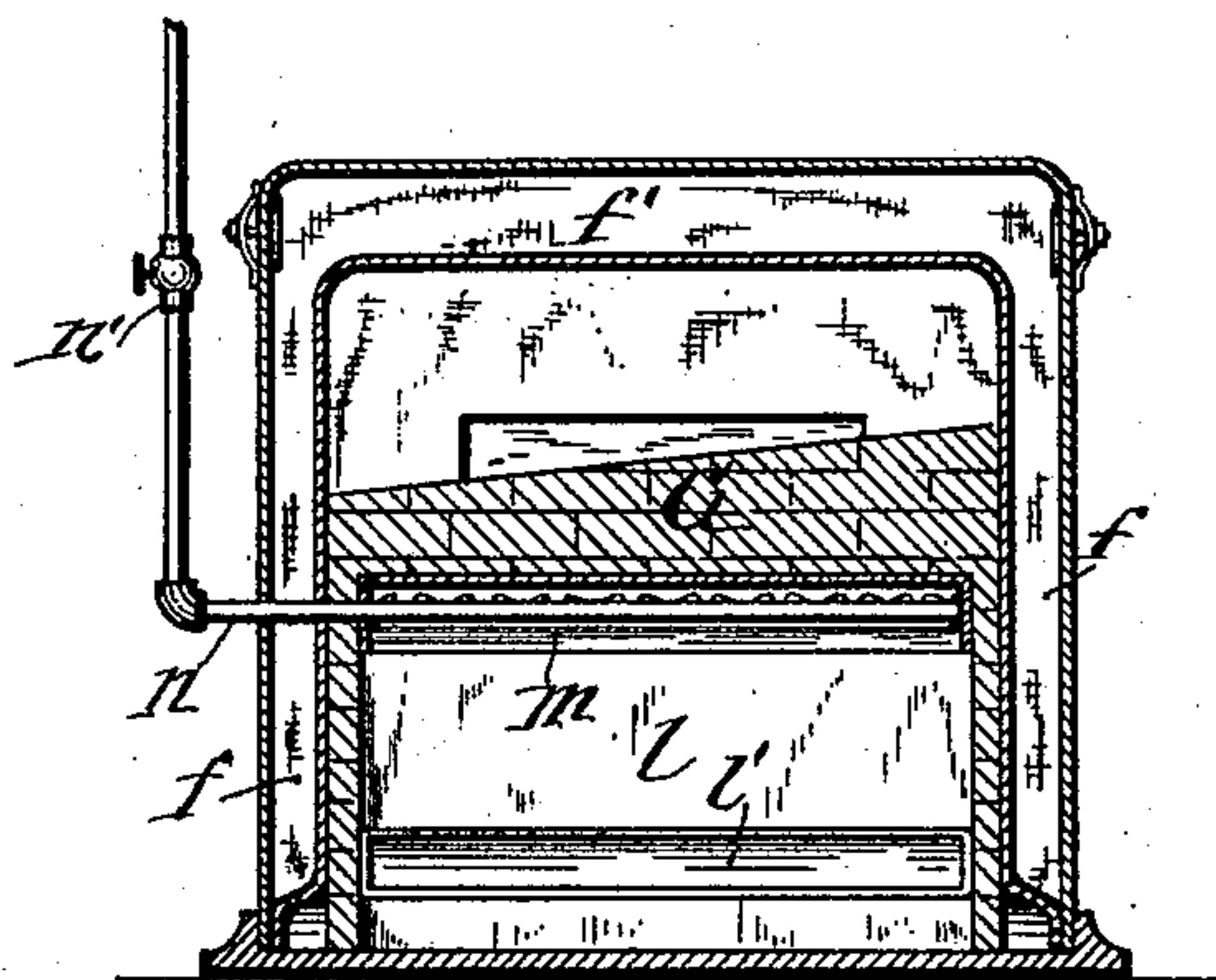


Fig. 7

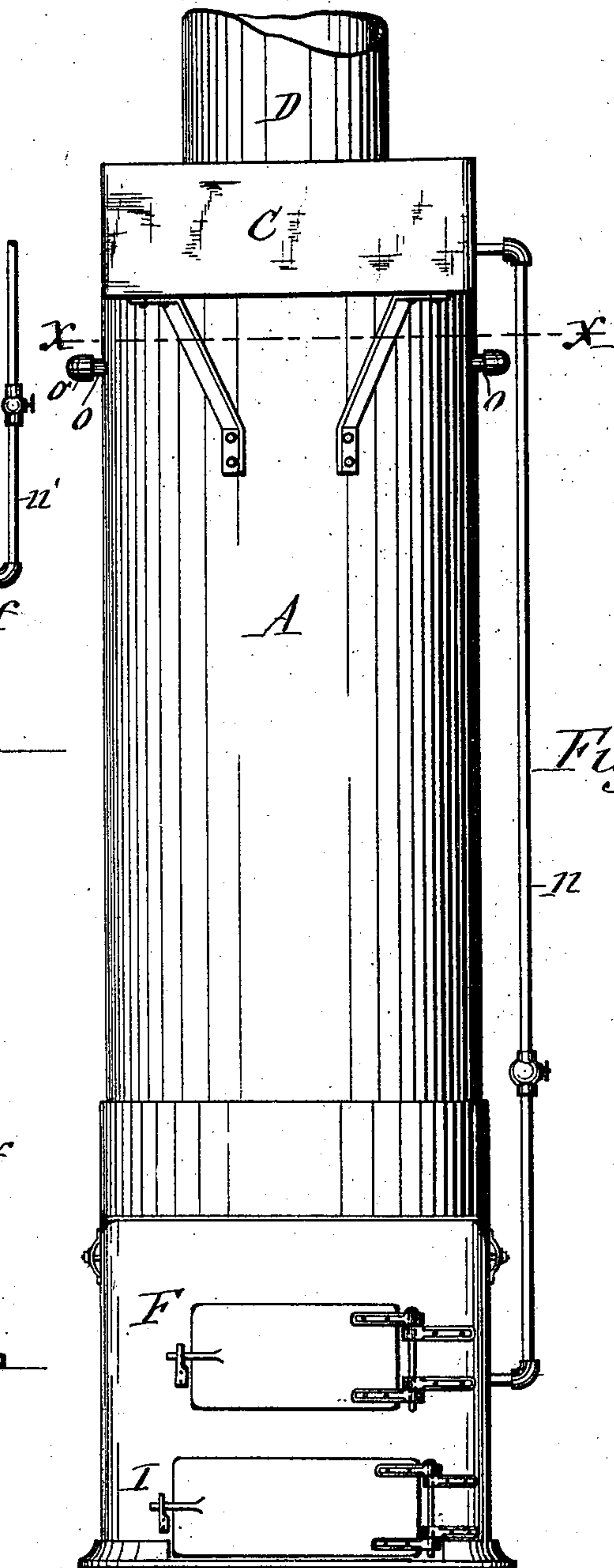


Fig. 1

WITNESSES:

C. L. Burdison
M. A. Leyden

INVENTOR

Robert Joy
By E. Laass
his ATTORNEY

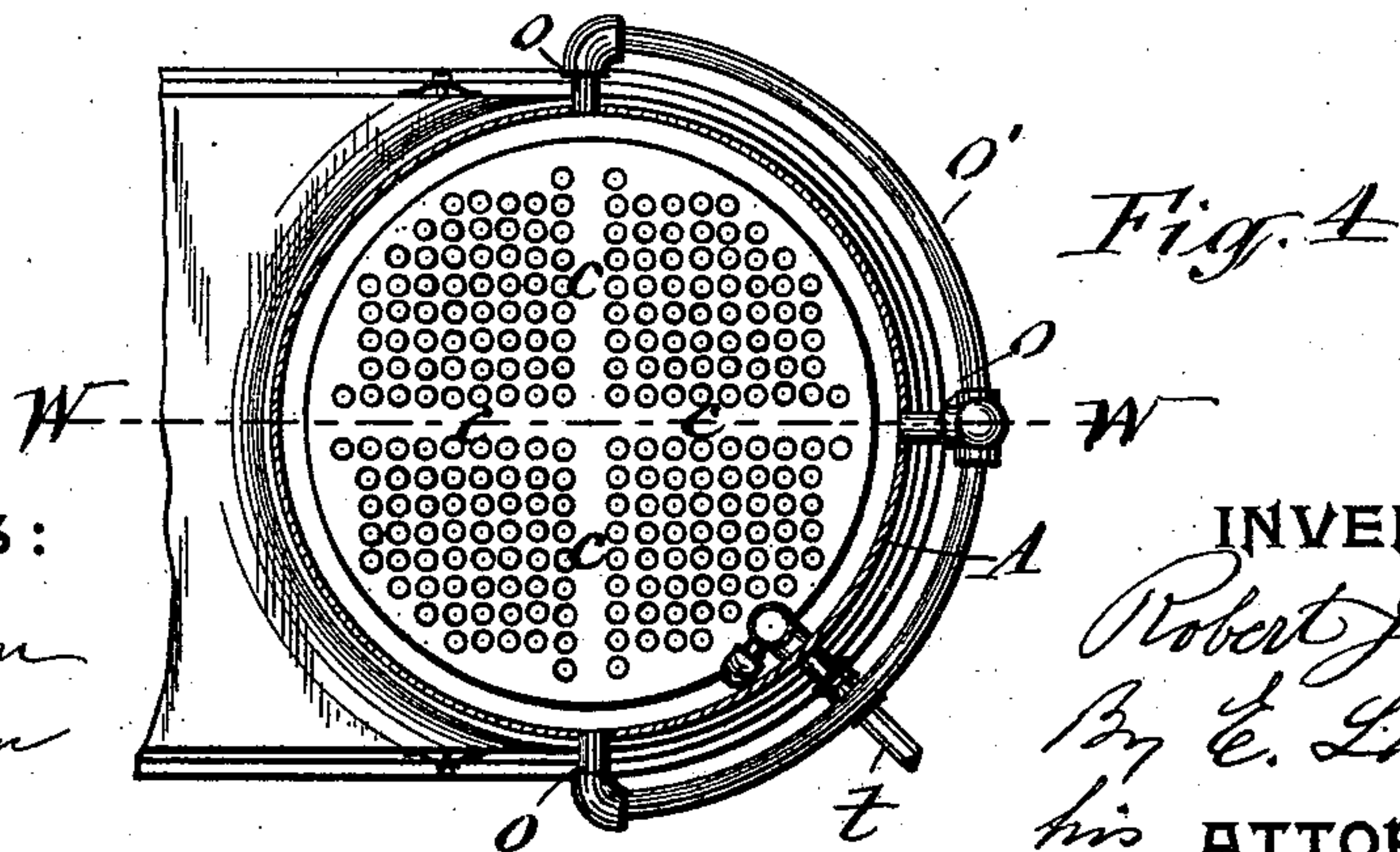
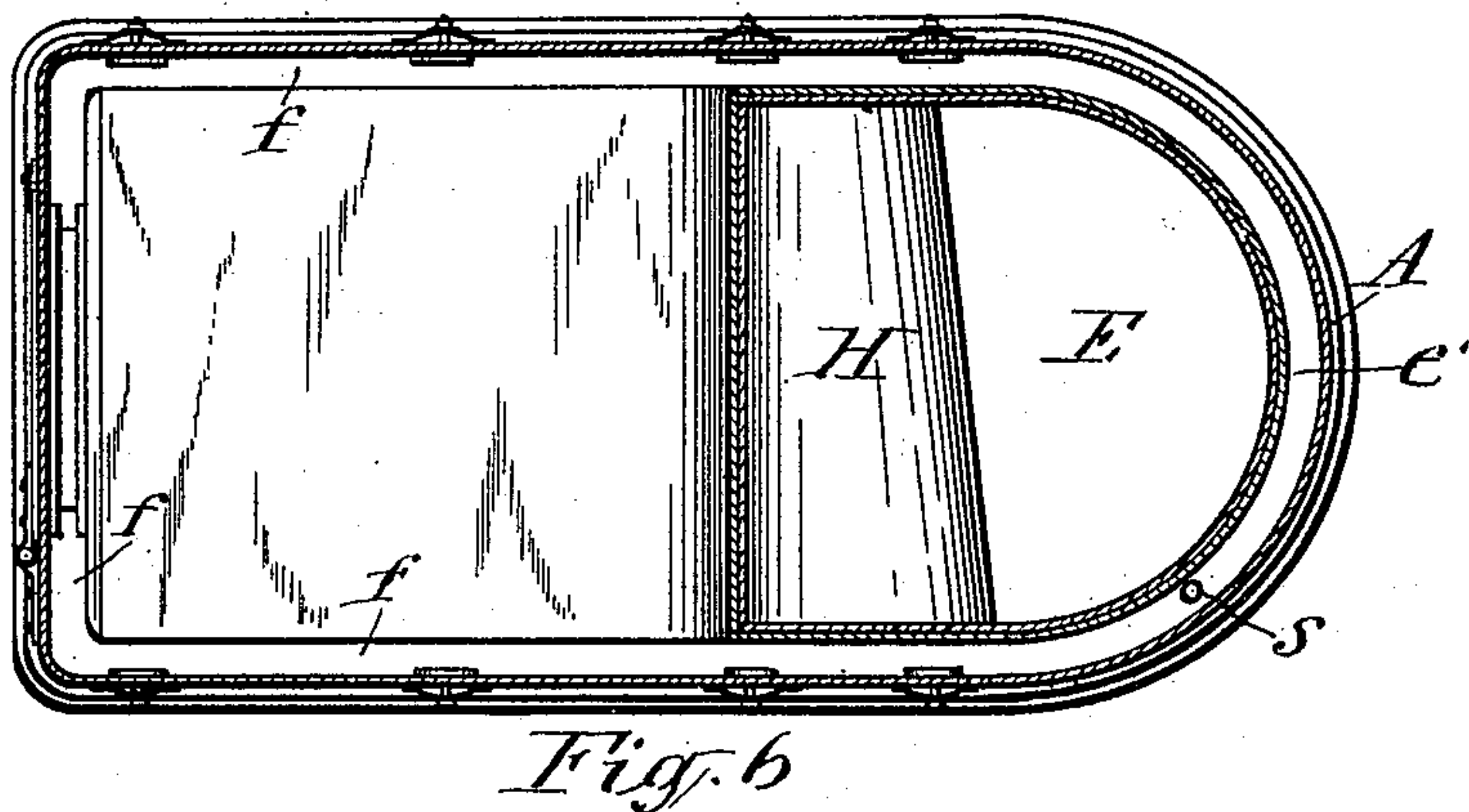
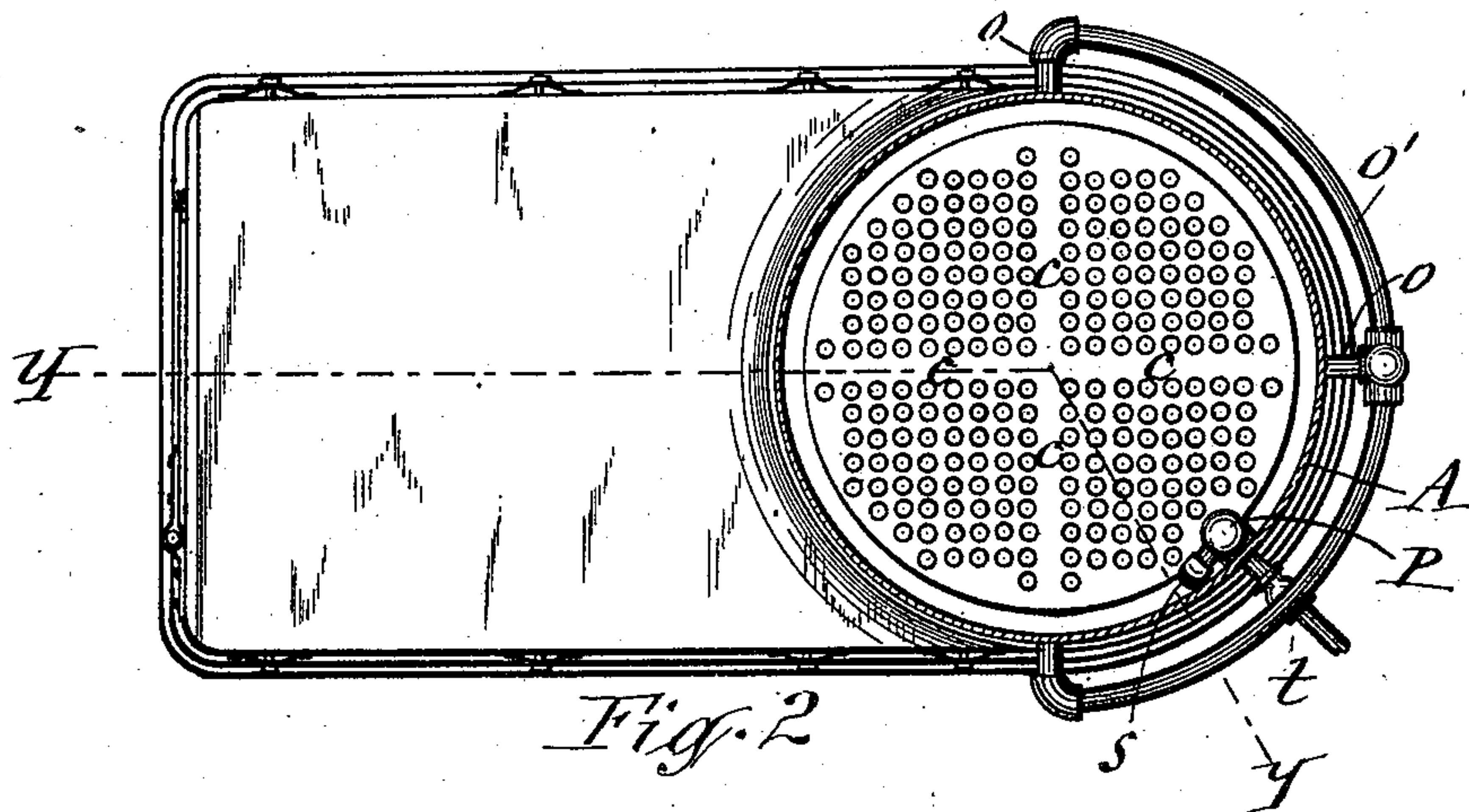
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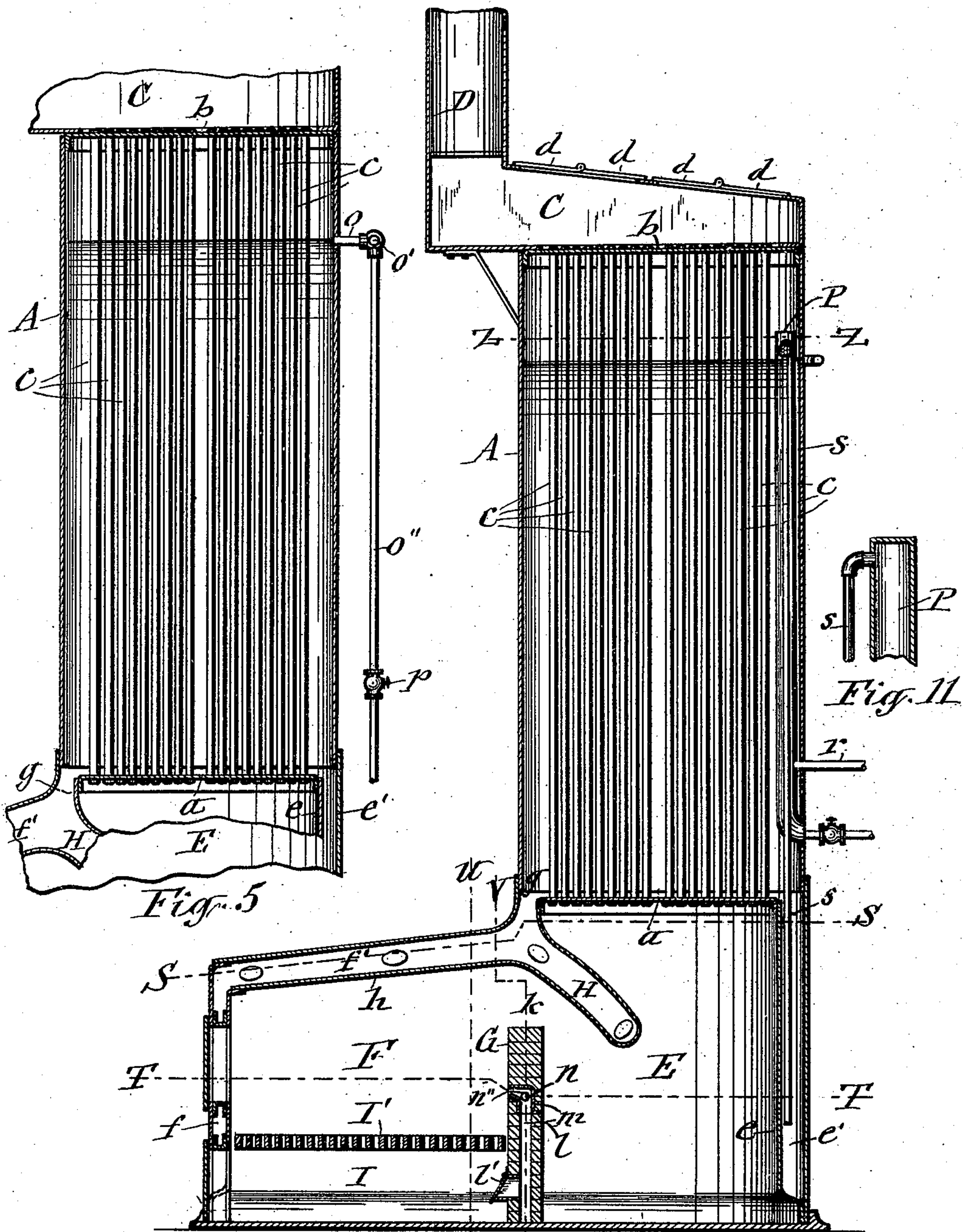
(No Model.)

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WITNESSES:

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4 Sheets—Sheet 4.

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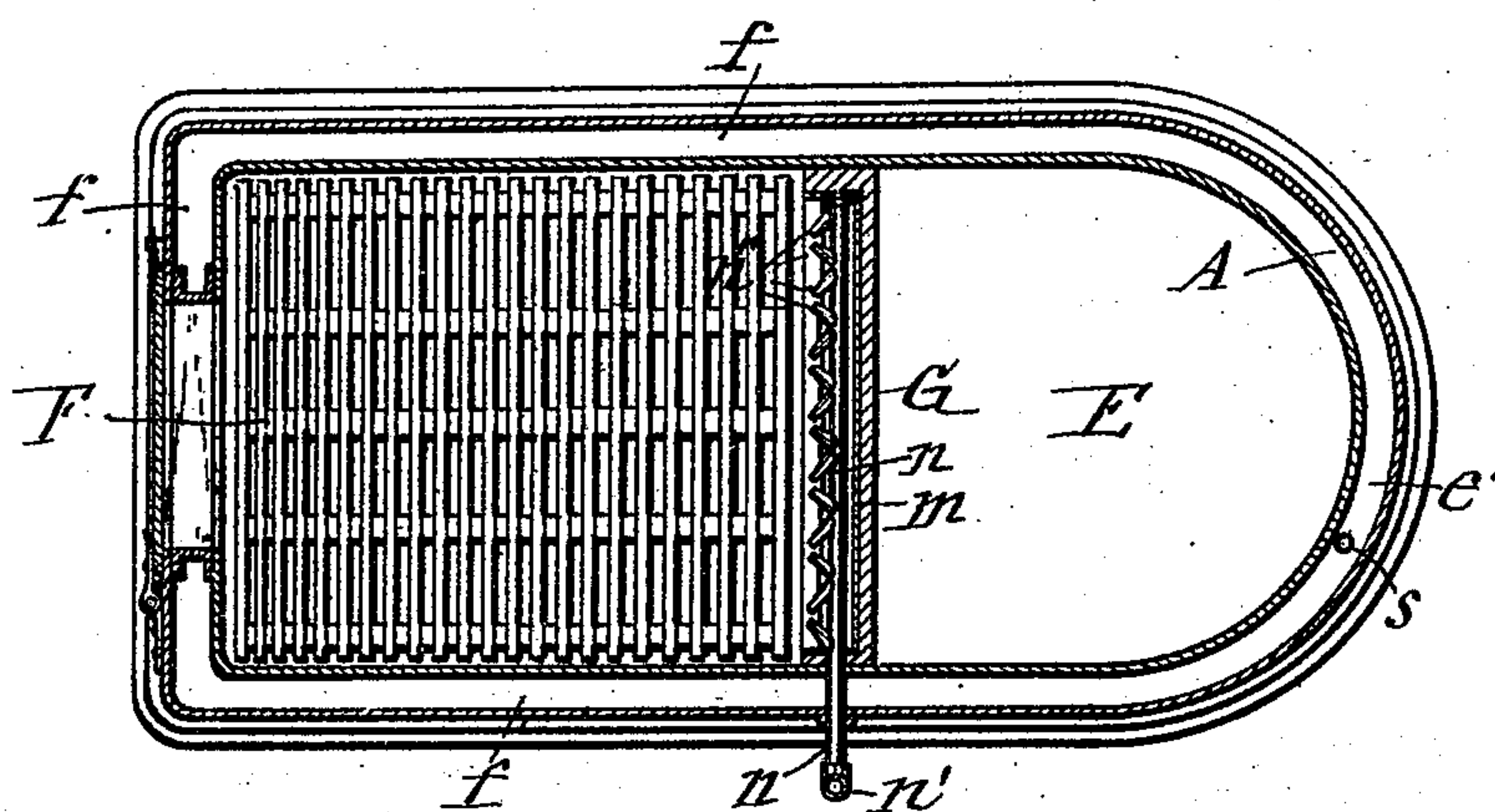


Fig. 9

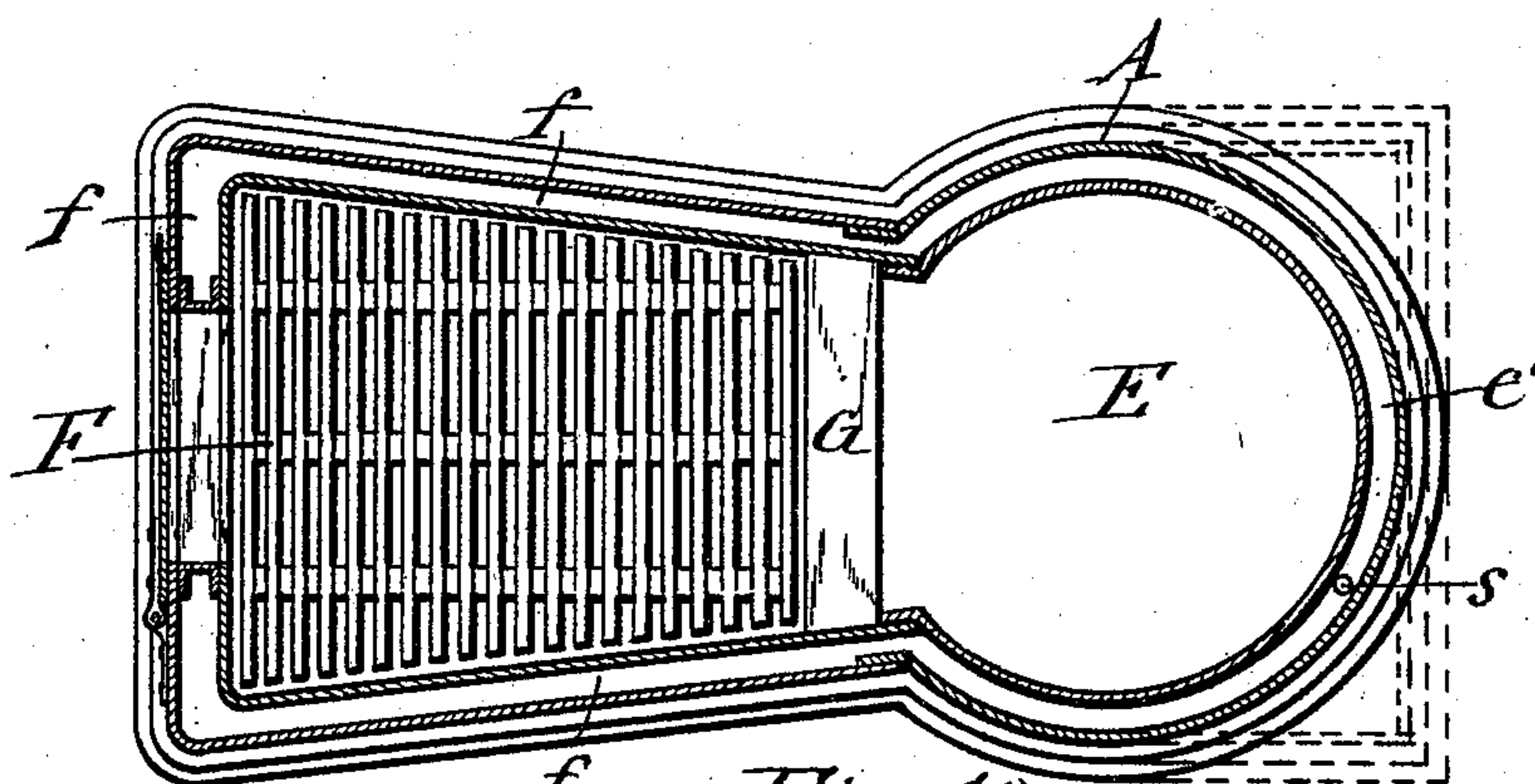


Fig. 10

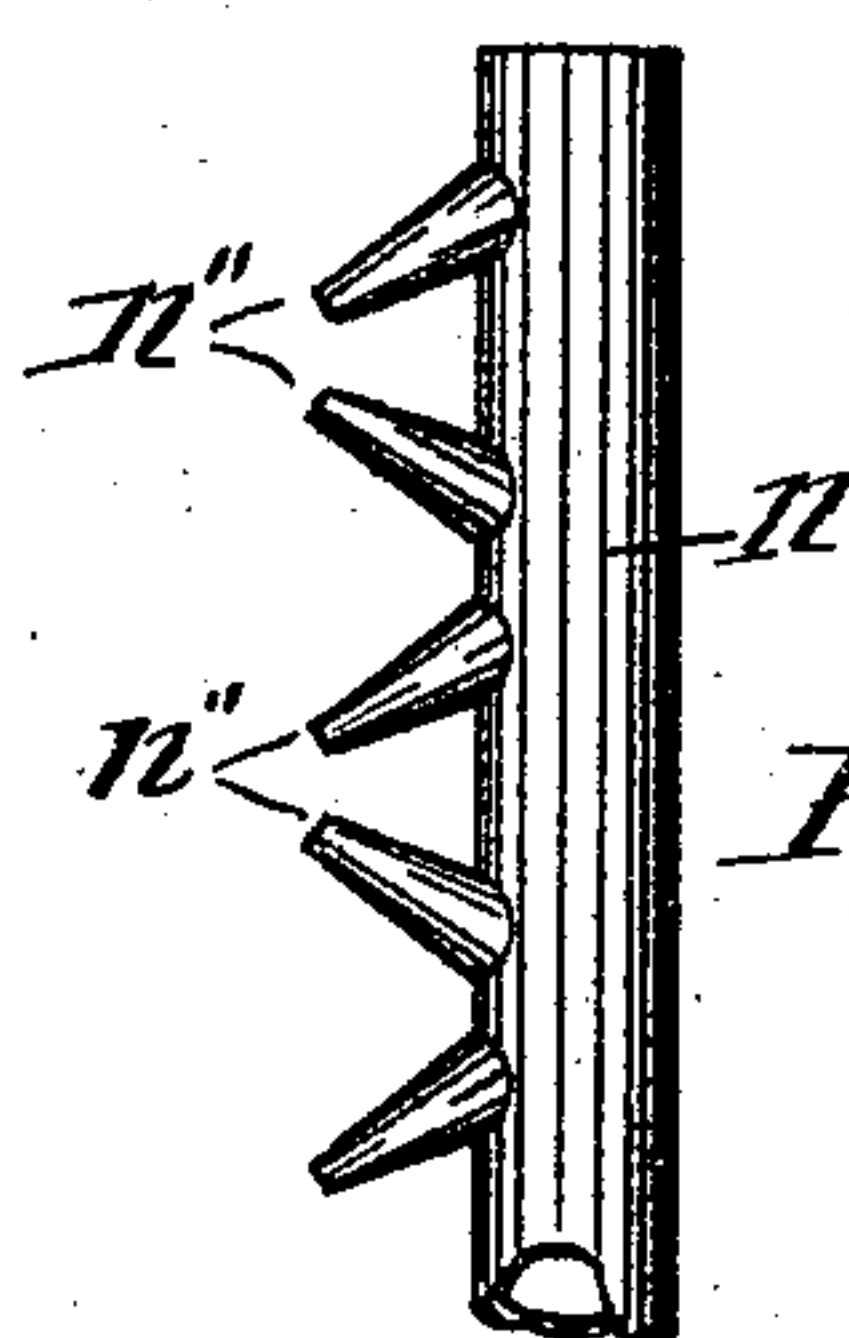


Fig. 12

WITNESSES:

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UNITED STATES PATENT OFFICE.

ROBERT JOY, OF OSWEGO, NEW YORK, ASSIGNOR TO THOMSON KINGSFORD,
OF SAME PLACE.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 574,738, dated January 5, 1897.

Application filed March 13, 1896. Serial No. 582,997. (No model.)

To all whom it may concern:

Be it known that I, ROBERT JOY, of Oswego, in the county of Oswego, in the State of New York, have invented new and useful Improvements in Steam-Boilers, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to the class of steam-boilers which are placed in an upright position and have direct-draft flues extending through them; and the invention consists in an improved construction and combination of the constituent parts of the boiler and auxiliary devices connected therewith, all arranged in a most compact manner and organized to contribute to materially enhance the efficiency of the boiler and insure its safety and durability.

The invention is fully illustrated in the annexed drawings, in which—

Figure 1 is a front elevation of a steam-boiler embodying my invention. Fig. 2 is a horizontal transverse section on line X X in Fig. 1. Fig. 3 is a vertical transverse section on line Y Y in Fig. 2. Fig. 4 is a horizontal sectional view of the connection of the surface blow-off pipes to the boiler, taken in the plane indicated at Z Z in Fig. 3. Fig. 5 is a vertical sectional view of the boiler, taken through W W in Fig. 4. Fig. 6 is a horizontal transverse section on line S S in Fig. 3. Fig. 7 is a vertical transverse section on line V V in Fig. 3. Fig. 8 is a vertical transverse section on line U U in Fig. 3 with a portion of the bridge-wall broken away to show the deflector at the rear thereof. Fig. 9 is a horizontal transverse section on line T T in Fig. 3. Fig. 10 is a horizontal transverse section on said line T T, showing a modification of the shape of the fire-box and a plain bridge-wall. Fig. 11 is an enlarged transverse section of the upper end portion of the sediment-trap pipe, showing the attachment of the overflow-pipe; and Fig. 12 is an enlarged plan view of the air-induction pipe of the fire-box.

Similar letters of reference indicate corresponding parts.

A represents the boiler proper, the shell of which is preferably of cylindrical shape, placed upright and extended below the lower

flue-sheet *a*, as shown in Fig. 3 of the drawings, for the purpose hereinafter explained. Through said boiler extend the series of vertical direct-draft flues *c c*, secured in the usual manner to the aforesaid lower flue-sheet *a* and upper flue-sheet *b*, riveted to the upper extremity of the boiler-shell, upon which is mounted the smoke-box C, which is elongated so as to project laterally from the boiler and has the smoke-stack D connected to the extension. The top of this smoke-box I provide with trap-doors *d d* to obtain ready access to the interior of the smoke-box and to the flues *c c* for cleaning and repairing the same. Directly under said boiler is the combustion-chamber E, formed by the flue-sheet *a*, constituting the crown of said combustion-chamber, and by the vertical wall *e*, which is riveted at its bottom edge to the aforesaid downward extension of the boiler-shell and is sustained a sufficient distance from said shell extension to form a water-space *e'*, which communicates directly with the interior of the boiler and surrounds the combustion-chamber.

F denotes the fire-box, which extends laterally from the combustion-chamber and is formed with water-legs *f f* along its sides and across its front and with a water-crown *f'* extending the entire length of the fire-box and communicating with the water-space of the boiler A, as shown at *g* in Fig. 3 of the drawings, while the water-legs connect directly with the water-space *e*, surrounding the combustion-chamber. G represents a bridge-wall which is interposed between the fire-box and combustion-chamber, and over this bridge-wall is a fire-deflector H, which extends from the crown of the fire-box downward part-way into the combustion-chamber. The deflector thus arranged forms a tortuous passage for the products of combustion from over the bridge-wall downward and thence upward to the vertical flues *c c*. The base of the boiler is thereby thoroughly heated. This deflector is formed of a hollow metallic chamber joined to the crown-sheet *h* of the fire-box and to the flue-sheet *a* and water-space *e'*, so as to be charged with water direct from the water-crown *f'* and from the boiler A, and permit the water to pass through said deflec-

tor to the water-space surrounding the combustion-chamber. In order to prevent the sediments from collecting in said deflector, I form the lower or closed end thereof inclined to the water-space e' at the side of the combustion-chamber, as shown at i in Fig. 8 of the drawings. Said deflector forms a partly-contracted throat k over the bridge-wall, and causes the products of combustion to be more thoroughly distributed throughout the combustion-chamber E and through the flues $c c$, which distribution of the products of combustion is aided by the location of the smoke-stack D over the side of the boiler opposite to that toward which the products of combustion are first conducted by the deflector H .

To further insure the aforesaid diffusion of the products of combustion, I form the top of the bridge-wall inclined, corresponding to the inclination of the extremity of the deflector H .

In order to insure proper combustion of the gases generated in the fire-box, I form the bridge-wall G with an internal air-passage l , which extends lengthwise of said wall and part way the height thereof and has secured in its top portion a twyer-iron m , extending the length of the air-passage and provided with a longitudinal slot, by which it communicates with the fire-box. Said air-passage is provided with a suitable damper l' for controlling the inlet of the air, which damper may be located either in the ash-pit I , as shown, or placed in any other suitable or convenient location.

In the twyer-iron is placed longitudinally a steam-pipe n , receiving steam from the boiler A by a suitable pipe n' , and has projecting from it and into the slot of the twyer-iron a series of jets or nozzles n'' , which are arranged in pairs convergent toward the fire-box, so as to thoroughly commingle with the air drawn from the twyer-iron by the suction produced by the force of the steam ejected from the nozzles n'' . The inflowing air is thus heated, and, in conjunction with the steam forced through the gases rising from the fire on the grate I' , causes said gases to ignite. The products of combustion passing through the throat k over the bridge-wall and effectually impinging the water-charged deflector H materially enhances the efficiency of the boiler.

The flues $c c$ I place in groups with definite radial water-passages c' between the groups, as shown in Fig. 4 of the drawings, and at or near the water-line of the boiler and at points in line with the water-passages $c' c'$ I tap the boiler with blow-off pipes $o o o$, which are united at the exterior of the boiler by a pipe o' , provided with a blow-off cock p .

To further guard against accumulation of sediment in the boiler, I employ the trap-pipe P , which I preferably place inside of the boiler, so as to be heated thereby. This pipe is closed to the water-space of the boiler and has the feed-water pipe r connected to its lower portion. To the upper portion of the said trap-pipe is connected pipe s , which is

extended down, preferably, into the water-space e' , surrounding the combustion-chamber, and thus admits the feed-water to the boiler at the coolest part thereof.

The base of the trap-pipe T has connected to it a blow-off cock t to permit the sediment to be expelled from said pipe.

I do not limit myself to any specific shape of the fire-box, which may be either rectangular, as shown in Figs. 2, 6, and 9 of the drawings, or with converging sides, as represented in Fig. 10 of the drawings.

What I claim as my invention is—

1. The combination of an upright boiler-shell, a smoke-box on top of said shell, a combustion-chamber under said shell, direct-draft flues extending vertically through the boiler-shell, the fire-box extending laterally from the combustion-chamber, a bridge-wall interposed between the fire-box and combustion-chamber, and a deflector extending from the crown of the fire-box over the bridge-wall and with an inclination part way into the combustion-chamber, substantially as set forth and shown.

2. The combination of an upright boiler-shell, a combustion-chamber directly under said shell, a smoke-box on top of the boiler-shell, direct-draft flues extending from the combustion-chamber to the smoke-box, a water-leg surrounding the combustion-chamber and communicating with the interior of the boiler-shell, the fire-box extending laterally from the combustion-chamber and formed with a water-crown and with water-legs on its sides and front communicating with the water-leg of the combustion-chamber, a bridge-wall interposed between the fire-box and combustion-chamber and a hollow water-charged deflector extending from the water-crown rearward and downward into the combustion-chamber and connected to the water-legs of the latter, substantially as described and shown.

3. In combination with the upright direct-flue boiler proper and a smoke-box and combustion-chamber respectively on top and directly under the said boiler, of a fire-box extending laterally from said combustion-chamber and formed with a water-crown, a hollow deflector extending from said crown into the combustion-chamber and charged with water and having its extremity inclined toward the side of the combustion-chamber, as set forth.

4. In combination with the upright direct-flue boiler proper and a smoke-box and combustion-chamber respectively on top and directly under said boiler, a fire-box extending laterally from said combustion-chamber and formed with a water-crown, a hollow water-charged deflector extending from said crown into the combustion-chamber and having its extremity inclined toward the side of the combustion-chamber, and a bridge-wall interposed between the fire-box and combustion-chamber and having its top inclined cor-

responding to the inclination of the extremity of the aforesaid deflector as and for the purpose set forth.

5. In combination with the upright direct-flue boiler proper and a smoke-box and combustion-chamber respectively on top and directly under said boiler, the fire-box extending laterally from said combustion-chamber and formed with a water-crown, and a hollow deflector extending from said crown at its junction with the boiler proper into the combustion-chamber and having its interior communicating directly with the water-crown and water-space of the boiler, substantially as shown.

6. In combination with the upright direct-flue boiler proper and a smoke-box and combustion-chamber respectively on top and directly under said boiler, the fire-box extending laterally from said combustion-chamber and formed with water-legs at its sides and with a water-crown, a hollow deflector extending from said crown into the combustion-chamber and having its interior communicating with the water-spaces of the boiler and crown and the extremity of said deflector inclined toward the side of the combustion-chamber and a bridge-wall interposed between the fire-box and combustion-chamber and having its top inclined to correspond to the inclination of the extremity of the deflector as set forth.

7. In combination with the upright direct-flue boiler proper and a smoke-box and combustion-chamber respectively on top and directly under said boiler, a water-leg surrounding said combustion-chamber, the fire-box extending laterally from said combustion-chamber and formed with water-legs at its sides and with a water-crown communicating with said water-legs, a hollow deflector extending from said crown into the combustion-chamber and having its interior communicating directly with the water-spaces of the boiler, crown and water-leg of the combustion-chamber and inclined to said water-leg as set forth.

8. The combination of an upright boiler having fire-flues extending vertically through it and arranged in groups with definite radial waterways between the groups, surface blow-off pipes tapping the boiler at points in line with said waterways, a pipe uniting said blow-off pipes at the exterior of the boiler, and a main blow-off pipe connected to said uniting-pipe as set forth.

In testimony whereof I have hereunto signed my name this 3d day of February, 1896.

ROBERT JOY. [L. S.]

Witnesses:

J. J. LAASS,
M. A. LEYDEN.