

No. 621,442.

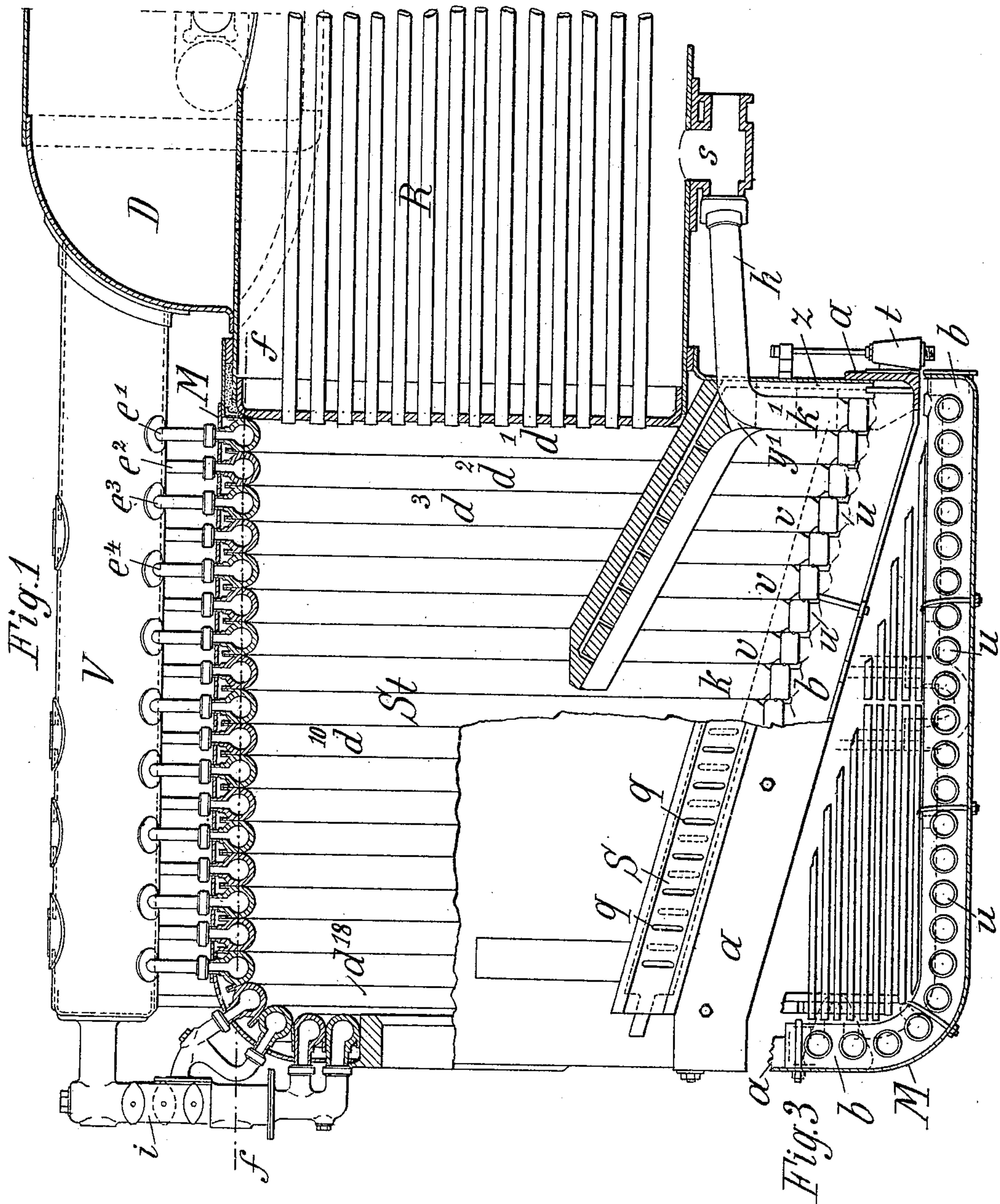
Patented Mar. 21, 1899.

J. BROTON.
STEAM GENERATOR.

(No Model.)

(Application filed Dec. 13, 1898.)

4 Sheets—Sheet 1.



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Fig. 2

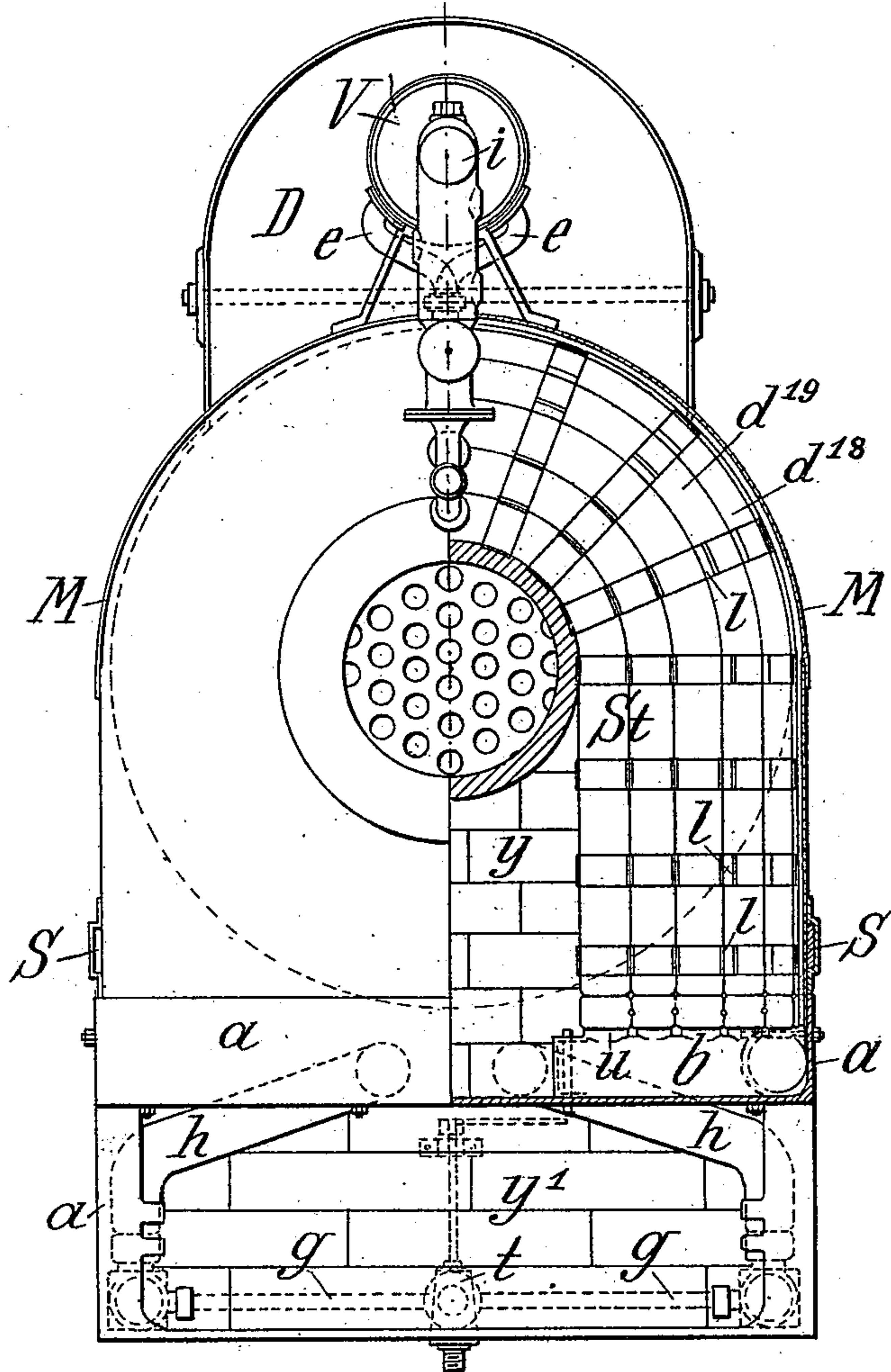


Fig. 4

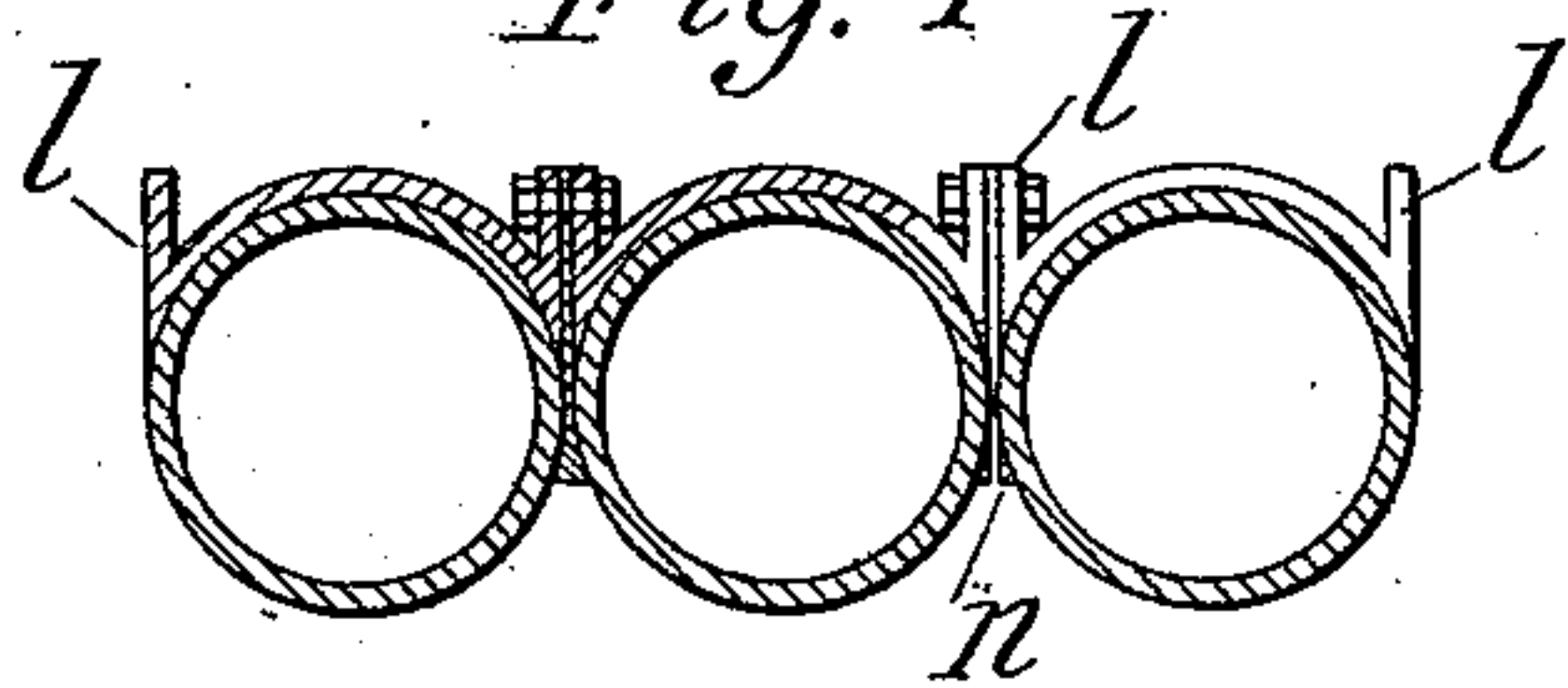
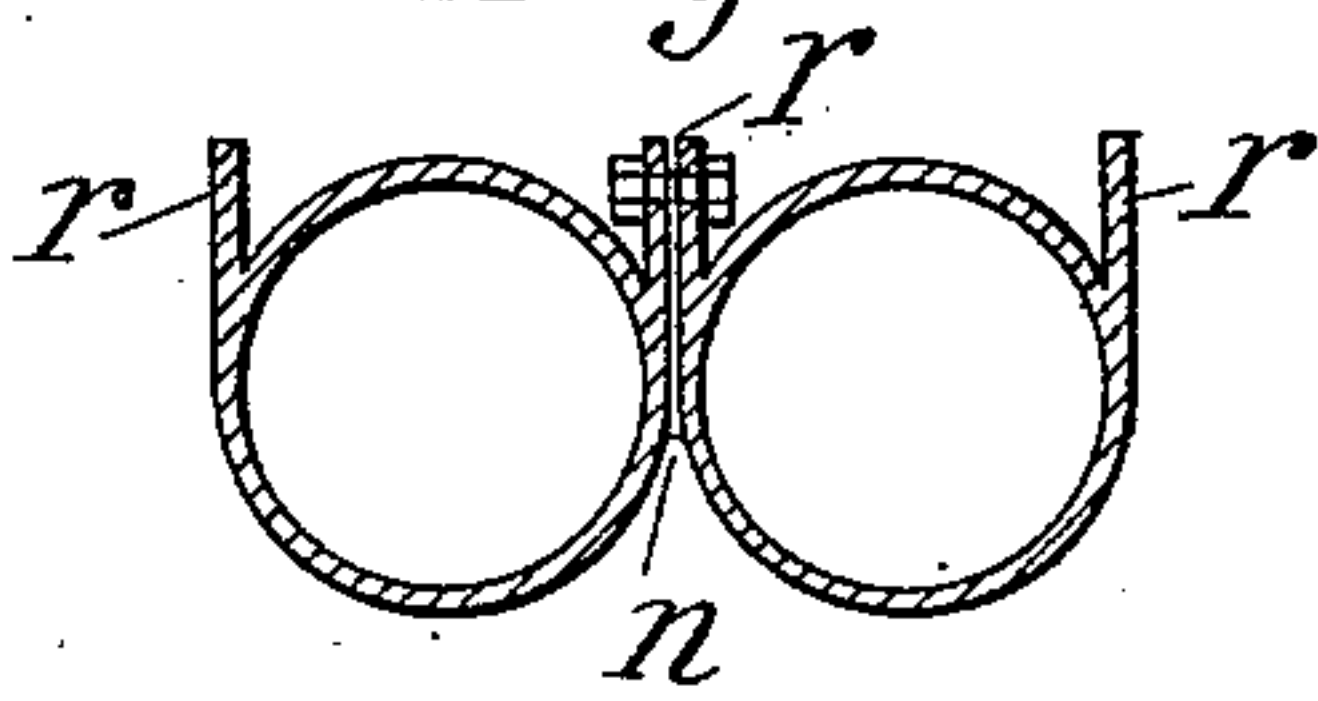


Fig. 5



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Fig. 7

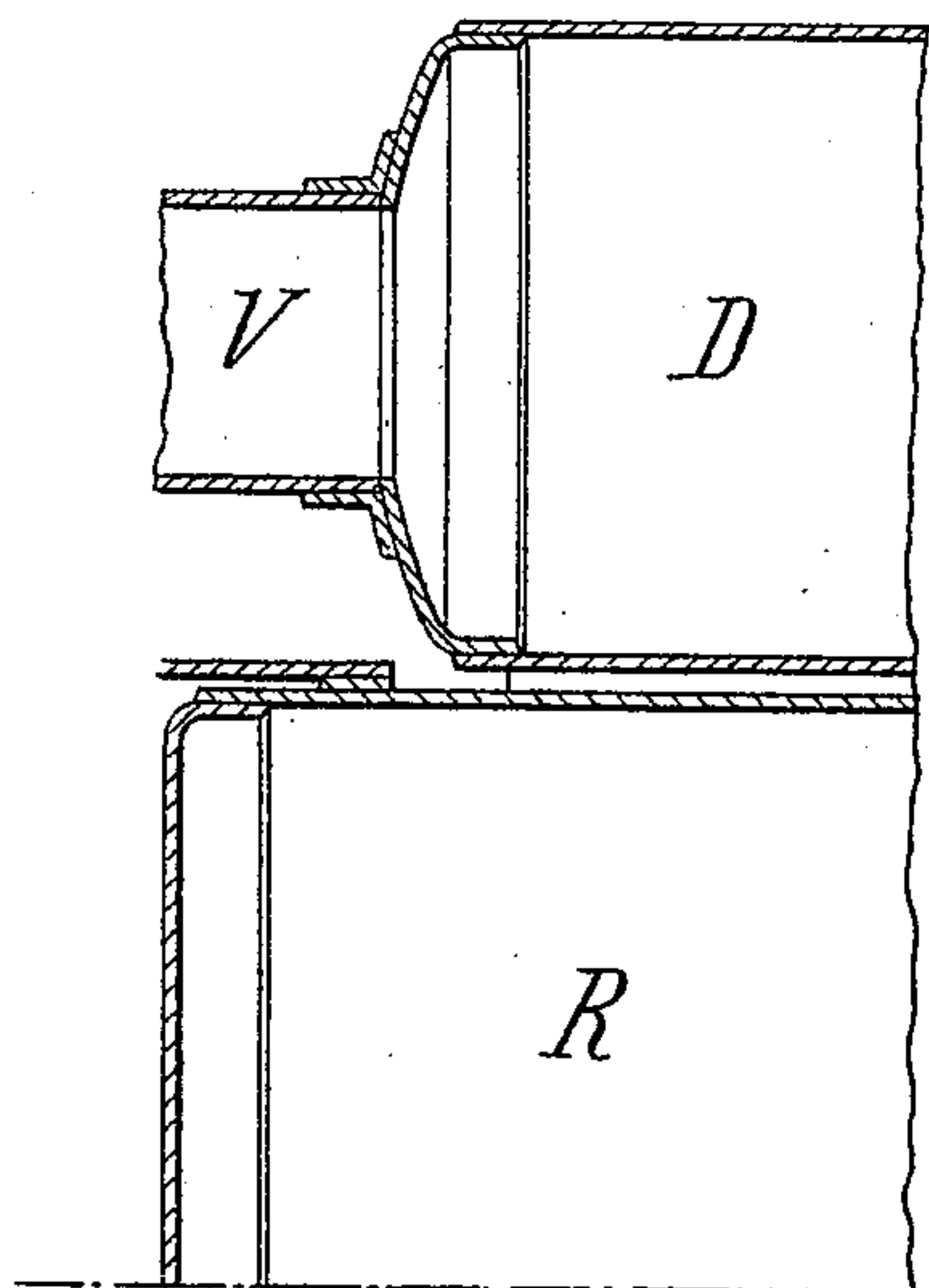


Fig. 8

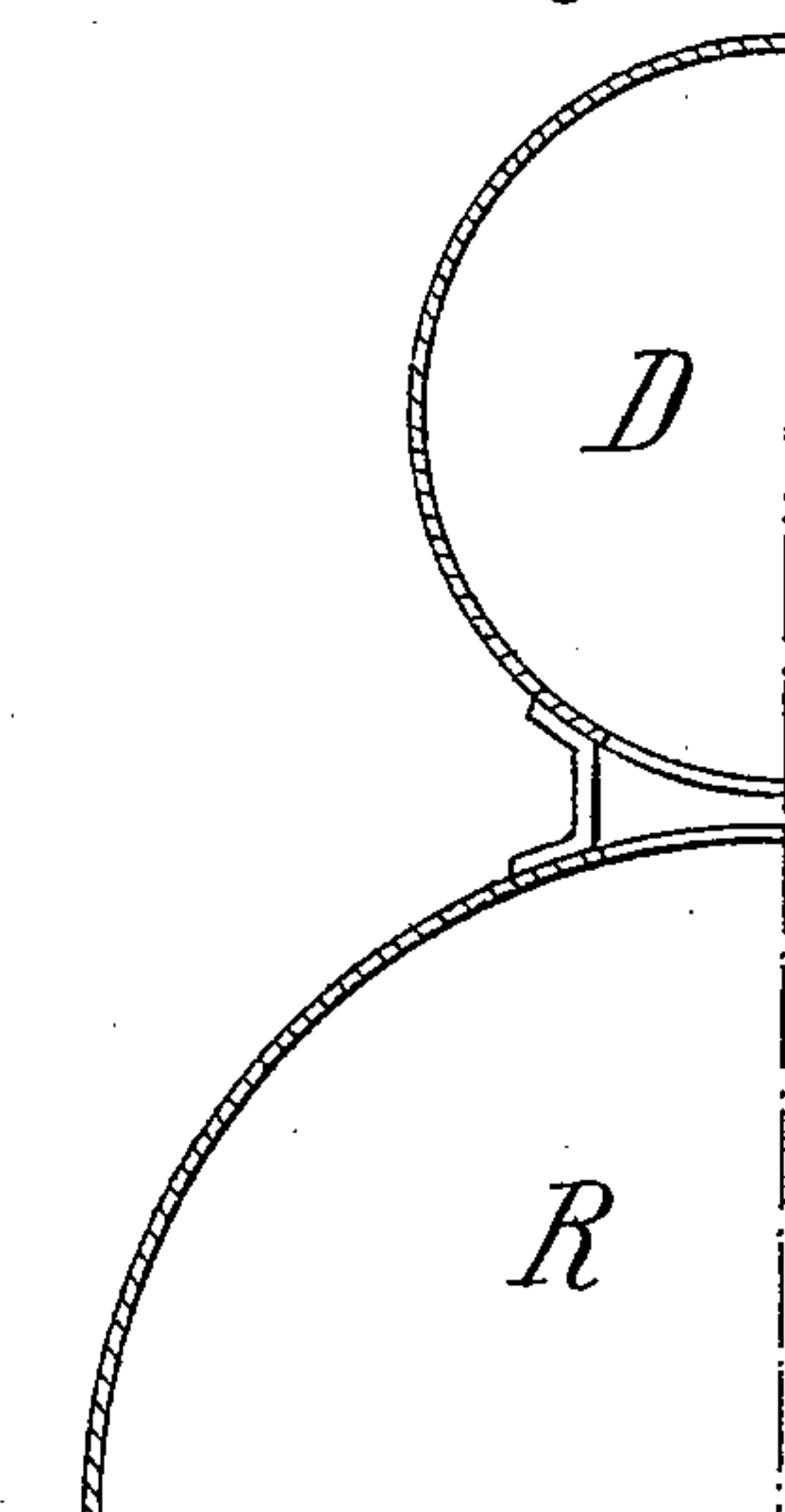


Fig. 9

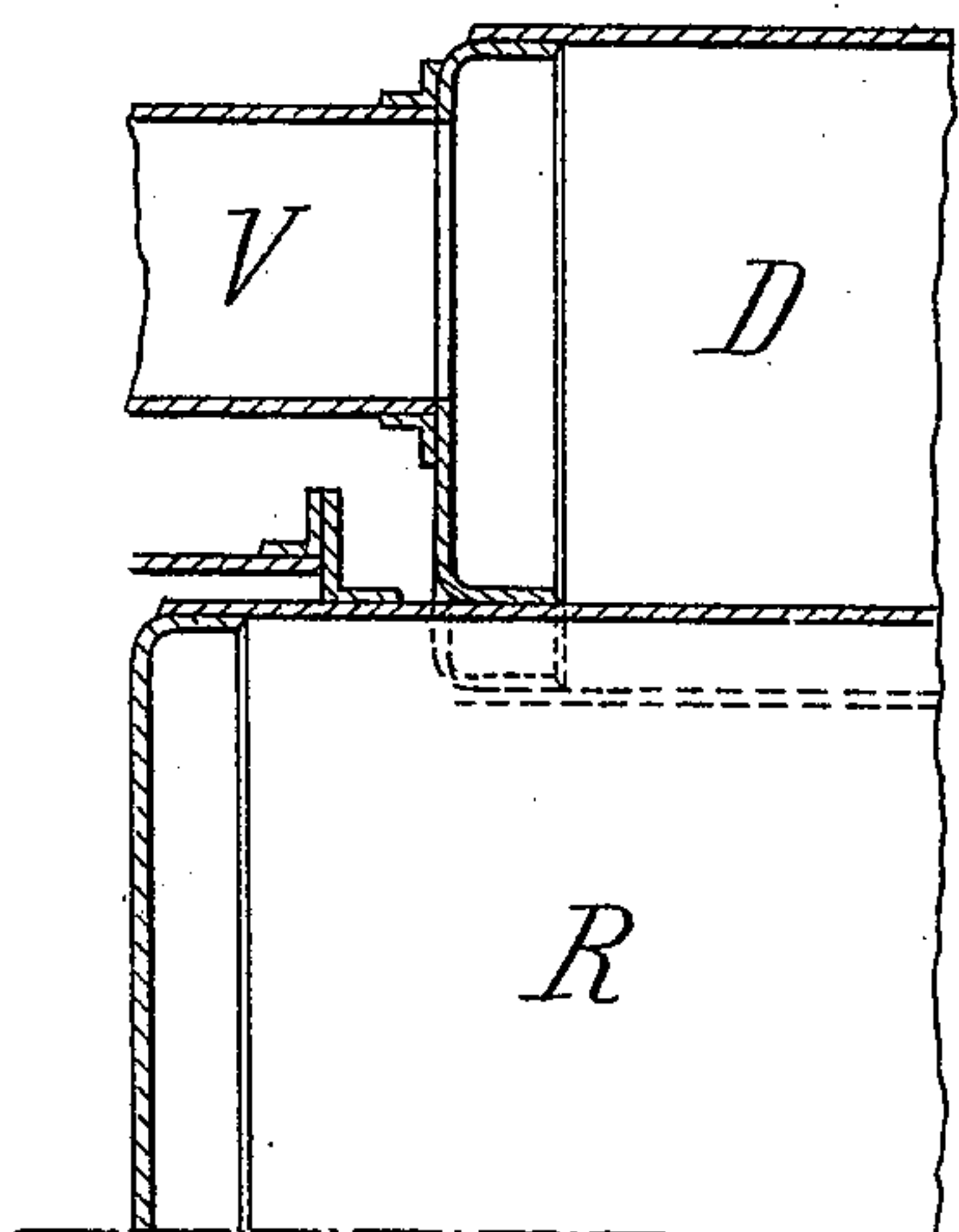


Fig. 10

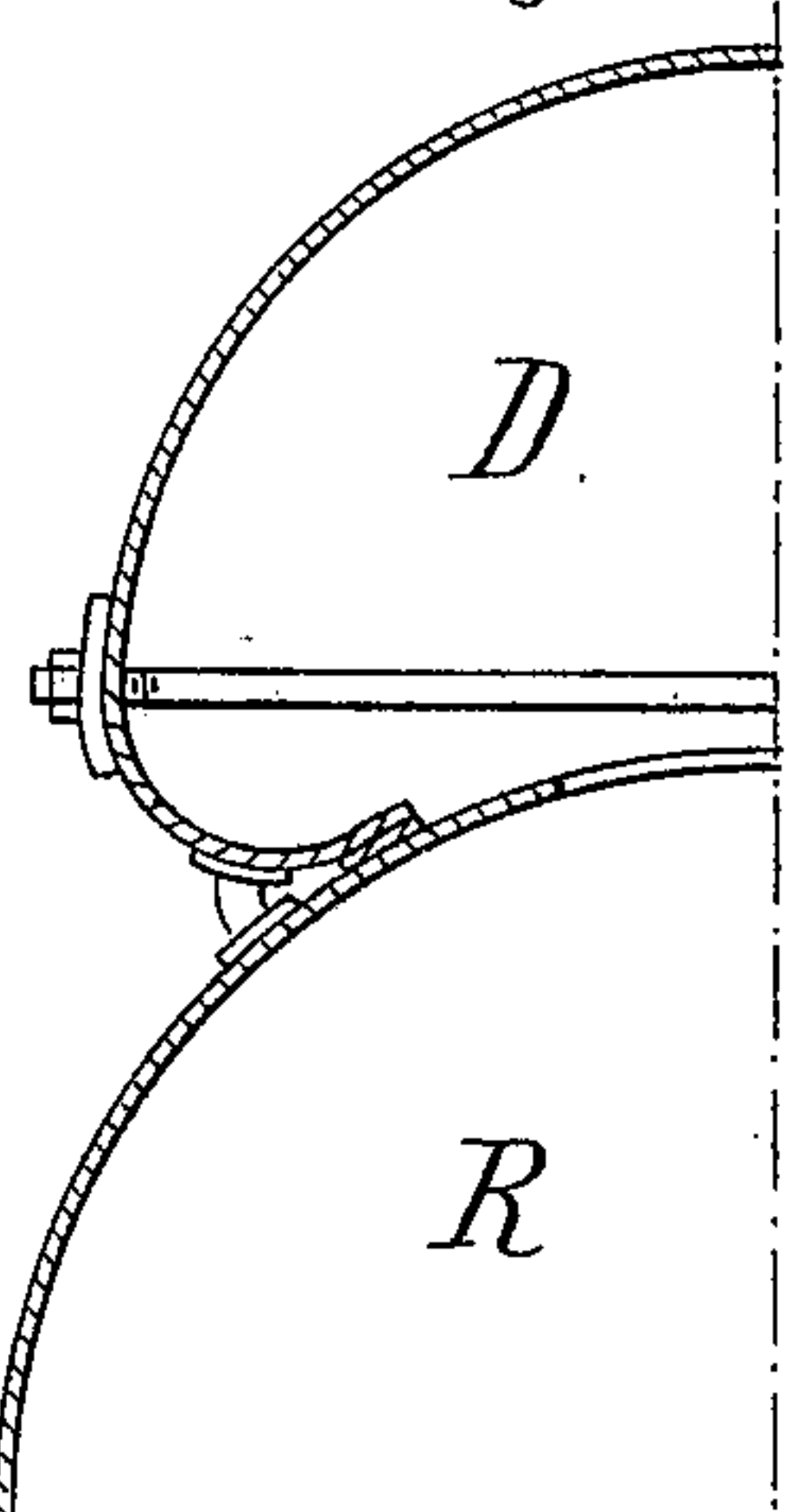
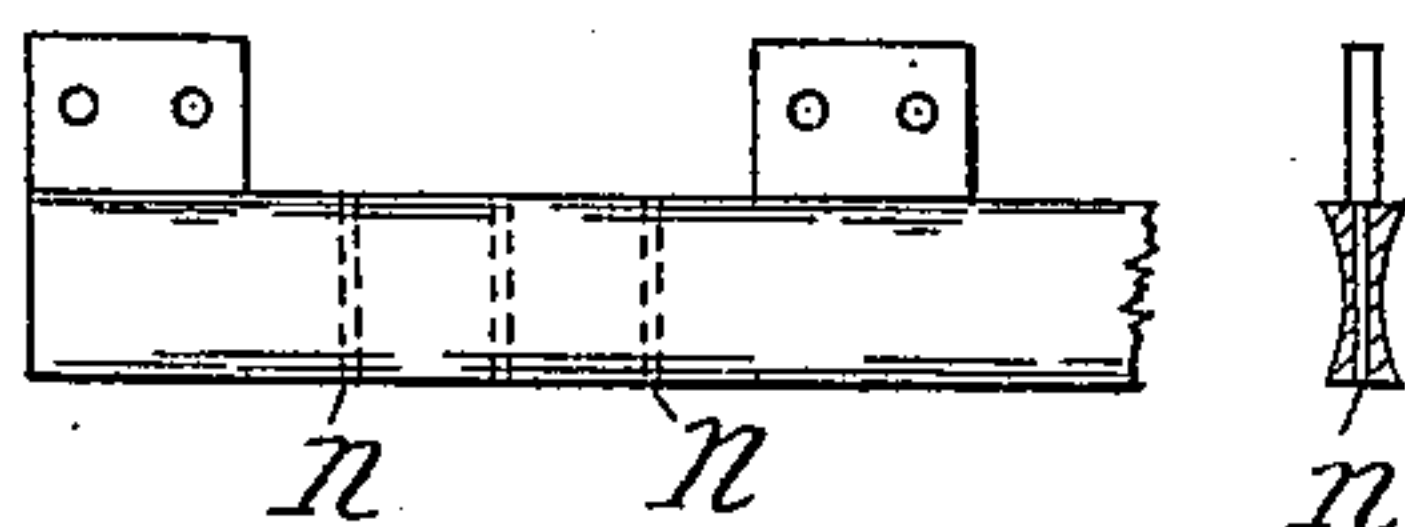


Fig. 6



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Fig. 12

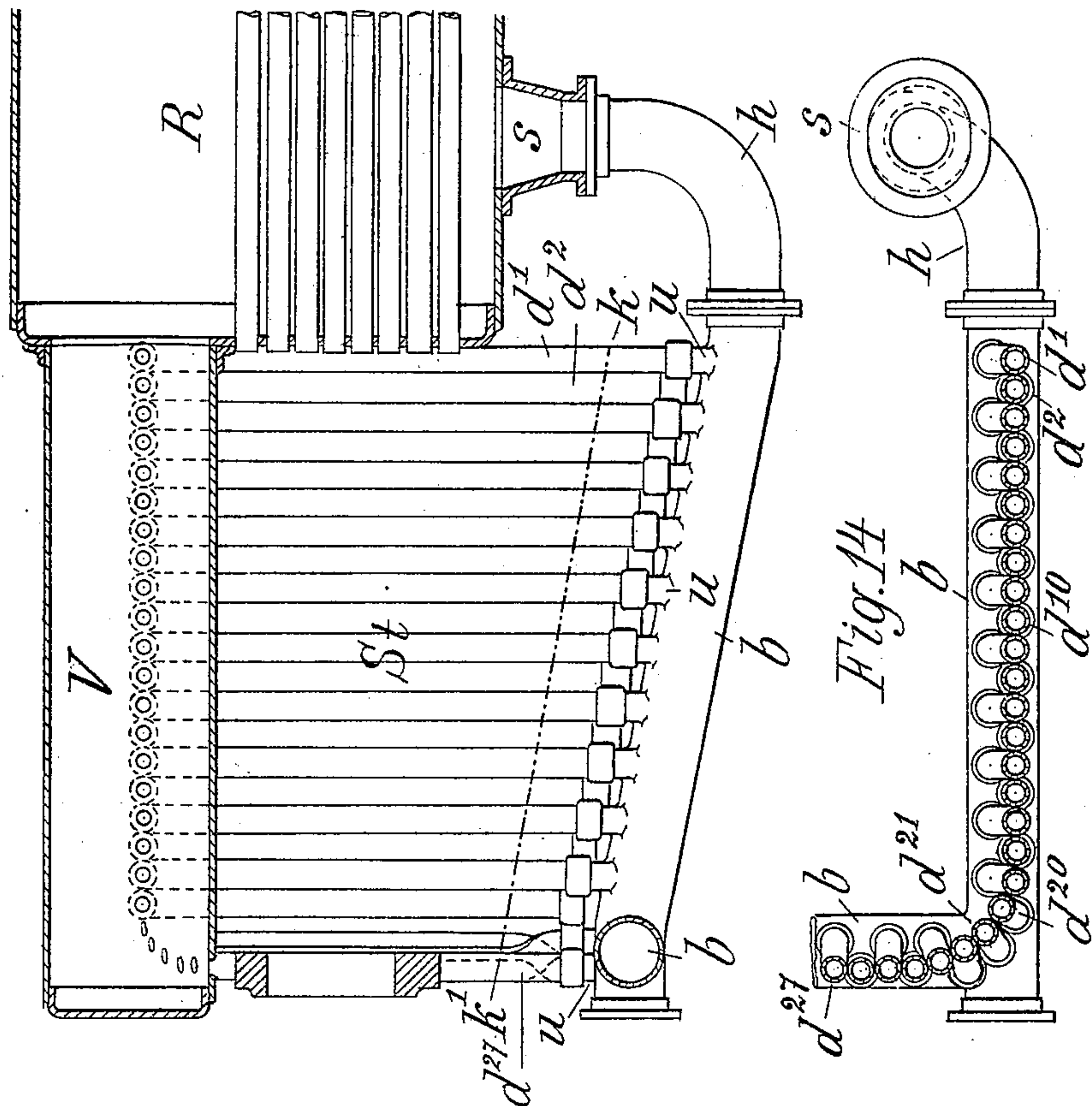


Fig. 14

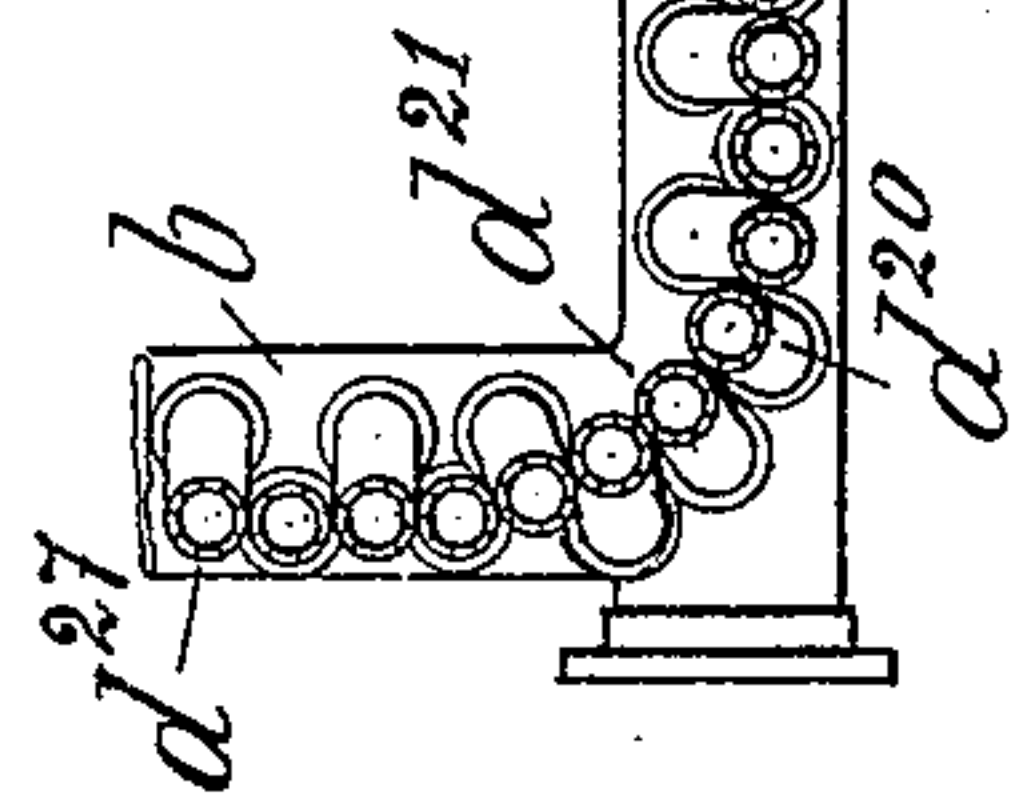


Fig. 13

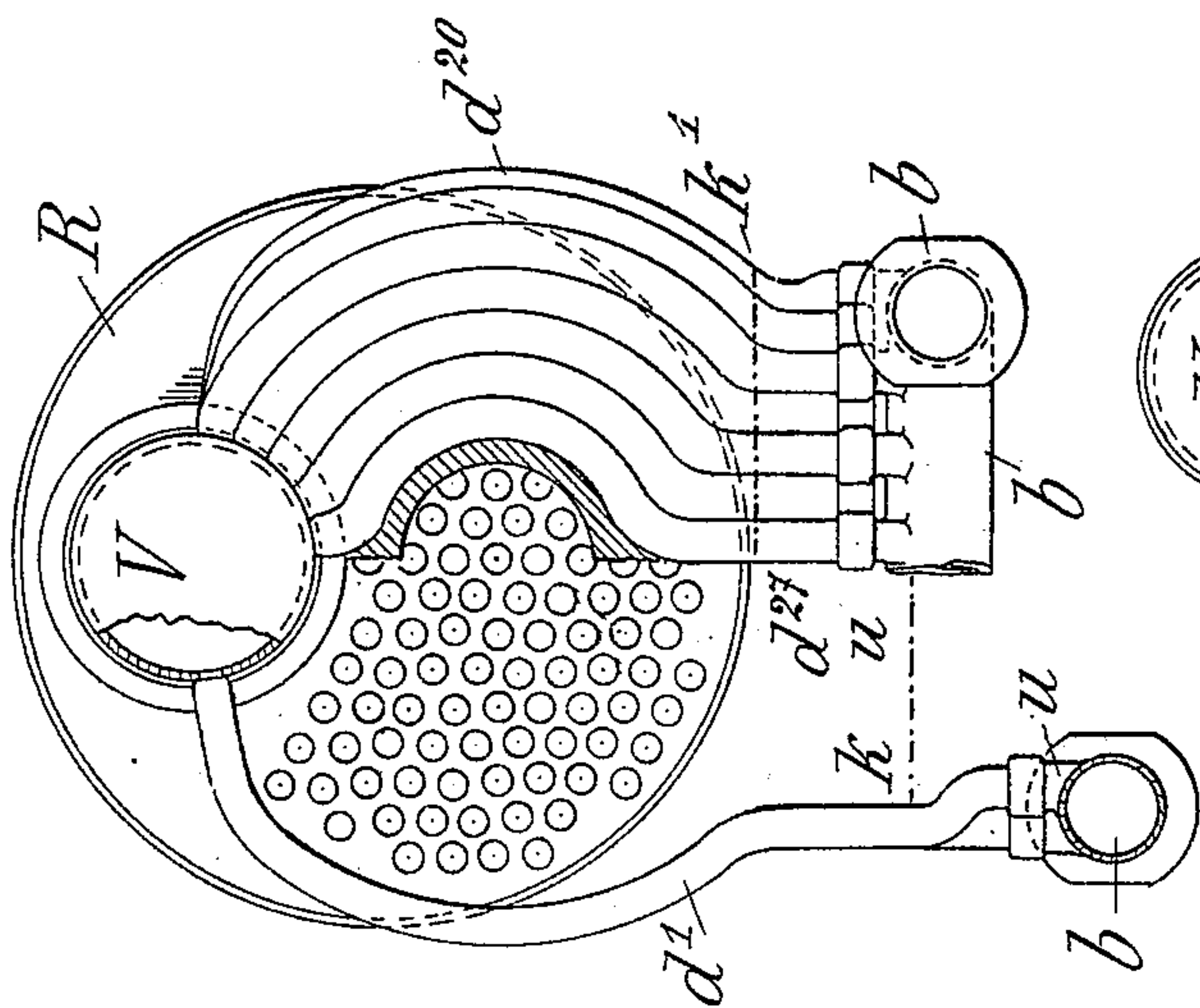
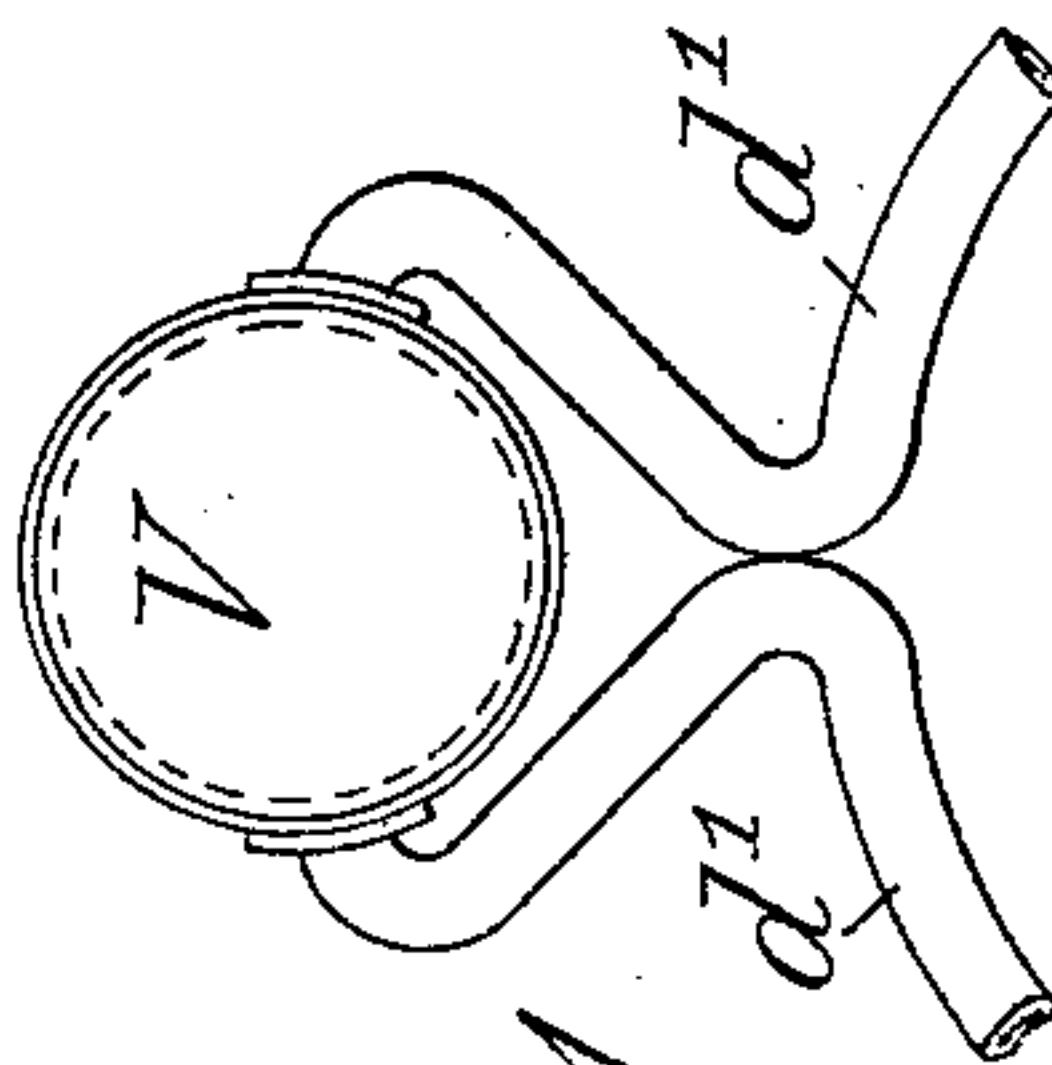


Fig. 11



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UNITED STATES PATENT OFFICE.

JOHANN BROTON, OF LINZ, AUSTRIA-HUNGARY.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 621,442, dated March 21, 1899.

Application filed December 13, 1898. Serial No. 699,148. (No model.)

To all whom it may concern:

Be it known that I, JOHANN BROTON, a subject of the Emperor of Austria-Hungary, residing at Linz, in the Province of Upper Austria, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Steam-Generators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention has reference to improvements in locomotive steam-generators, which may also be constructed as stationary high-pressure steam-generators, as ship or torpedo-boat engines, and as locomobile steam-generators. According thereto the fire-box is composed of bent tubes, which communicate with each other and also with the water-space and steam-space of the longitudinal boiler and which are arranged closely in contact with one another and form a closed domed surface which, in conjunction with the tube-plate of the longitudinal boiler, incloses the fire-space above the grate in a box-like manner. These tubes thus form in their entirety a vertical boiler, which is inclosed by the outer casing of the fire-box.

In the accompanying drawings, Figures 1 to 3 are respectively a longitudinal section, a vertical cross-section, and a partial horizontal section of a steam-generator provided with a fire-box of this kind. Figs. 4, 5, and 6 are separate views illustrating the attachment of the tubes to one another, and Figs. 7, 8, 9, and 10 are longitudinal and cross sections illustrating different forms of steam-collectors and their connection with the longitudinal boiler. Fig. 11 shows the connections of the fire-box tubes made in two parts with the forward head of the steam-collector, and Figs. 12, 13, and 14 represent a modified form of arrangement of the generator shown in Figs. 1 to 3.

The fire-box, which forms the vertical boiler H and is connected with the fire-tube boiler R and with the steam-collector D, is surrounded by an air-tight jacket M, which is, however, not subjected to steam-pressure and

can therefore be made of thin metal plate. Its walls are provided at their lower portions with a horizontal angle-iron frame *a*, which may, however, be inclined toward the rear wall of the fire-box. In this frame there is mounted right and left the bottom tube *b*, which may be made in one or in two parts and which is suitably bent.

The bottom tube, which when made in two parts is closed under the fire-door, opens by means of the cleaning-union *c* in the rear wall of the vertical boiler, or it may be so arranged as to open in the longitudinal boiler either direct or by means of a water-pocket.

The bottom pipe is provided on its upper side and along its whole length with screwed unions *u*, which are situated very close together. The unions, which are situated symmetrically on both sides of the vertical central plane of the fire-box, are connected in pairs by means of bent pipes *d'* *d''*, which, if necessary, may be made in two parts (see Fig. 11) and which extend upward along the walls of the outer jacket M and along the domed top of the same. The pipe *d'*, which is situated nearest to the longitudinal boiler R and which may be made in two parts, extends close along the tube-plate of the same and leaves the fire-tube openings in the said tube-plate free. The next following pipes *d''* *d'''* *d''''* are situated close together, and their upper bent portions are made either all of the same height to suit the form of the top of the jacket or they are arranged gradually deeper toward the front wall.

Along the front wall the pipes are arranged in concentric rows, the innermost one of which surrounds the fire-door opening. Spaces *y* and *y'* are left free under the fire-door and at the rear wall of the fire-box are lined with fire-bricks, but may be diminished or even entirely dispensed with by suitable arrangements of the pipes.

The connections are preferably effected by means of sleeve-nuts having right and left hand threads or by a tight joint being made by means of rings or of a packing of copper wire. They are screwed upon the (if necessary) contracted ends of the fire-box tubes *d'* *d''* and upon the unions of the bottom tube. The sleeves can be fixed in their tightened-up position by means of screwed pins *v*. The

fire-box tubes may also be simply expanded in the bottom tube if on the opposite side of the bottom tube suitable apertures will be provided.

5 For the purpose of preventing a warping of the fire-box tubes and the radiation of large quantities of heat to the exterior the said tubes are provided each with two ribs r , Fig. 5, which are screwed or riveted to the adjacent ribs of the adjacent tubes with intermediate packings. When using rolled tubes, they are provided with lugs l , Fig. 4, which are welded or brazed thereto. In the latter case the jointing is preferably effected in the manner shown in Fig. 6 and is calked moderately on both sides.

Each fire-box tube carries at its highest point a discharge-pipe e or e' e^2 e^3 , leading to the steam-collector. The discharge-pipe e , 20 issuing from the front wall, may be arranged to open into a casing i , which communicates with the water and steam space. When the fire-box tubes are made in two parts, each part of the tube may be provided with a discharge-pipe or may be arranged to open direct in the steam-collector or in its forward head by suitably bending the fire-box tubes. (See Fig. 11.) The highest fire-line f , Fig. 1, is determined by the highest places of contact of the fire-box tube d' d^2 , &c. 30

Water is supplied from the water-pocket s or the longitudinal boiler by means of the pipes h . The boiler can be completely emptied by means of pipes g , which branch off from the bottom tube and which lead to the discharge-cock t . When the bottom tube opens direct into the longitudinal boiler or into the water-pocket of the same, water-discharge cocks may be arranged on both sides 40 of the tube.

The grate is arranged in such a manner that its surface k k' is situated above the pipe-couplings. The fire-screen may be mounted upon the masonry of the rear wall y' .

45 The space between the walls of the jacket M and the tubes d' d^2 , &c., may be either filled up with insulating material—such as asbestos, slag-wool, or kieselguhr—or may be utilized for consuming smoke. In the latter case there are bored at the places of contact of the fire-box tubes numerous small holes n , Figs. 4 and 5, which serve to connect the air-space between the wall of the jacket and the fire-box tubes with the fire-space. On both 55 sides of the vertical boiler there is provided above the frame a a slide or damper S , which allows the outer air to enter between the jacket and the tubes, and which air after having been highly heated is blown into the fire in the form of fine jets from all sides, the amount of air being regulated by the position of the damper. This air, which is drawn in through the damper-apertures q and which is highly heated by contact with the walls of the fire-box tubes, effects the most perfect 65 possible combustion of the smoke-gases. To increase this action, there is preferably pro-

vided a fire-screen, the masonry of which is built of hollow bricks, the recesses of which communicate with the air-space z , situated 70 behind the masonry, while their sides facing the grate are provided with small holes.

The steam-collector D is preferably provided with a forward head V , into which the steam is discharged by the pipes d' d^2 , &c. 75 On this forward head any suitable number of washing-out holes may be provided. The steam-collector may also be provided with a dome and is either mounted directly upon the longitudinal boiler R , as shown in Figs. 80 1 and 2, or it is made of cylindrical shape, as shown in Figs. 7 and 8, or it is mounted saddle fashion over the longitudinal boiler, as shown in Figs. 9 and 10.

In the modified form shown in Figs. 12 to 85 14 the arrangement of a separate steam-collector is dispensed with, the forward head V being fitted direct upon the tube-wall of the fire-box, which similarly to the arrangement previously described is surrounded by a 90 jacket.

I claim—

1. The combination with a tubular boiler, of a fire-box having its side, top and front walls formed of closely-arranged pipes, the 95 upper and lower terminals of which respectively communicate with the steam and water spaces of the boiler, the pipes constituting the front wall of the fire-box arranged to leave a fuel-feed opening above the grate, and the pipes nearest the tube-sheet of the boiler fitting snugly against said sheet, for the purpose set forth. 100

2. The combination with a tubular boiler, of a fire-box having its side, top and front 105 walls formed of closely-arranged pipes, the upper and lower terminals of which respectively communicate with the steam and water spaces of the boiler, the pipes constituting the front wall arranged to form a fuel-feed 110 opening above the grate, the pipes nearest the tube-sheet of the boiler fitting snugly against the same, said pipes having flat contacting faces to form practically tight joints between them, for the purposes set forth. 115

3. The combination with a tubular boiler and its fire-box, having its side, top and front walls formed of closely-arranged pipes, the upper and lower terminals of which respectively communicate with the steam and water 120 spaces of the boiler, the pipes constituting the front wall arranged to form a fuel-feed opening above the grate, and the pipes nearest the tube-sheet of the boiler fitting snugly against said sheet, of a jacket inclosing the 125 fire-box to form a chamber between them, said jacket provided in its side wall with air-openings in register with like openings formed between the pipes forming the side wall of the fire-box, and a regulating-slide for controlling the admission of air to said chamber, 130 for the purposes set forth.

4. The combination with a tubular boiler, its fire-box constructed of pipes in close con-

tact with one another and with the tube-sheet of the boiler, the upper and lower ends of said pipes respectively in communication with the steam and water spaces of the boiler, and air-ports between the pipes constituting the side wall or walls of the fire-box, opening into the latter above the grate; of a jacket inclosing the fire-box to form an air-chamber between the two, air-ports in the side wall or walls of said jacket, and means for controlling the passage of air through the jacket-ports, for the purpose set forth.

5. The combination with a tubular boiler, of a fire-box whose top, side and front walls are formed of pipes in close contact with one another and with the tube-sheet of the boiler, and arranged to form an arched roof, the highest and lowest point of the pipes in communication with the steam and water spaces of the boiler respectively, the pipes constituting the front wall of the fire-box arranged to leave a fuel-feed opening, for the purpose set forth.

6. The combination with a tubular boiler, of a fire-box the top, side and front walls of which are formed of pipes having flat contacting faces and bolt-flanges projecting therefrom, and a packing between said contacting faces and bolt-flanges except at points along one or both sides and above the upper face of the grate to form air-ports; of a jacket inclosing the fire-box to form an air-chamber between the two, air-ports in the side wall or walls of the jacket, means for controlling the air passing through said ports and means for connecting all the pipes at their highest and lowest points respectively with the steam and water spaces of the boiler, for the purpose set forth.

7. The combination with a tubular boiler; of a fire-box whose top, side and front walls are composed of pipes in close contact with one another and with the tube-sheet of the boiler, rearwardly and downwardly inclined pipes to which the lower ends of the wall-pipes are connected, said rearwardly-inclined pipes connected at their rear end which lies below the water-space of the boiler with said water-space at its lowest point, means for connecting the wall-pipes at their highest points with the steam-space of the boiler, and means at the lowest point of the inclined pipes for discharging the water therefrom and consequently from the boiler, for the purpose set forth.

8. The combination with a tubular boiler, its fire-box having its top, side and front walls formed of pipes in close contact with one another and with the tube-sheet of the boiler, and means for connecting the lower ends of said pipes with the water-space of said boiler; of a steam-collector to which the upper end of the wall-pipes are connected, said collector in communication with the steam-space of the boiler, substantially as and for the purpose set forth.

9. The combination with a tubular boiler, its fire-box having its top side and front walls formed of pipes in close contact with one another and with the tube-sheet of the boiler, means for connecting the lower ends of said pipes with the water-space of said boiler, and a jacket encompassing the fire-box to form an air-chamber between them; of a steam-collector arranged outside the jacket and communicating with the steam-space of the boiler, and pipe connections between the upper ends of the fire-box wall-pipes and said collector, substantially as and for the purpose set forth.

10. A locomotive-boiler provided with a fire-box whose top, side and front walls are formed by pipes in such close contact with one another and with the tube-sheet of the boiler as to form substantially air-tight walls, the highest and lowest points of said pipes respectively connected with the steam and water spaces of said boiler, a jacket inclosing the fire-box to form an air-tight chamber between them; in combination with a rearwardly and downwardly inclined grate whose lowest point lies below the water-space of the boiler, a fire-bridge projecting forwardly and upwardly from the lower part of the tube-sheet of the boiler into the fire-box and having longitudinal passages open at one end to the atmosphere and transverse passages leading from said longitudinal passages and opening into the fire-box, and means for admitting air to the aforesaid air-chamber and thence to the fire-box through its side wall or walls along the upper surface of the grate, for the purpose set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

JOHANN BROTON.

Witnesses:

ALVESTO I. HOGUE,
AUGUST FUGGER.