

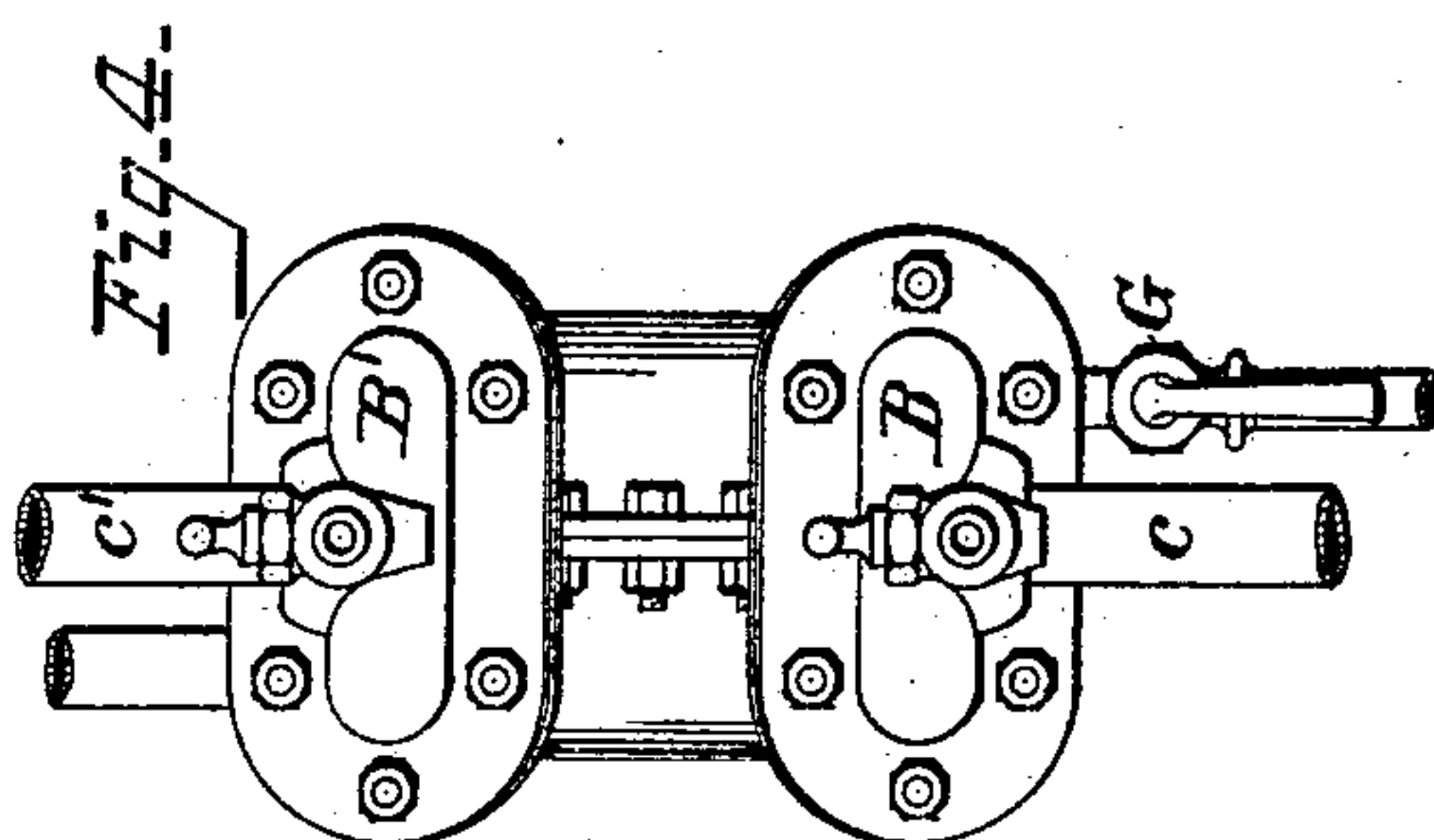
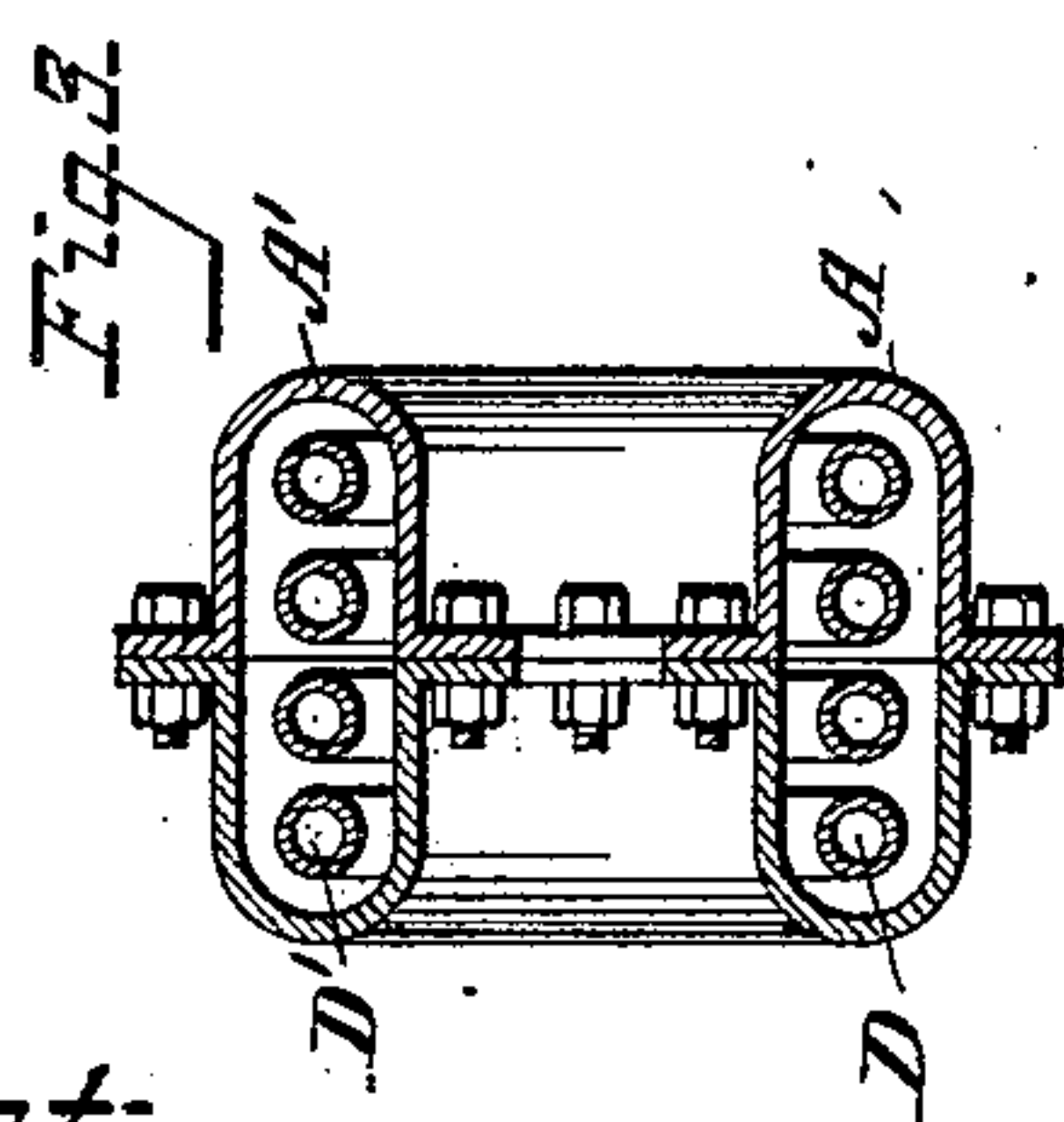
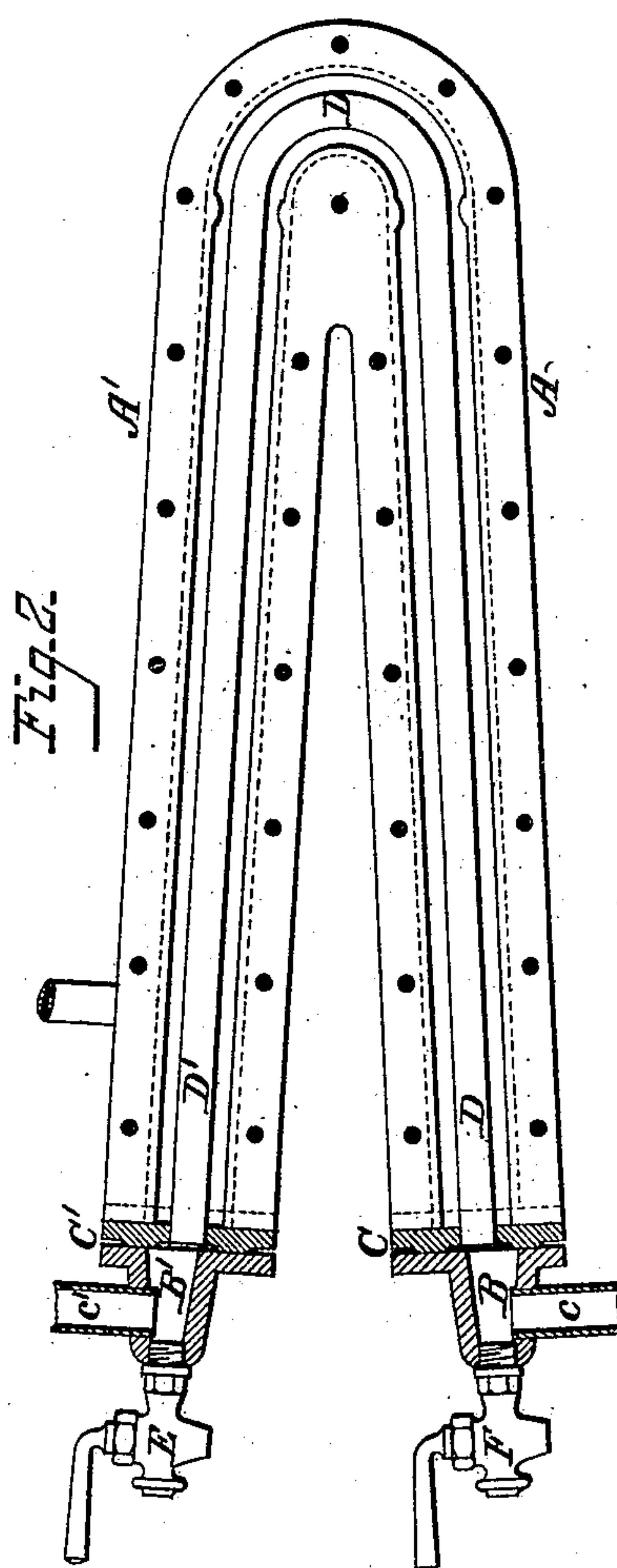
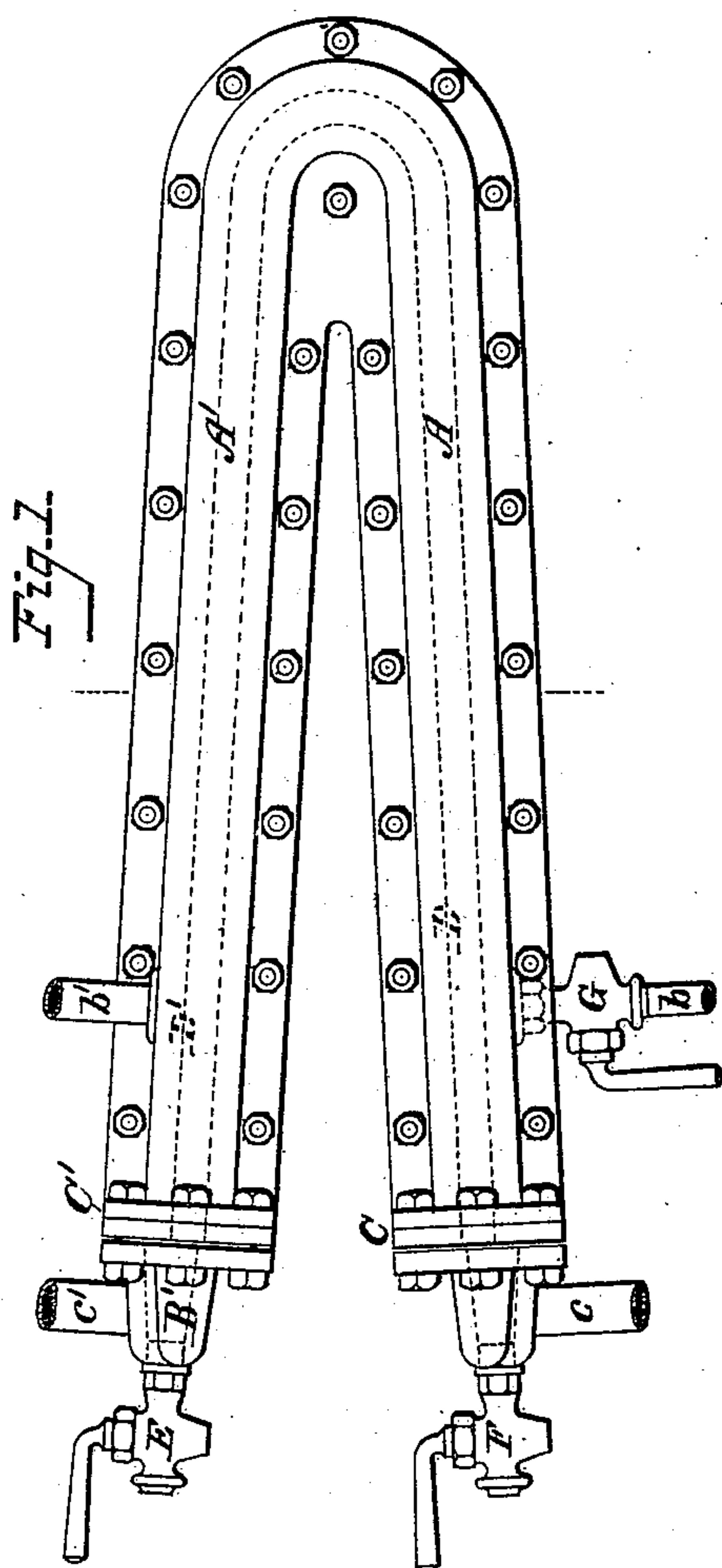
(No Model.)

3 Sheets—Sheet 1.

I. R. BLUMENBERG.  
Surface Condenser.

No. 238,754.

Patented March 15, 1881.



Attest:  
Courtney A. Cooper,  
A. Hansmann.

I. R. Blumenberg  
By his attorney  
Charles E. Fort

(No Model.)

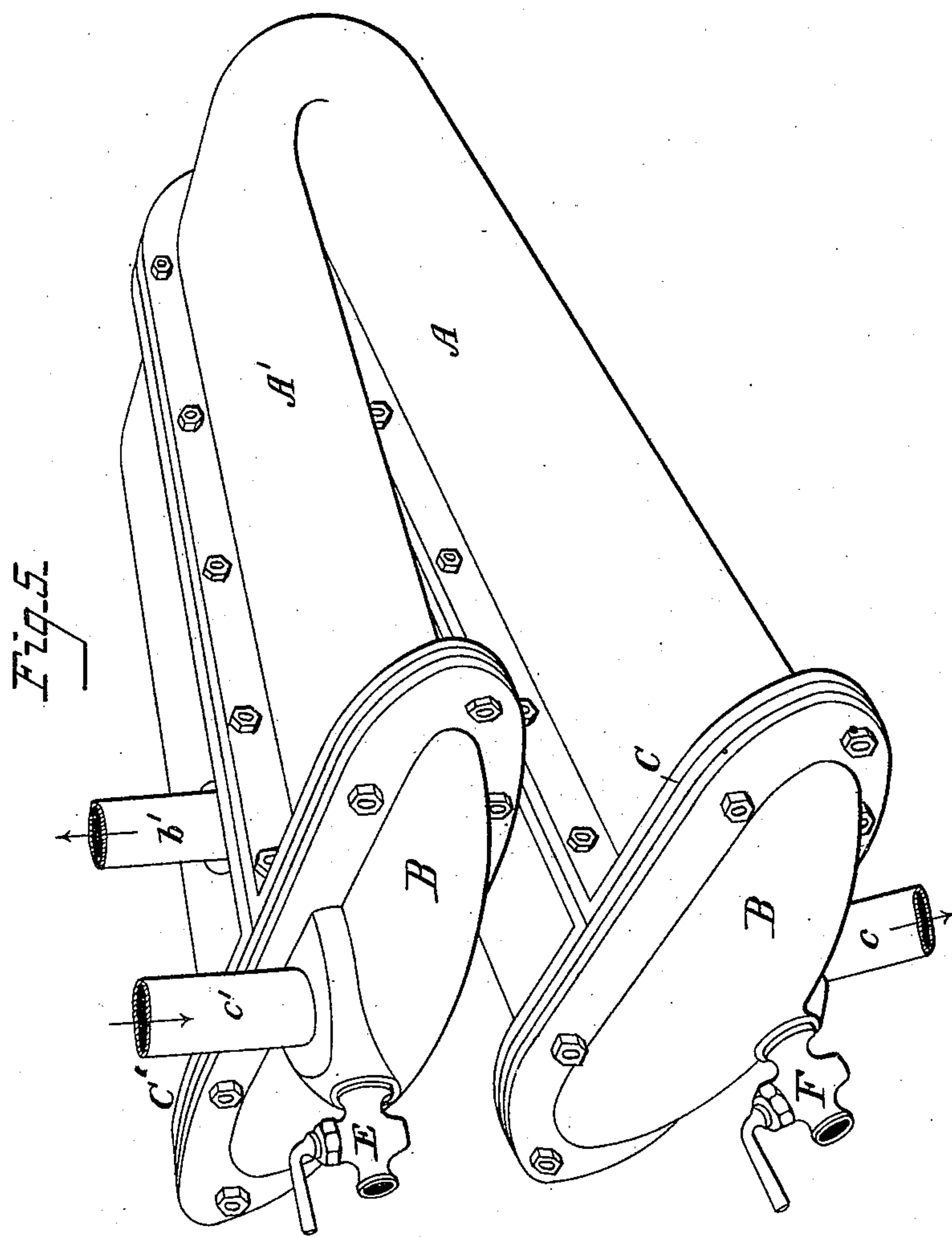
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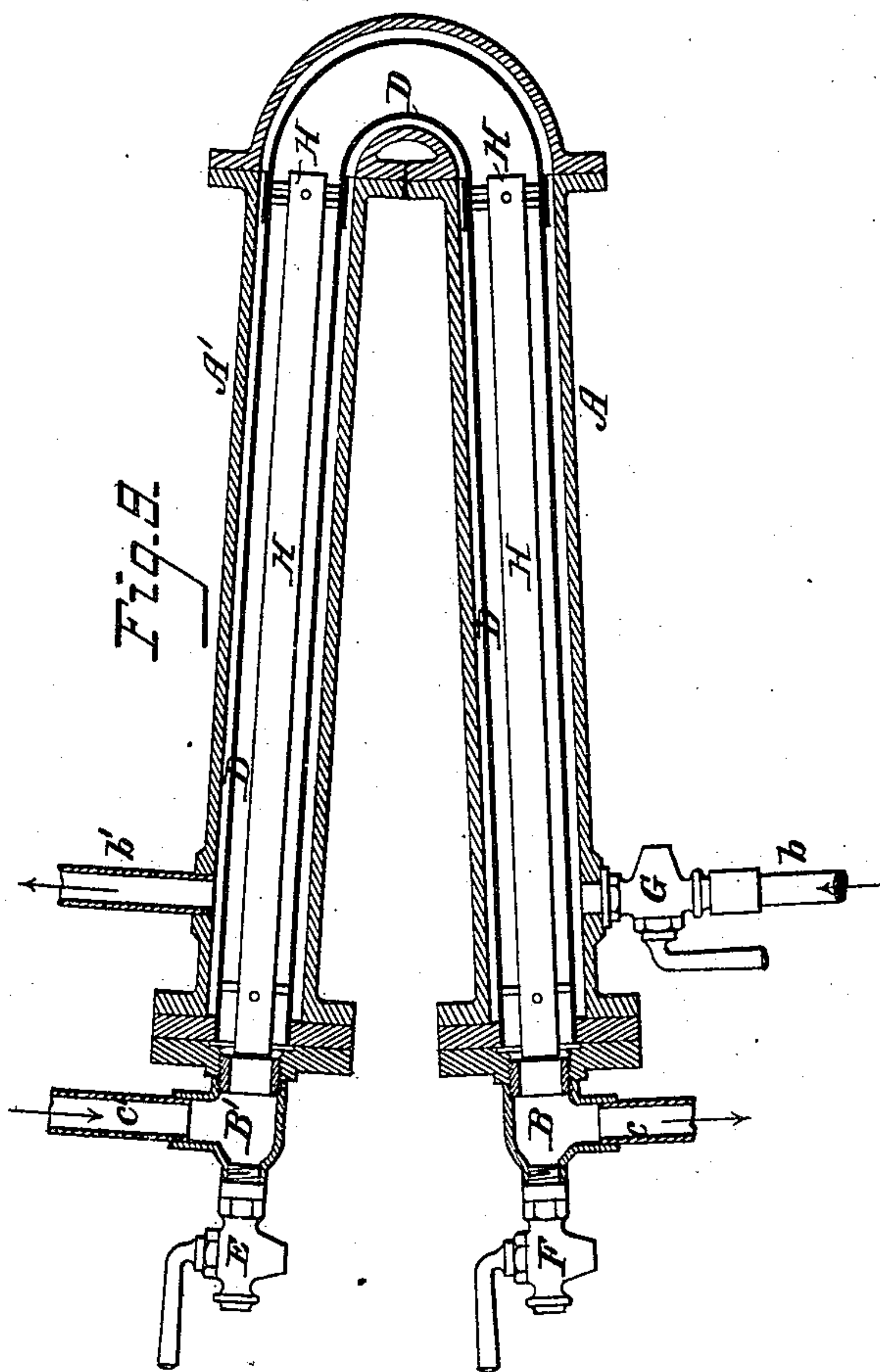
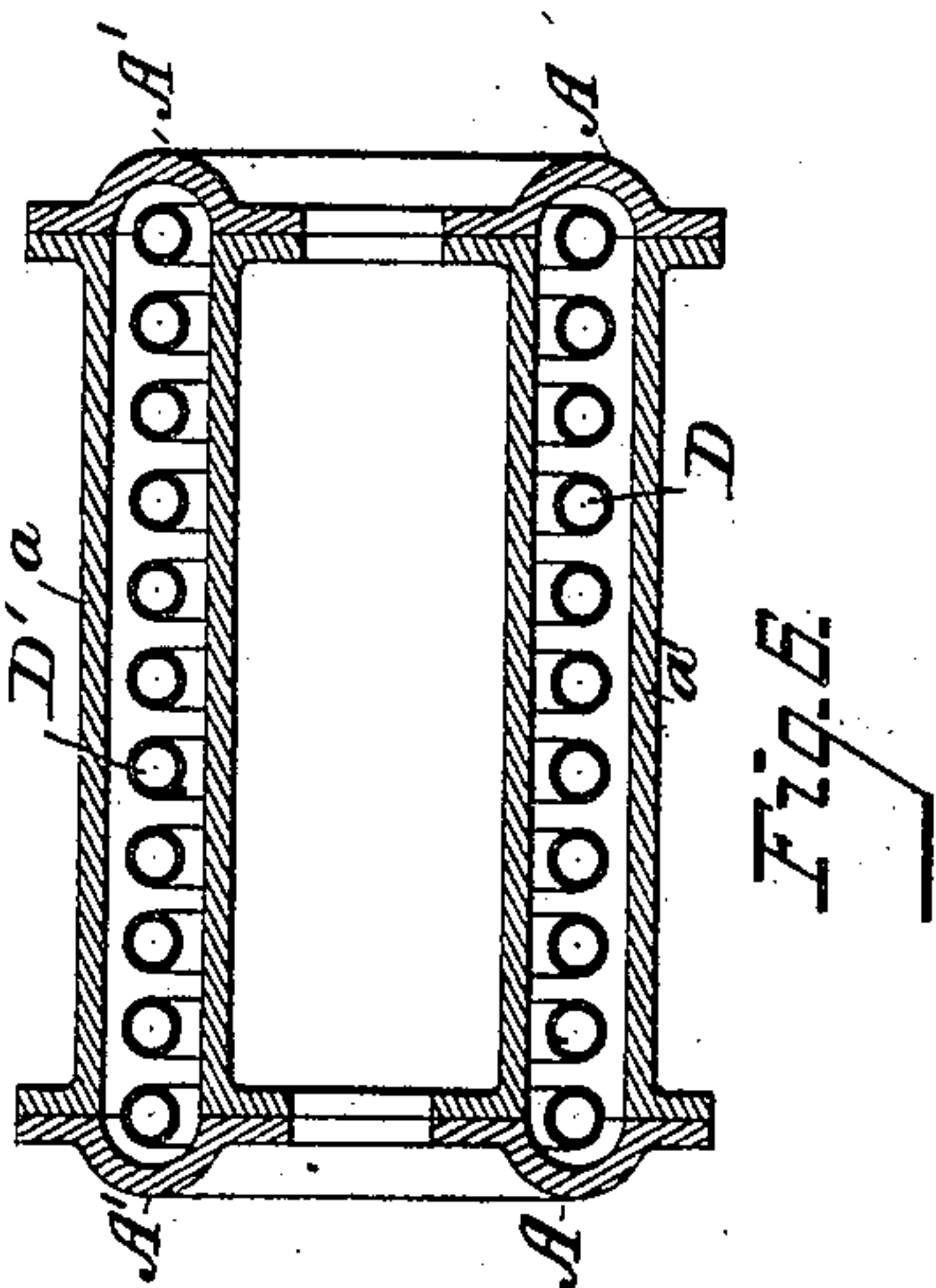
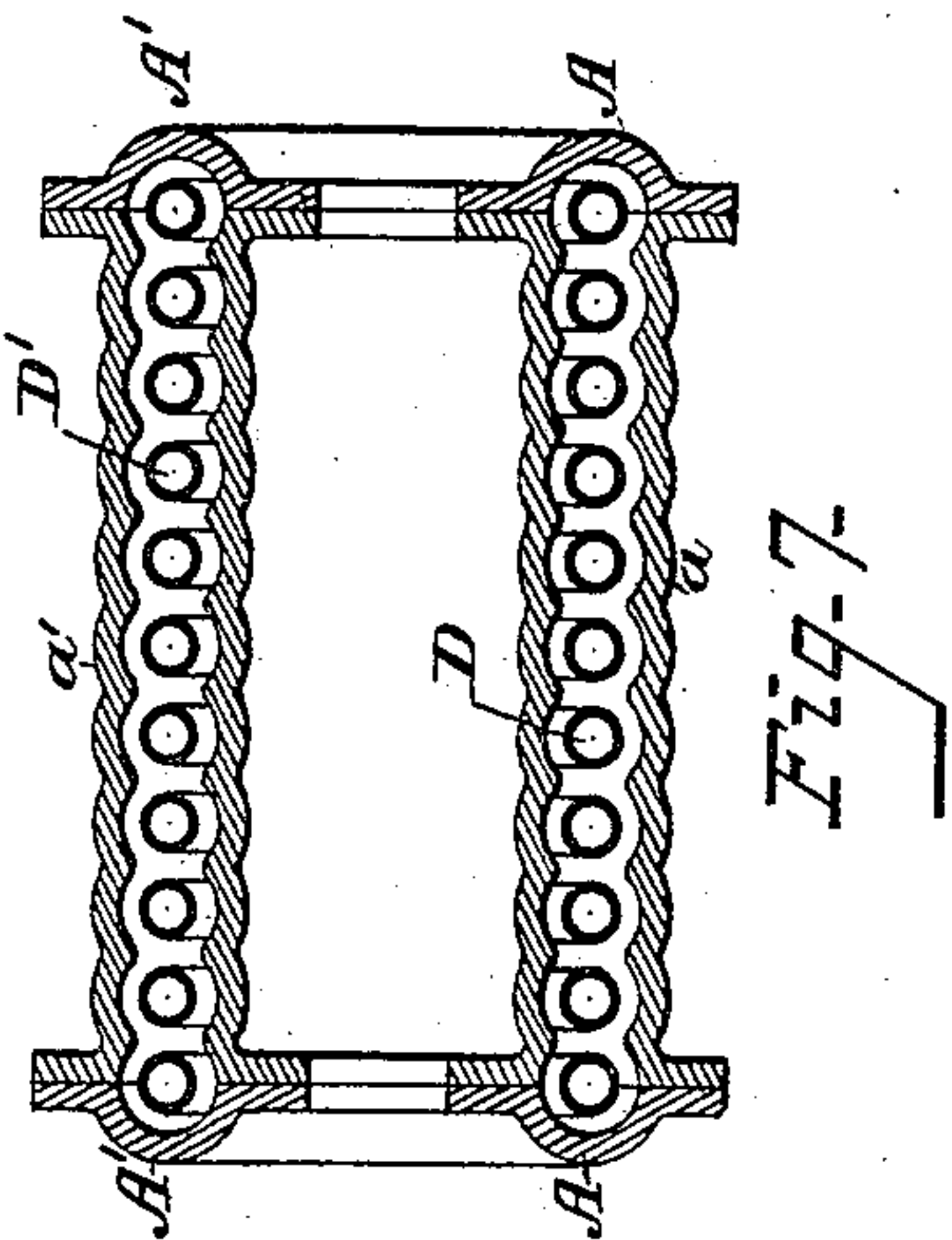
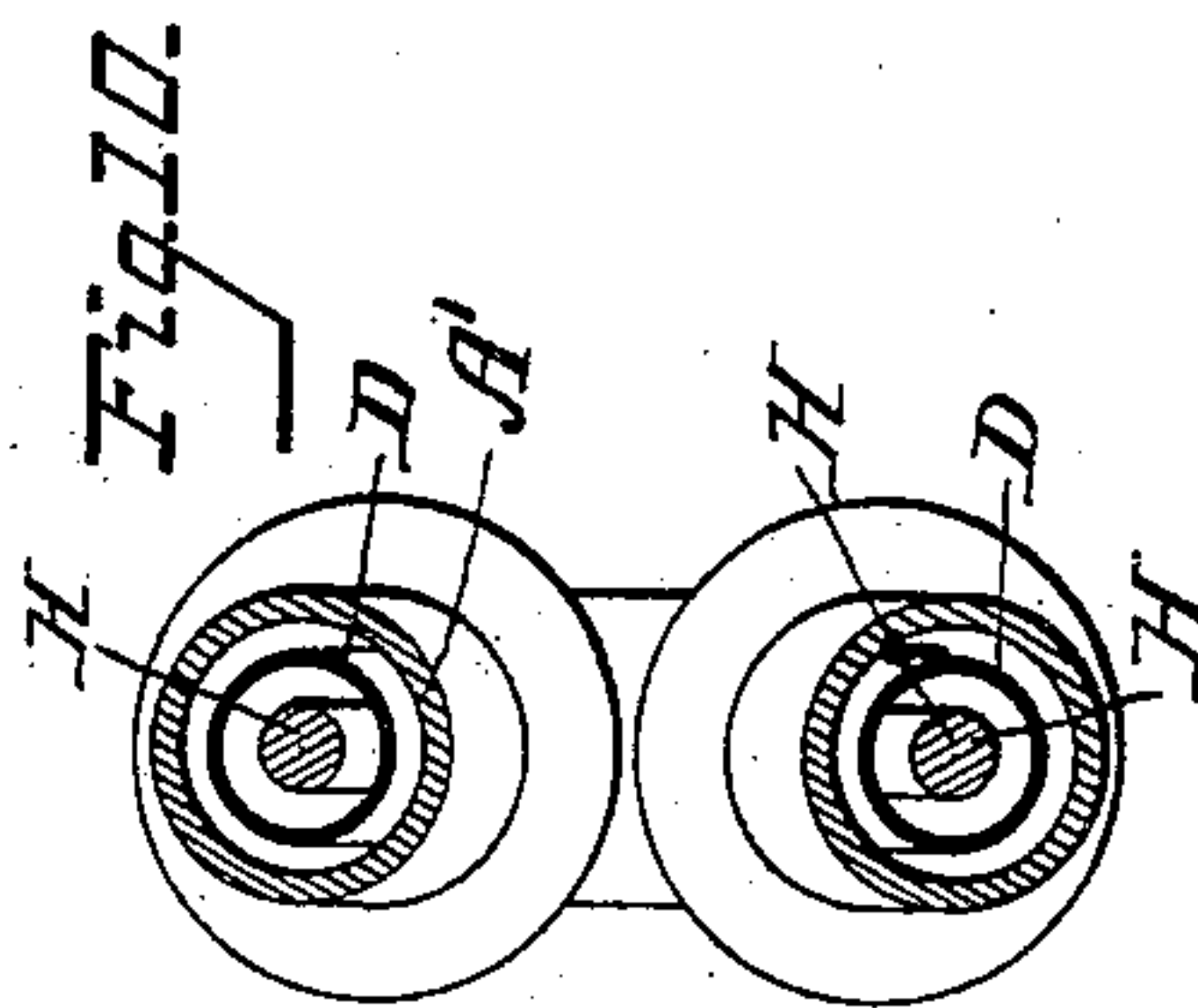
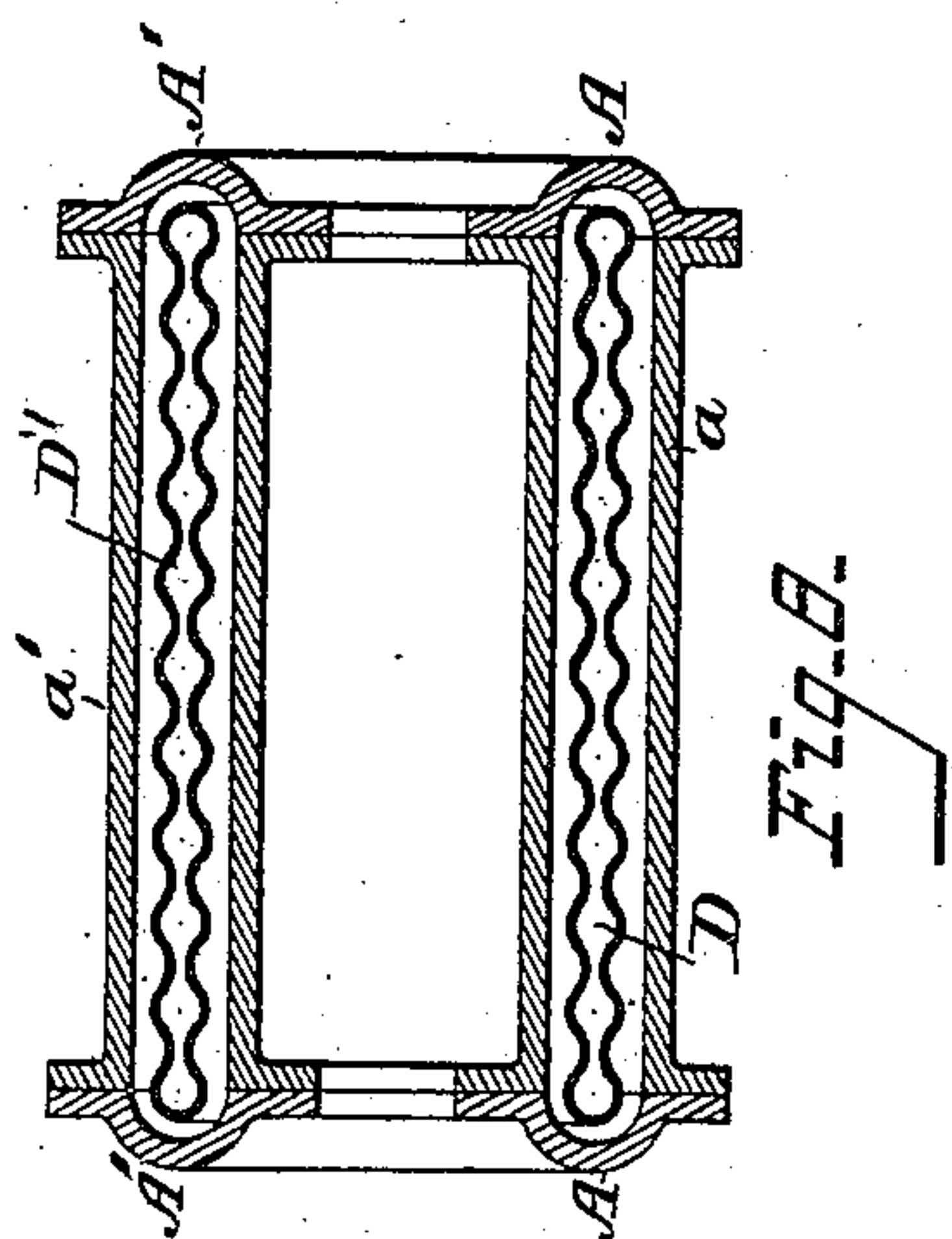
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3. Sheets—Sheet 3.

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# UNITED STATES PATENT OFFICE.

ISRAEL R. BLUMENBERG, OF WASHINGTON, DISTRICT OF COLUMBIA.

## SURFACE-CONDENSER.

SPECIFICATION forming part of Letters Patent No. 238,754, dated March 15, 1881.

Application filed December 20, 1880. (No model.)

*To all whom it may concern:*

Be it known that I, ISRAEL RUDOLF BLUMENBERG, of Washington, District of Columbia, in the United States of America, but temporarily residing at London, England, have invented new and useful Improvements in Surface-Condensers, of which the following is a specification.

The main objects of this invention are to produce a condenser of small exterior dimensions and weight, large condensing-surface, and using a minimum quantity of condensing-liquid, at the same time also affording facility for being increased in size almost to any extent, if more condensing-surface is required, and also avoiding the strain on tube-joints by unequal expansion by heat.

I form the condenser of a chamber having approximately the form of a U, but with the two legs or sides not parallel, but diverging outwardly from the bend, and both running in a slanting direction one over the other. The legs may be of the same length or in any other relative proportion. The pipe or pipes or chamber or chambers containing the gas or vapor or steam to be condensed pass through the above condenser chamber or body. The water is forced upward, passing through the intermediate space, and the fluid to be condensed passes downward, or in the opposite direction, through the pipe or pipes, or chamber or chambers.

To increase the condensing-surface relatively to the volume of fluid to be condensed I may arrange internal closed pipes, or rods in the pipes, for the fluid to be condensed, which latter then flows through the annular intermediate space.

The condenser, in a simple and efficient form, is constructed as follows: The condenser chamber or body may conveniently be made in two halves, united by longitudinal flanges, and of an oval or oblong cross-section, or with flat top and bottom, united by half-round parts at each end. A series of small tubes bent to the form of the condenser-body and at each end secured in a plate are inserted in the chamber or body. These tube-plates are bolted to flanges formed on each condenser-leg, and to the said flanges are also bolted end bonnets or pockets, the upper one of them having the inlet for the fluid to be condensed, and the lower one hav-

ing the outlet for the condensed fluid. The inlet for the condensing water or liquid is at the lowest end of the lower leg of the condensing-chamber, and the outlet for the said water is at the upper end of the upper leg of same. A test cock or valve is arranged at the inlet for the fluid to be condensed, and a test cock or valve may be placed at the outlet end. To increase the size of the condenser any width of flat-ribbed or corrugated intermediate chamber may be placed between the two aforesaid condensing-chambers, the end bonnets being then replaced by correspondingly wider flanged bonnets, and the number of internal tubes being correspondingly increased.

Figure 1 of the accompanying drawings is a side elevation of my condenser in a simple form. Fig. 2 is a vertical longitudinal section, and Fig. 3 a vertical cross-section. Fig. 4 is an end view of one of the end pockets, and Fig. 5 a perspective view of the condenser.

The chamber or casing consists of two legs, A A', both slanting and of the section shown in Fig. 4. It is made in two halves united by flanges and bolts. B B' are the end bonnets or pockets, and C C' the tube-plates for the tubes D D'. The plates C C' are secured in place between the flanges of the chamber A A' and those of the pockets B B'. The condensing-water enters at *b*, ascends the lower leg, A, of the condenser, and then, ascending the upper leg, A', of same, passes out at *b'*. The fluid to be condensed enters at *c'*, descends the upper ends or legs, D', of the interior tubes, then descends the lower legs, D, of same, and passes out as a condensed liquid at *c*. The coolest condensing-water current thus meets the coolest condensed or partly-condensed vapor, gas, or steam, and the warmest condensing-water current meets the moist uncondensed vapor, gas, or steam in the well-known approved manner.

E and F are test-cocks on the vapor-inlet and condensed-vapor outlet, respectively.

G is a cock at the condensing-water exit for checking the flow, as required.

Fig. 6 is a vertical cross-section, showing an enlarged condenser—that is, one in which an intermediate chamber, *a a'*, is interposed between the two halves of the chamber A A'. Fig. 7 is a similar section of an enlarged condenser, in which the intermediate chamber, *a a'*, is of



a corrugated form in order to save condensing-water and to turn it over better. Fig. 8 is a cross-section of another enlarged condenser, in which the fluid to be condensed flows through  
5 a pipe or chamber, D D', of a corrugated form, instead of a number of small tubes. Fig. 9 is a longitudinal, and Fig. 10 a cross, section of a condenser in which the interior inner tube, D, for the fluid to be condensed is partly filled  
10 up centrally by a blind tube, H, or a solid bar so far as to leave only a narrow intermediate annular space for the fluid to be condensed.

I claim—

1. A surface-condenser consisting of two hori-  
15 zontally - arranged slanting diverging legs, provided with inlet and outlet for the condensing-liquid to ascend in one leg after the other, and having a corresponding interior tube system or chamber for the steam, vapor, or gas  
20 to descend in, and to be thus condensed, substantially as set forth.

2. The surface - condenser consisting of a chamber, A A', made in the form of two horizontally-arranged slanting diverging legs for the ascent of the condensing-water, and having at  
25 each end a tube-plate, C C', with connecting tube or tubes D D', for the descent of the fluid to be condensed, and also a bonnet, B B', and inlet and outlet openings *b b'* and *c c'*, substantially as set forth.

3. A surface-condenser the outer chamber of which is made in the form of two horizontally-arranged slanting diverging legs, and constructed in halves for the convenience of making and for affording facility for adding an in-  
35 termediate chamber, substantially as set forth.

ISRAEL R. BLUMENBERG.

Witnesses:

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