

No. 625,314.

Patented May 23, 1899.

T. C. BILLETOP.
TUBULAR STEAM BOILER.

(Application filed July 8, 1898.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 2.

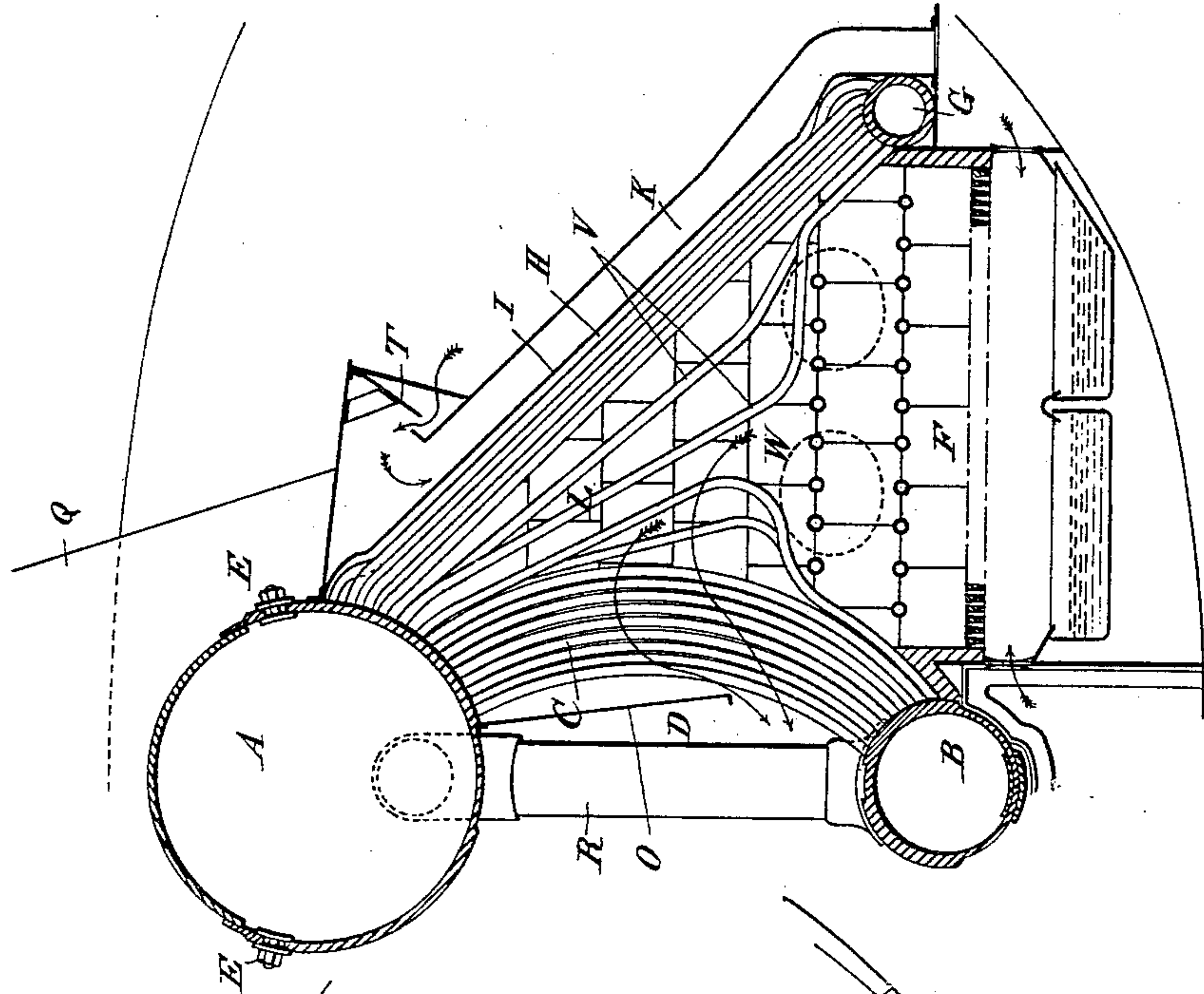
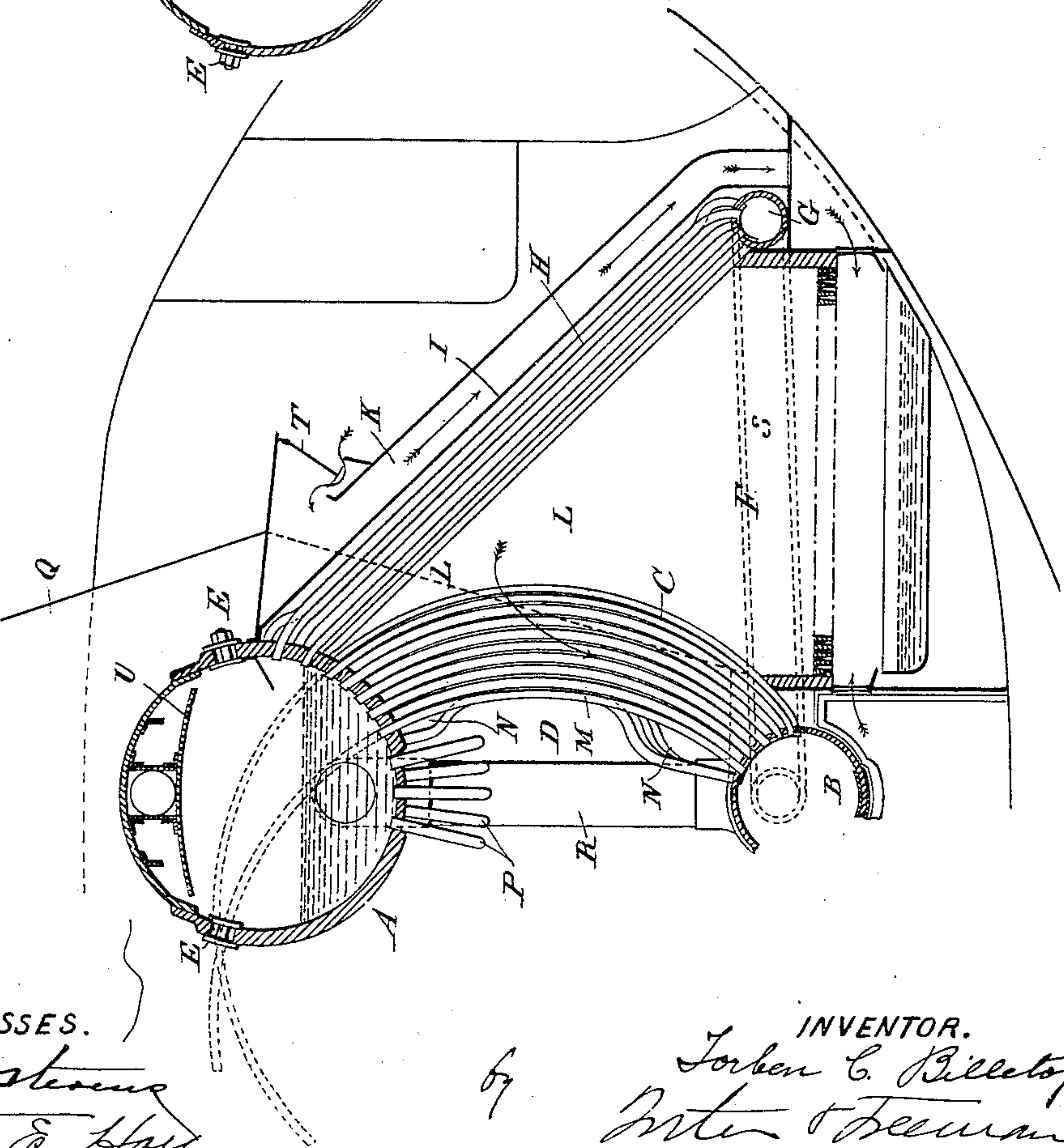


Fig. 1.



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Fig. 4.

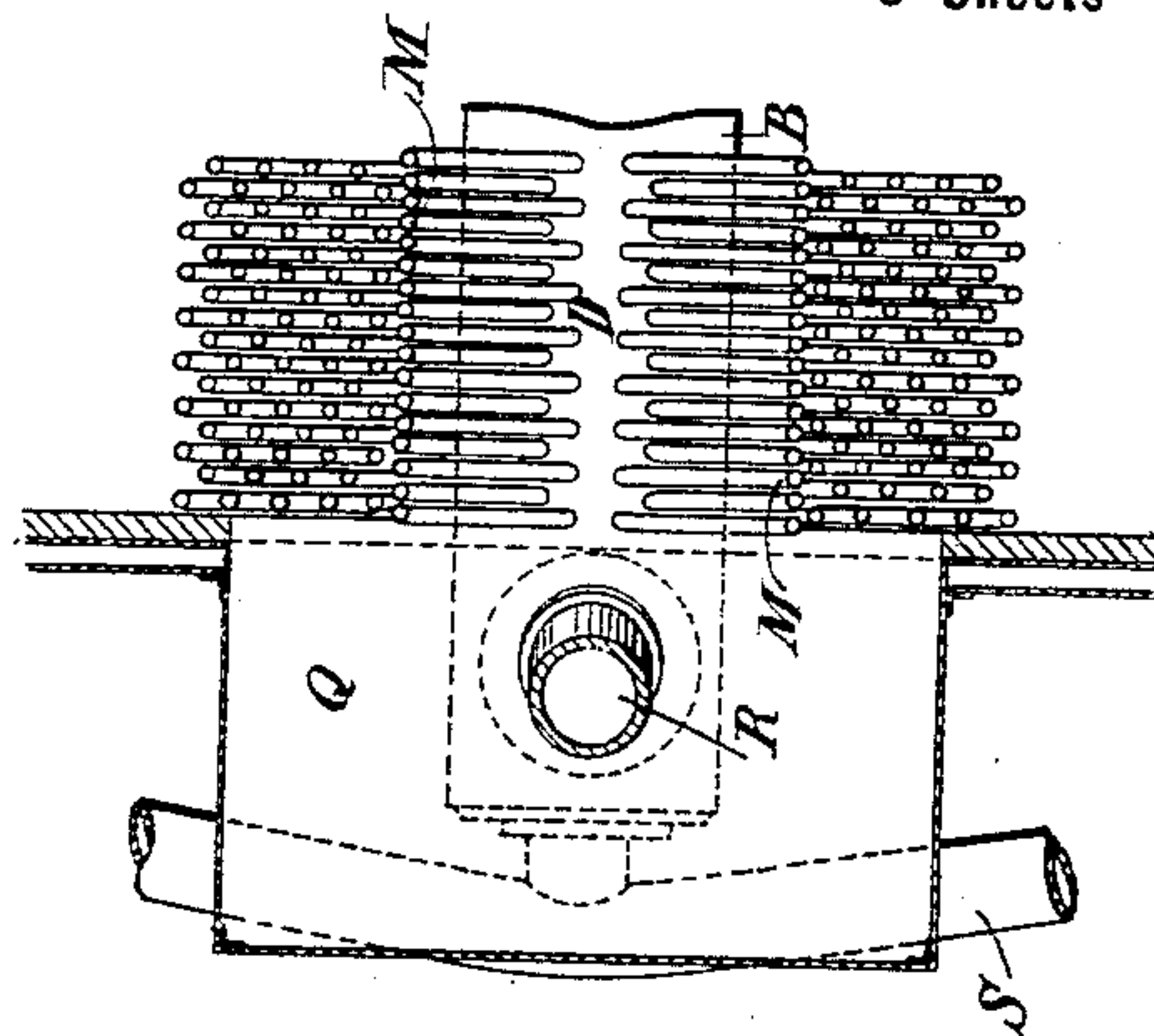
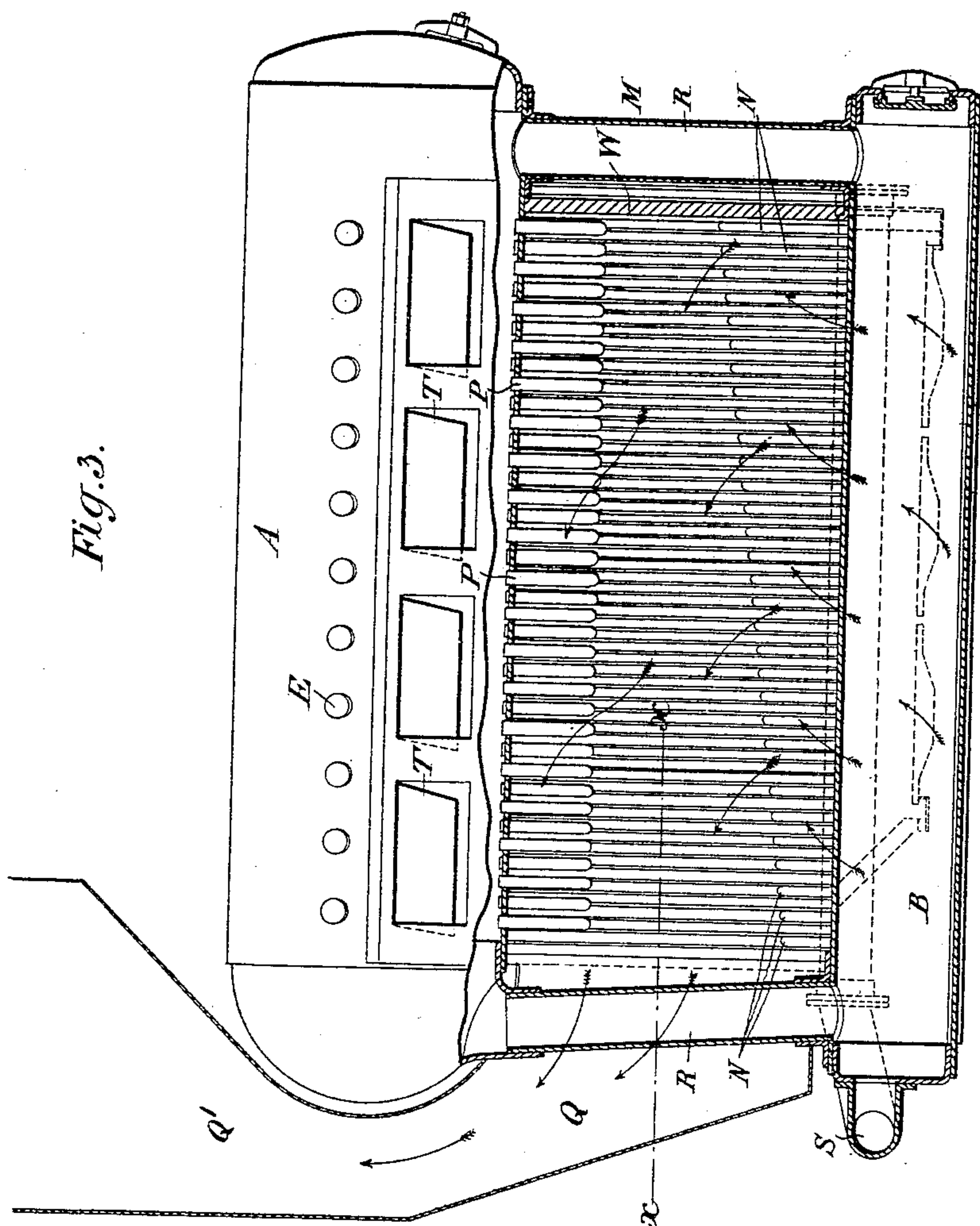


Fig. 3.



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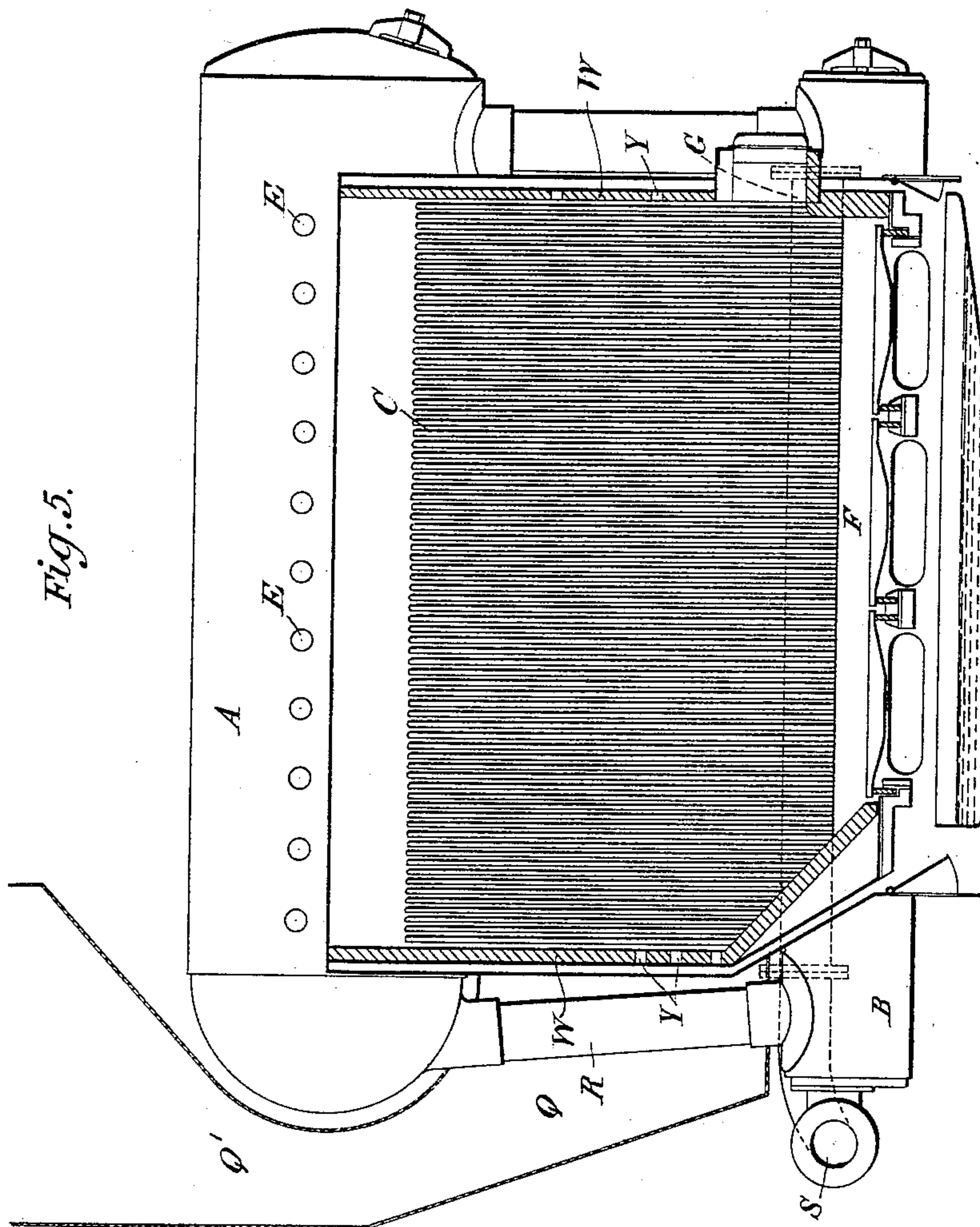
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3 Sheets—Sheet 3.



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UNITED STATES PATENT OFFICE.

TORBEN CHRISTIAN BILLETOP, OF NEWCASTLE-UPON-TYNE, ENGLAND,
ASSIGNOR TO ROBERT YOUNG McINTOSH, OF SAME PLACE, AND
ELIZABETH CRASTER BLECHYNDEN, OF JOPPA, SCOTLAND.

TUBULAR STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 625,314, dated May 23, 1899.

Application filed July 8, 1898. Serial No. 685,423. (No model.)

To all whom it may concern:

Be it known that I, TORBEN CHRISTIAN BILLETOP, a subject of the King of Denmark, residing at Newcastle-upon-Tyne, England, have invented a certain new and useful Improvement in Tubulous Steam-Boilers, of which the following is a specification.

This invention relates to certain improvements in tubulous steam-boilers of the class having horizontal upper and lower chambers connected by a series of tubes, the invention being in part an improvement on that set out in the specification of an application filed by A. Blechynden in the United States Patent Office on the 7th day of May, 1894, under Serial No. 510,356.

Part of the invention is applicable to boilers varying somewhat from the type above referred to.

The object of the invention is to increase the efficiency, while reducing the cost of manufacture, the weight, and the space occupied.

The invention will be best understood by describing same with reference to the accompanying drawings, in which—

Figure 1 is a half cross-section of one form of boiler constructed according to my invention. Fig. 2 is a similar view showing another form. Fig. 3 is a longitudinal section of Fig. 1 with parts in elevation. Fig. 4 is a plan taken on line *xx* of Fig. 3. Fig. 5 is a longitudinal section, with parts in elevation, of a boiler to show a modification.

All the drawings illustrate double furnace-boilers of the type above referred to, having an upper horizontal steam-and-water chamber A and a lower horizontal chamber B, connected together by nests of tubes C, which are curved in such a manner as to form a center space or flue D and are adapted to be withdrawn through openings E in the sides of chamber A when required. The openings E are closed, as shown, by plates and screws.

There are two furnaces F, one being arranged on each side of the groups of tubes C. To inclose or form the outside of the furnace F, an outer set of tubes are fitted between chamber A and a chamber G, the outermost

rows being set closely together and forming a wall H. The whole is inclosed in a light casing I, which may be fitted with a casing K, having an air-space between it and casing I. The gases after mixing in the usual combustion-chamber L flow through the curved tube-nests C, and their passage may be directed by setting the inner row of tubes closely together, so as to form a tubulous wall M, leaving openings N N' at the bottom or top, or at both, by suitably bending the tubes, as shown, these openings being so arranged as to gradually increase in size toward the front of the boiler, with the object of drawing the greater portion of the gases to that end, as indicated in Figs. 1 and 3. The bottom opening is preferably larger than that at the top in order that the gases may be drawn down between the front part of the nest. The opening N' should be of sufficient size to allow of the introduction of a steam-hose for cleaning purposes. In place of employing the close wall M the nest of tubes C may be open throughout and a baffle-plate O be arranged in the space D, so as to direct the gases downward, as shown by the arrows in Fig. 2.

The gases after entering the center flue D pass below chamber A, along the bottom of which may be introduced tubes P, having their lower ends closed and commonly known as "Field" tubes, as shown in Fig. 1, the object being to extract or utilize the waste heat of the gases and materially increase the heating-surface, and also by the circulation at this part of the chamber A to prevent accumulation of sediment on the inner surface. The gases ultimately enter the end casing Q and funnel Q'. By the arrangement of curved tubes C, connecting chambers A and B, the outer tubes, which are those most exposed to the fierce heat of a furnace, have the least head of water against them, and this greatly assists the circulation and permits of the boiler being forced to a much higher degree. To further assist the circulation, large down-comer pipes R, connecting chambers A and B, are employed, which are placed at the ends of the chamber A and at the lowest point of same, so as to be entirely covered by the wa-

ter in A even under heavy rolling of the ship in which the boiler may be placed. To assist the circulation, the small outer chambers G are connected by cross-pipes S to chamber B.

5 The air to the furnace may be fed through the casing K after entering through the flaps or baffles T, as shown by the arrows. The casings are attached to chamber A below the openings E, so as to permit the withdrawal of
10 the tubes without removing any part of the casing, and the openings E are placed so low on the chamber that no special doubling or thickening plates are required, as where these openings fall in the thin shell of the upper
15 part of the chamber, and, further, the internal baffle-plates U are kept high enough so as not to require to be disturbed when examining the boiler or withdrawing and renewing the tubes. The arrangement of parts fur-
20 ther permits, where the boiler is used in a vessel, of the decks being kept quite close down on the chamber A without making special provision for drawing the tubes, as it will be seen that they can be readily drawn out be-
25 low the deck and, by reason of the curvature, in a downward direction into the interior of the vessel.

In Fig. 5 is shown a furnace provided with holes Y through the brickwork of the end
30 walls for feeding air in above the fire.

In Fig. 2 is shown an arrangement of tubes V by which some tubes are bent in such a manner as to partly cover and support the vertical brickwork of end wall or walls W,
35 where often the usual means of attachment are found unsatisfactory, this arrangement

also adding support to the brickwork and enabling thinner and lighter bricks to be used.

What I claim is—

1. In combination a single upper steam- 40 and-water chamber, a water-chamber beneath same, two groups of tubes connecting the two chambers, the tubes of each group being formed on the curve of a circle, and said curves being oppositely arranged for each 45 group so that a flue closed at the sides by said chambers and groups of tubes is formed, into which flue the gases enter and expand, a furnace outside each group, water-return-circulating tubes carried in the lower side of the 50 upper chamber and adapted to extract the heat from the expanded gases in the flue between the groups of tubes and means for carrying away the gases from the flue.

2. In combination, a main upper steam- 55 and-water chamber, a water-chamber beneath same, a group of tubes connecting the two chambers, such tubes being formed approximately on the curve of a circle, a furnace outside of such group and an end wall of refrac- 60 tory material to such furnace and tubes forming part of the group, elongated and spread so as to lie flat against such end wall and form a support for same, substantially as described.

In testimony whereof I have hereunto set 65 my hand in the presence of two subscribing witnesses.

TORBEN CHRISTIAN BILLETOP.

Witnesses:

PERCY CORDER,
JNO. EDWD. MILLER.