

(No Model.)

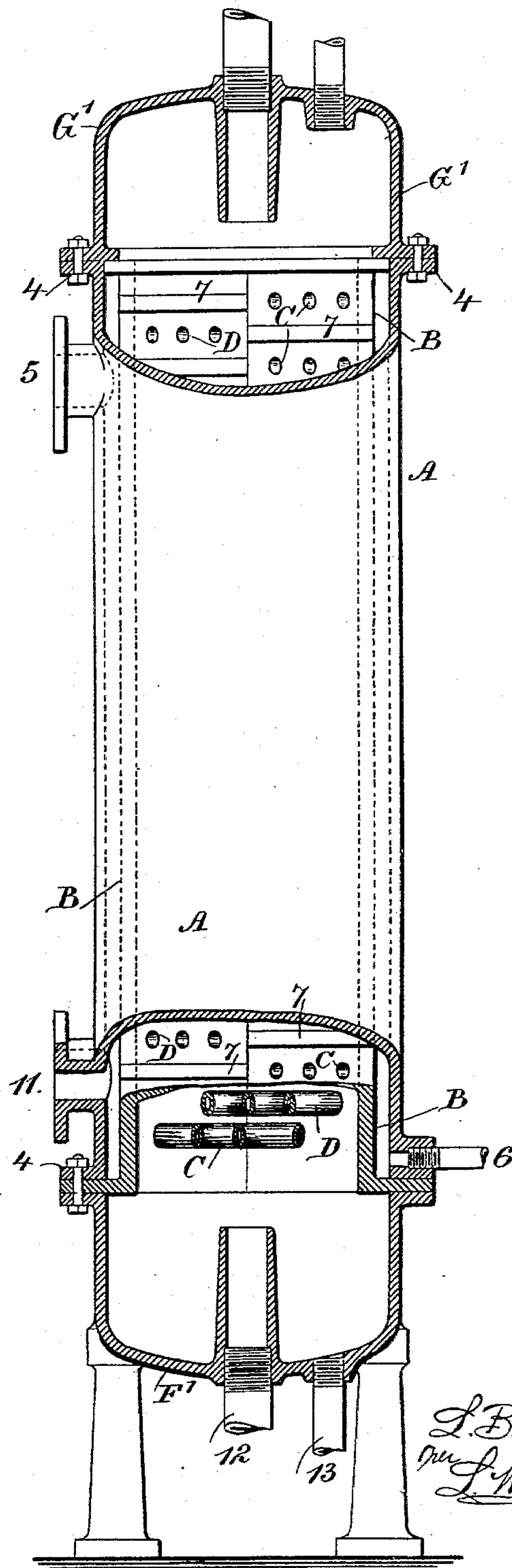
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L. B. CARRICABURU.
FEED WATER HEATER OR CONDENSER.

No. 559,674.

Patented May 5, 1896.

Fig. 1.



Witnesses
Chas. H. Smith
J. Staib

Inventor
L. B. Carricaburu
By *J. W. Serrell & Son*
attys

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Fig. 3.

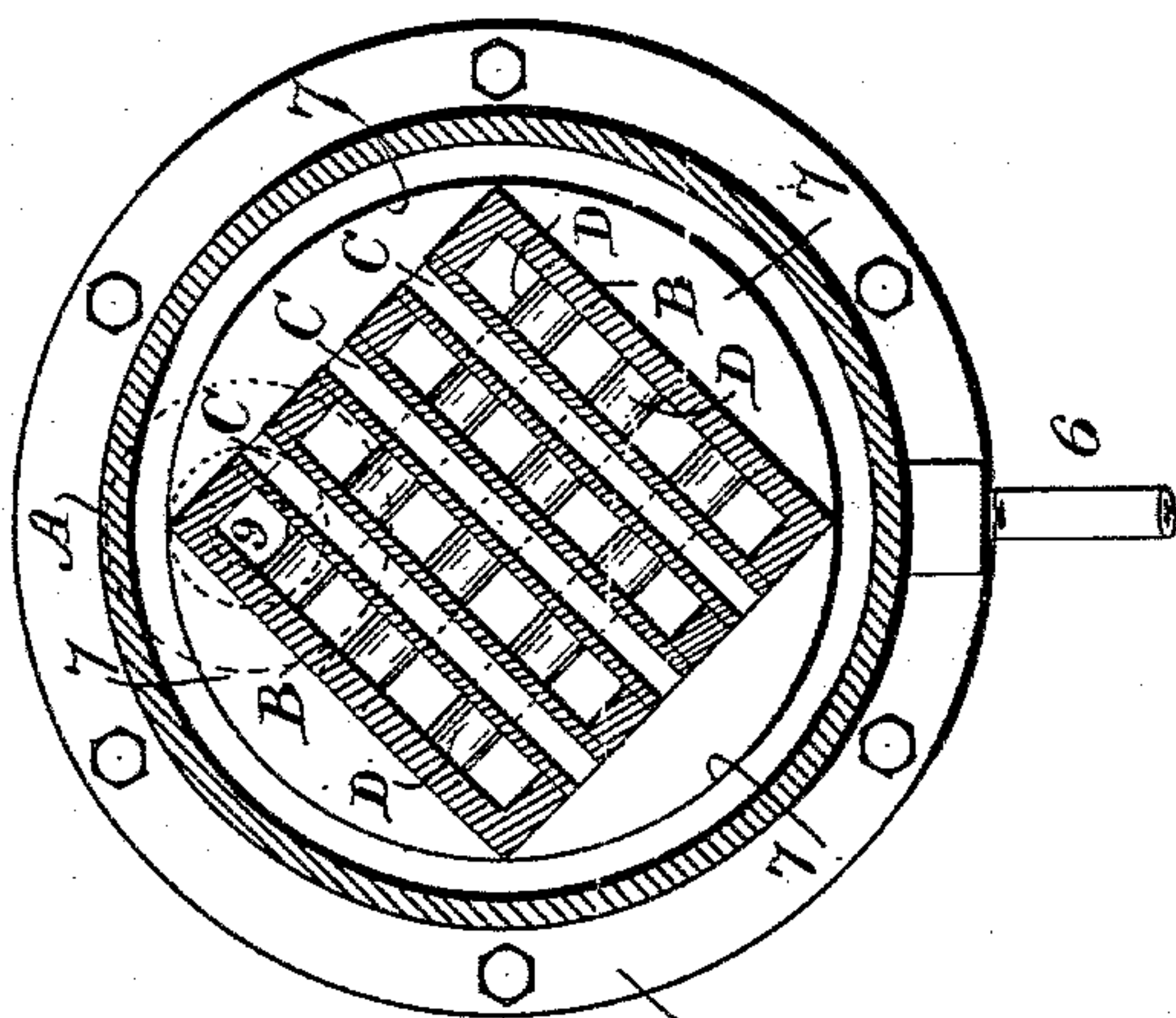
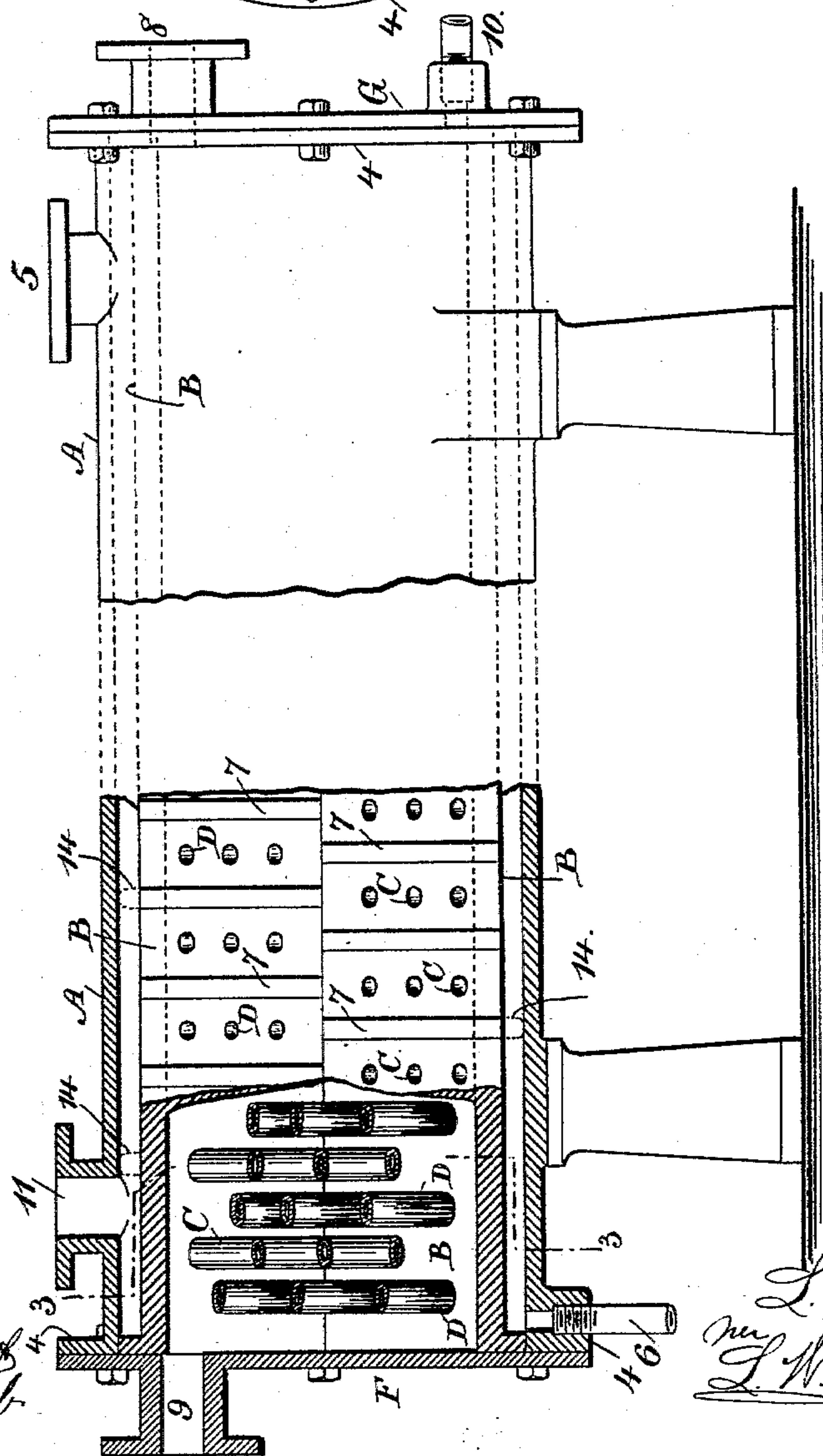


Fig. 2.



Witnesses

Chas. H. Smith
J. Stait

Inventor

L. B. Carricaburu
By L. W. Lurrell & Son
Attys.

UNITED STATES PATENT OFFICE.

LEON B. CARRICABURU, OF NEW YORK, N. Y.

FEED-WATER HEATER OR CONDENSER.

SPECIFICATION forming part of Letters Patent No. 559,674, dated May 5, 1896.

Application filed February 17, 1896. Serial No. 579,504. (No model.)

To all whom it may concern:

Be it known that I, LEON B. CARRICABURU, a citizen of the United States, residing at New York city, in the county and State of New York, have invented an Improvement in Feed-Water Heaters or Condensers, of which the following is a specification.

This invention relates to the combination of an outer and inner case and crossing pipes, as hereinafter described, and it is adapted to use as a feed-water heater or as a condenser.

In my improvements the short tubes are at alternate opposite inclinations, so that the fluid will pass in at one end and rapidly circulate through and discharge at the other end. In some instances the water is within the tubes and the steam around them, or the steam is caused to pass through the tubes and the water surrounds the same.

I will now proceed to describe the general features of the apparatus, and then the manner in which it may be employed either as a condenser or a feed-water heater.

In the drawings, Figure 1 is a partial section of the apparatus when placed vertically and adapted to use as a feed-water heater. Fig. 2 is a similar view of the apparatus when placed horizontally and adapted to use as a condenser, and Fig. 3 is a cross-section at the line 3 3.

The external case A is advantageously cylindrical and provided with end flanges 4, and there are openings into this cylinder at 5 and 6, and these are usually and advantageously at opposite sides, and within the external case A is an internal polygonal case B, which is preferably square, and across through the internal case B are the ranges of tubes C and D opening through such case, and one range of tubes C is at the opposite inclination to the other range of tubes D, as illustrated in Fig. 3, so that the fluid passing along through the case B impinges upon the ranges of tubes, and the one range being in the opposite direction to the other range insures the most intimate contact of the fluid with the surfaces of such tubes, so that there will be either a heating or cooling action effected to the best advantage by such impingement.

It is advantageous to apply upon the surface of the case B ribs 7 for the purpose of strengthening the flat sides of the internal

case, and these ribs are advantageously arcs of circles on their exterior edges, so that such edges are parallel with the internal surface of the external case A, the required space being left for the proper circulation of the fluid.

When the devices before described are used in a condenser, the heads F and G are advantageously flat or nearly so, and water is admitted through the pipe 8 and the same escapes through the outlet 9. Hence the water will circulate through the square internal case B, and in its passage it will impinge upon the ranges of pipes C and D and take up from them heat, and there will be a very large area of condensing-surface in a small space, because the steam will be admitted through the opening 5 and the water of condensation will be taken away at the opening 6.

Should the connections be reversed, so that the steam passes through the internal case B and the condensing-water between the internal case B and the external case A, then the water of condensation should be taken away by the pipe 10 at the bottom angle of the internal case, and this same pipe may be used in such condensers as are supplied with condensing-water through the internal case for drawing off such condensing-water when the condenser is to be cleaned or repaired; and it is usually advantageous to provide a pipe at 11 extending to a relief-valve for preventing injury to the condenser by pressure in case the supply of condensing-water may become obstructed.

When this apparatus is used as a feed-water heater, it is sometimes advantageously placed in a vertical position, with the supply-pipe 12 at the bottom opening through the head F', which is formed as a cylindrical chamber, and sediment may be drawn off by the pipe 13, and the head G' at the upper end is advantageously made similar to the head F', and the feed-water passing in at the bottom of the heater becomes highly heated by the action of the steam that is admitted at the opening 11 and passes in between the case A and the case B and passes through the ranges of tubes C D, and the water of condensation passes off at the opening 6, and escape-steam passes off at the opening 5.

In some instances the ends of the case B are made with flanges to fit within the case

A, as seen in Fig. 2, or such flanges may be sufficiently large to come in between the flange of the cylindrical case A and the flange of the head F', as seen in Fig. 1, the bolts passing through and connecting the respective parts.

If desired, the apparatus can be used in a vertical position, as shown in Fig. 1, for condensing purposes, in which instance the water can be admitted between the case A and the case B and pass through the tubes C D and the steam be admitted into the upper head G' and pass down as it is condensed, the water of condensation passing away by the pipe 12, or the connections may be made in the reverse manner, so that water passes through the case B while the steam is around the same.

Where the flanges or ribs 7 are made wider at one side than at the other and alternate, as illustrated at 14 by dotted lines, the fluid which is between the case A and the case B can be made to travel first in one direction and then in the other, so that the direction of circulation can be regulated at will according to the position of the wider flanges, which touch, or nearly so, the interior surface of the external case A.

I claim as my invention—

1. The external cylindrical case A, having inlet and outlet openings, in combination with the polygonal internal case, and the ranges of tubes passing perpendicularly through the same with one range crossing the other range and circular end flanges to the polygonal case extending to and forming tight joints with the circular case, substantially as specified.

2. The external cylindrical case in combi-

nation with the internal polygonal case having ribs upon its surfaces, and ranges of tubes with their ends opening through the internal case and between the ribs and the tubes in one range crossing the tubes in the other range, and heads at the ends of the cases, there being inlet and outlet openings for the respective fluids, substantially as set forth.

3. The external cylindrical case A, having inlet and outlet openings, in combination with the polygonal internal case, and the ranges of tubes passing perpendicularly through the same with one range crossing the other range, and circular end flanges to the polygonal case extending to and forming tight joints with the circular case, and end heads to the outer cylindrical case and connections thereto for the fluid passing through the polygonal case, substantially as specified.

4. The combination in a condenser of an external cylindrical case with inlet and outlet openings, an internal square case and ranges of tubes opening through such internal case and standing at alternate opposite inclinations, end heads and inlet and outlet pipes and a draw-off pipe through one of the heads and in line or nearly so with the interior bottom angle of the inner case for drawing off the liquid from such inner case, substantially as set forth.

Signed by me this 14th day of February, 1896.

L. B. CARRICABURU.

Witnesses:

GEO. T. PINCKNEY,

S. T. HAVILAND.