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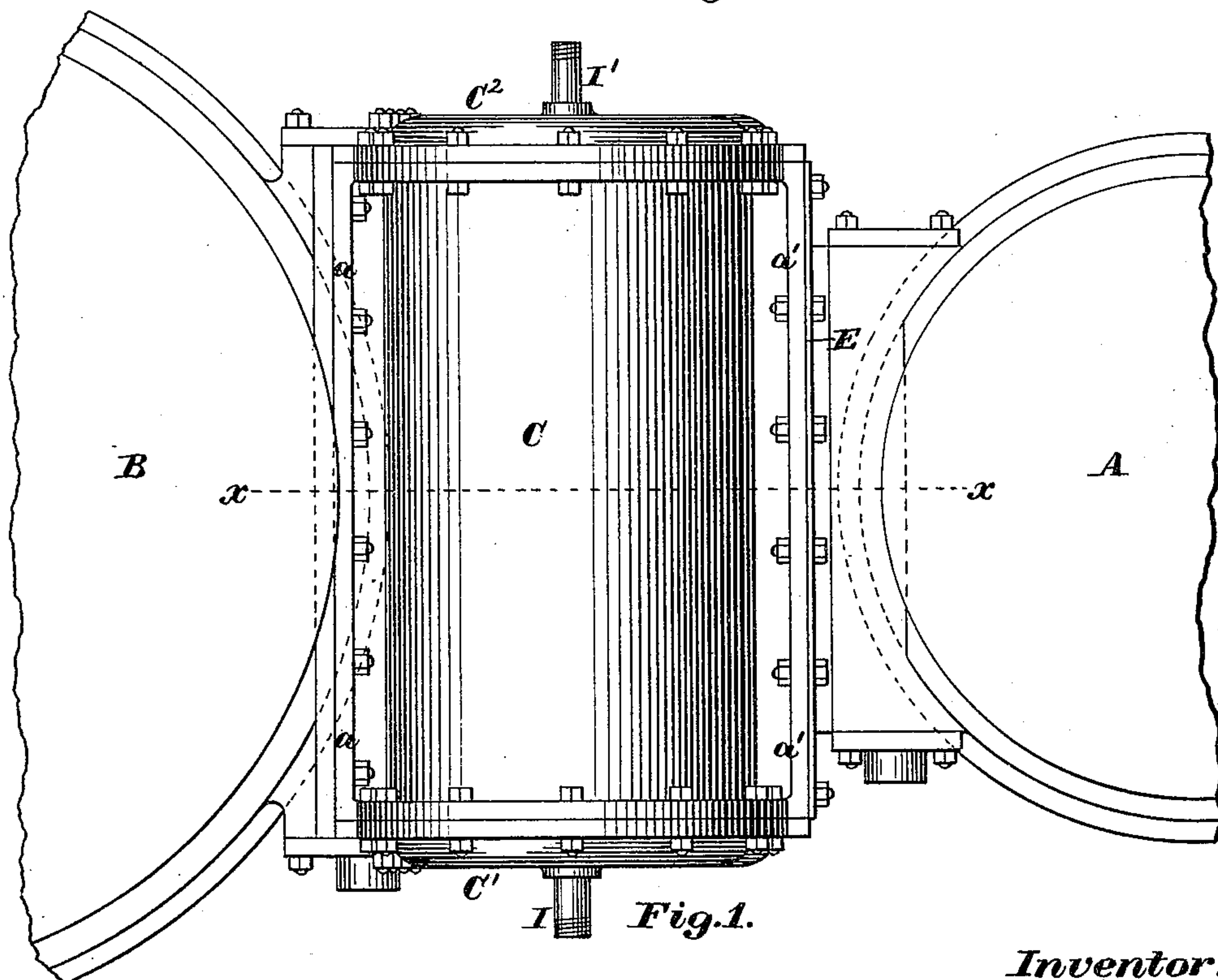
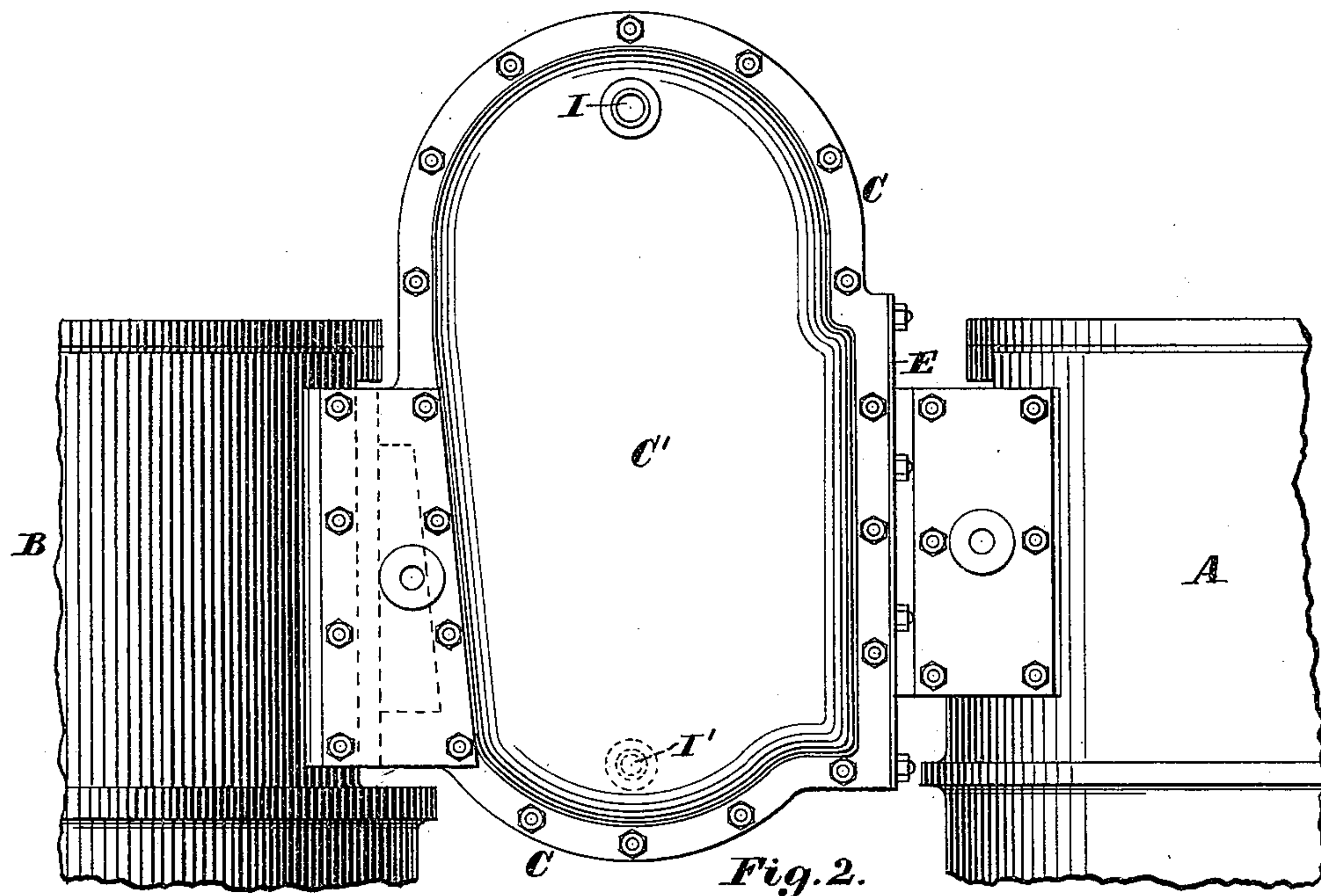
3 Sheets—Sheet 1.

E. D. LEAVITT, Jr.

Reheater for Compound Engines.

No. 231,061.

Patented Aug. 10, 1880.



Witnesses:

E. A. Hummenway
Walter C. Lombard

Inventor:

Erasmus D. Leavitt Jr.,
by N. C. Lombard

Attorney.

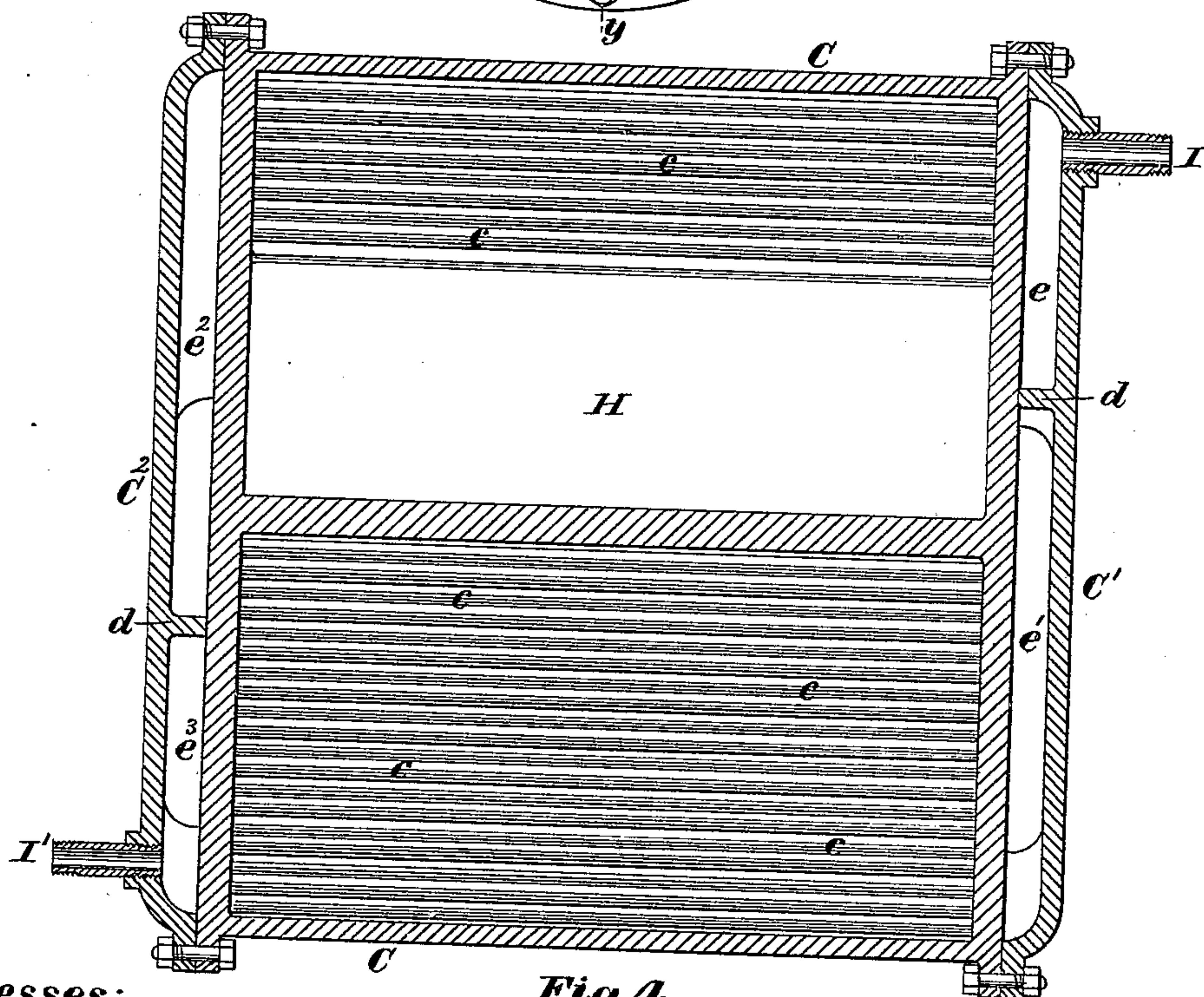
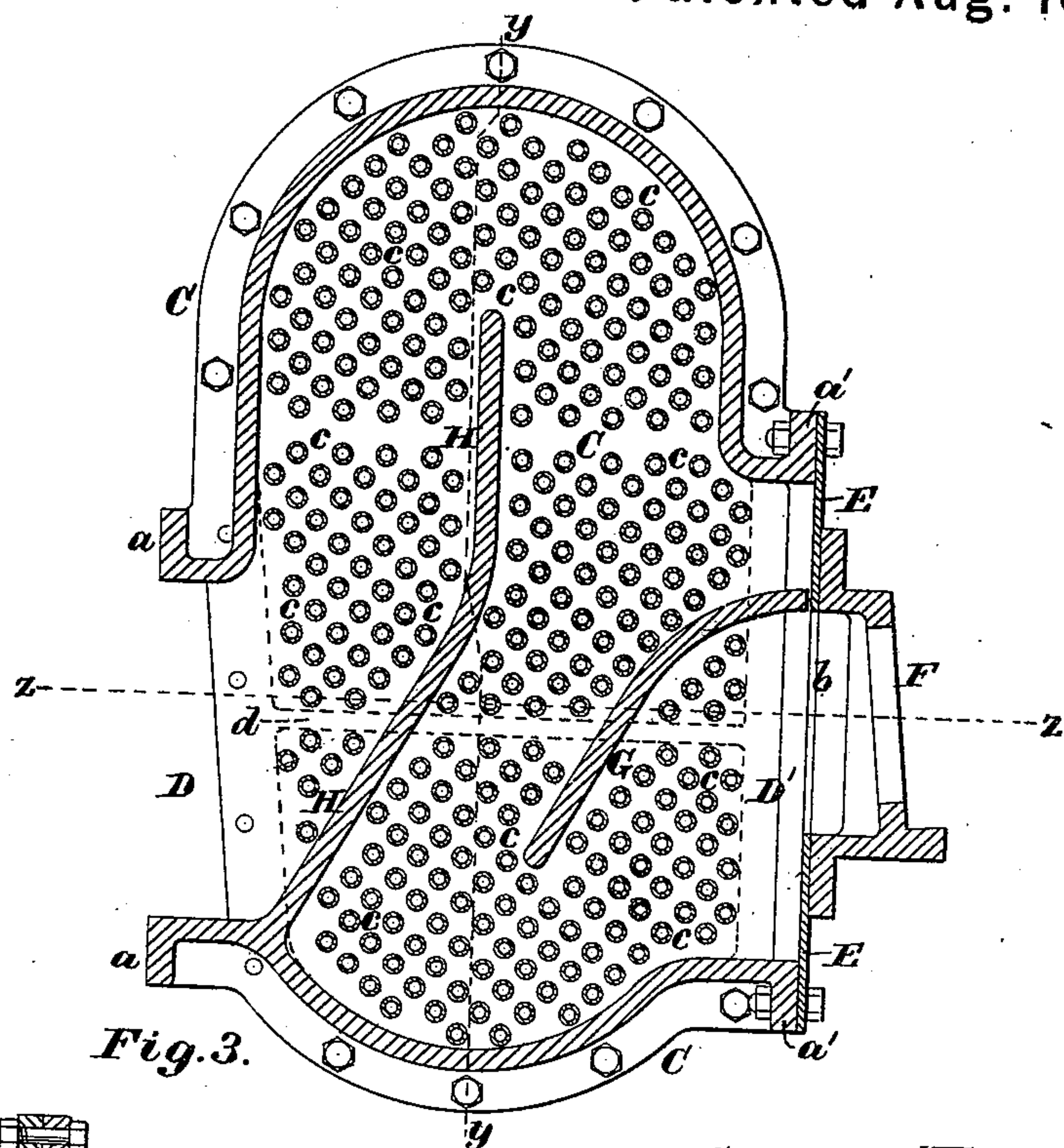
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Fig. 4.

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(No Model.)

3 Sheets—Sheet 3.

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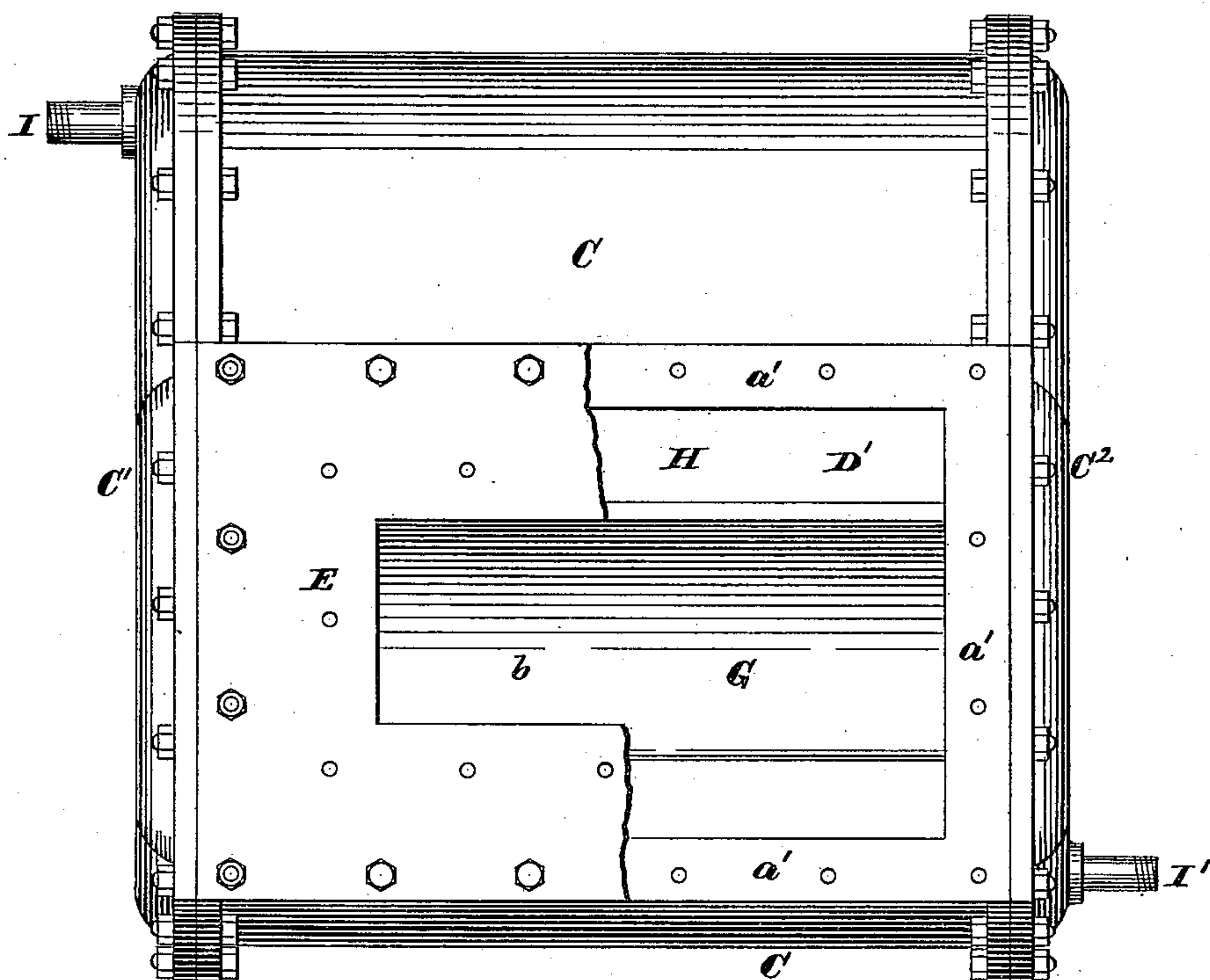


Fig. 6.

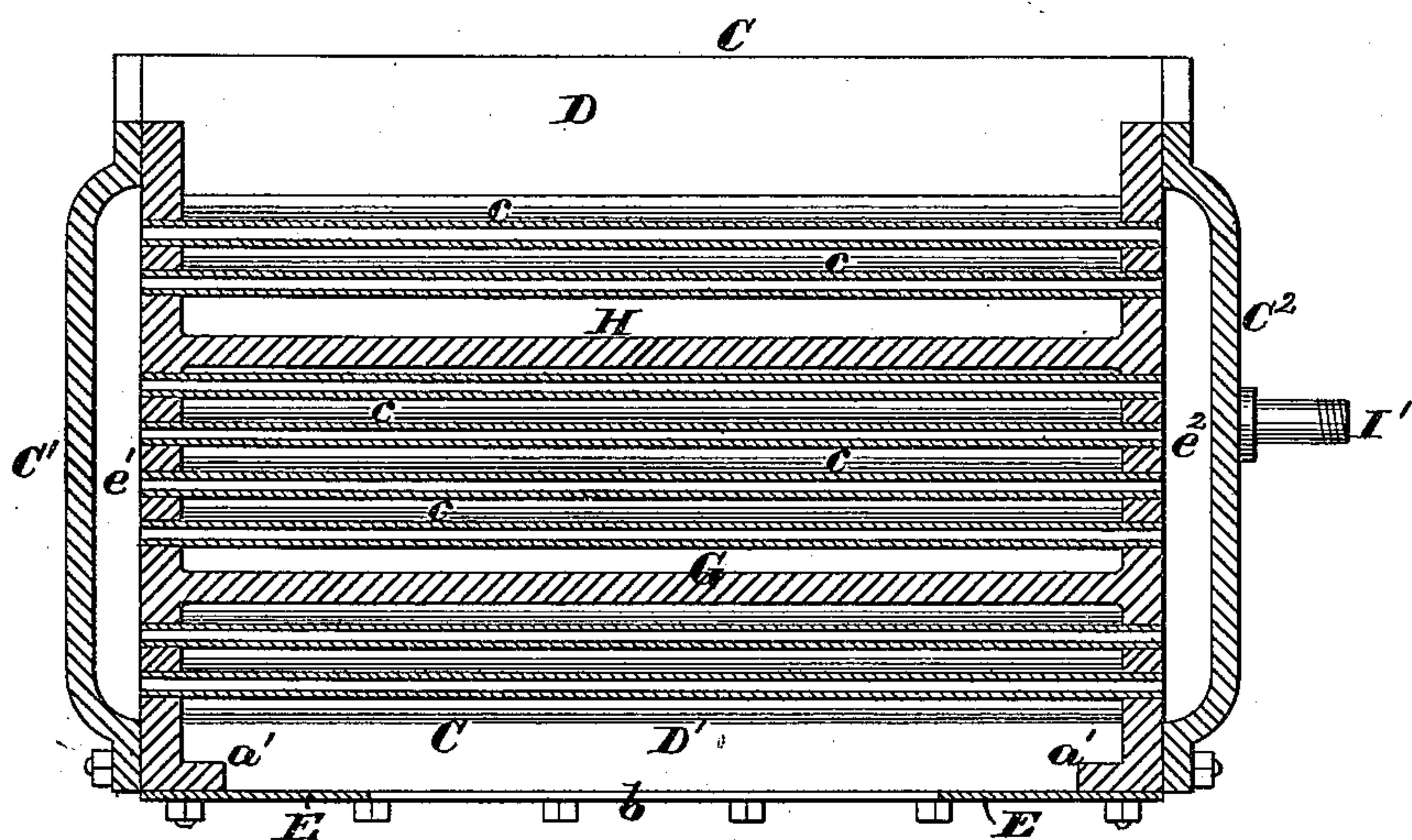


Fig. 5.

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UNITED STATES PATENT OFFICE.

ERASMUS D. LEAVITT, JR., OF CAMBRIDGEPORT, MASSACHUSETTS.

REHEATER FOR COMPOUND ENGINES.

SPECIFICATION forming part of Letters Patent No. 231,061, dated August 10, 1880.

Application filed March 25, 1880. (No model.)

To all whom it may concern:

Be it known that I, ERASMUS D. LEAVITT, JR., of Cambridgeport, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Reheaters for Compound Engines, (Case B,) of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to the construction of heaters for reheating the exhaust-steam from the high-pressure cylinder of a compound steam-engine before it enters the low-pressure cylinder, and is designed for use in cases where the cylinders are necessarily too near together to permit the use of the heater shown and described in another application of even date herewith; and it consists in the use, in combination with the high and low pressure cylinders of a compound steam-engine, of a heater composed of a central chamber communicating at opposite sides with the exhaust of the high-pressure cylinder and the inlet-valve chamber of the low-pressure cylinder, respectively, and provided internally with one or more deflecting-partitions, by which the exhaust-steam entering said chamber is compelled to traverse two or more times the length of said chamber among a series of small tubes which extend across said chamber and open through its side walls into one or more side chambers which cover or inclose the ends of said tubes, and through which and said tubes live steam from the boiler is made to flow and impart a large part of its heat through the walls of said tubes to the exhaust-steam surrounding and moving among said tubes.

It further consists in a novel method of connecting said heater to the cylinders, whereby provision is made for unequal expansion and contraction, which will be best understood by reference to the description of the drawings, in which—

Figure 1 is a plan of my improved heater and parts of the high and low pressure cylinders of a compound engine in their proper position and relation to each other. Fig. 2 is a side elevation of the same as applied to the upper ends of the cylinders. Fig. 3 is a vertical section of the heater and the exhaust-valve seat of the high-pressure cylinder, the cutting-plane being on line *xx* on Fig. 1. Fig. 4 is a

section on line *yy* on Fig. 3. Fig. 5 is a section on line *zz* on Fig. 3 with the valve-seat removed; and Fig. 6 is an elevation of the heater, looking from the high-pressure toward the low-pressure cylinder, with a portion of the expansion-plate broken away and the tubes removed.

A represents a portion of the upper end of the high-pressure cylinder of a compound engine, and B represents a similar portion of the low-pressure cylinder in their proper relative positions and connected together by my improved heater, composed of the main casting C and covers or heads C' and C², firmly bolted together with packed steam-tight joints.

The casting C incloses a chamber the vertical sides of which are straight and substantially parallel with each other, while its top and bottom sides are preferably curved, as shown, and its two opposite vertical walls, which are nearest to each other, are provided with openings D and D', respectively, around which are flanges *a* and *a'*, the purpose of which will presently appear.

The flange *a*, surrounding the opening D, is bolted firmly to the cylinder B or its inlet-valve casing, as shown in Figs. 1 and 2.

The opening D', which is considerably larger than D, has bolted over it the plate E, of boiler-iron, through the center of which is cut a rectangular opening, *b*, of a much smaller area than the opening D' in the casting C, the plate E being bolted around the opening *b* to the valve-seat F of the high-pressure cylinder, which valve-seat is firmly secured to said cylinder.

This construction enables the heater or cylinders to expand and contract without injury to the steam-joints, the plate E springing between its bearing upon the heater and its bearing upon the valve-seat.

The interior of the chamber C is provided with the deflecting-partitions G and H, extending across said chamber from front to rear, and so arranged that the exhaust-steam escaping from the cylinder A through openings *b* and D' is turned downward to the lower end of said chamber by the deflector G till it comes in contact with the deflector H, by which it is turned upward around the lower end of G to the upper end of the chamber, where it passes

around the upper edge of H, and descending upon its other side, passes through the opening D into the cylinder B.

A series of small thin tubes, *c c c*, extend
 5 across the chamber C, in a horizontal position, and extend through the opposite walls of said chamber, as shown in Figs. 3, 4, and 5. These tubes are arranged in three separate clusters, and are set in zigzag positions or diagonal
 10 rows, and the covers or heads *C'* and *C²* are each provided with an inwardly-projecting rib, *d d*, so that when said heads are secured in position the ends of said tubes are inclosed in chambers *e* and *e'* upon one side and *e²* and *e³*
 15 upon the other side, the chambers upon either side of the chamber C being of unequal length and arranged, relative to the chambers upon the other side, in such a manner that live steam from the boiler entering the chamber *e* through
 20 the pipe I will pass through one cluster of said tubes into the chamber *e²*, through the central cluster of said tubes into the chamber *e'*, and thence through the lower cluster of tubes into the chamber *e³* and escape through
 25 the pipe I', substantially as described in another application of even date herewith, the object of this invention being to raise the temperature of the steam exhausted from the cylinder A, and thereby increase its pressure be-
 30 fore it enters the cylinder B by imparting to it a portion of the heat of the live steam passing through the tubes *c c*. It is desirable that said exhaust-steam should be exposed to as large an area of heated tube-surface and for as
 35 long a time as practicable. Hence the reason for using the deflector-plates G and H, whereby the passage from cylinder to cylinder is made several times longer than if it were direct.

What I claim as new, and desire to secure 40 by Letters Patent of the United States, is—

1. The reheater C, provided with the side chambers, *e, e', e², and e³*, made of two different lengths, the series of horizontal tubes *c c c*, pipes I and I', and the deflector-partitions G 45 and H, all arranged and adapted to operate substantially as described.

2. In combination with the cylinders of a compound engine, a reheater-chamber located between said cylinders and communicating 50 therewith, traversed by a series of tubes through which live steam from a boiler may circulate, and provided with one or more deflector-partitions, all constructed and arranged for operation substantially as and for the purposes de- 55 scribed.

3. In combination with the high and low pressure cylinders of a compound engine, the reheater-chamber C, bolted rigidly to one of said cylinders and connected to the other by 60 means of the thin flexible plate E, and provided with means of communication with each of said cylinders, substantially as described.

4. The combination of the cylinders A and B, reheater-chamber C, provided with the de- 65 flectors G and H, and having set therein the tubes *c c*, chambered heads or covers *C'* and *C²*, pipes I and I', and the expansion-plate E, all arranged and adapted to operate substan- 70 tially as described.

Executed at Boston, Massachusetts, this 23d day of March, A. D., 1880.

ERASMUS D. LEAVITT, JR.

Witnesses:

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 WALTER E. LOMBARD.