

No. 681,623.

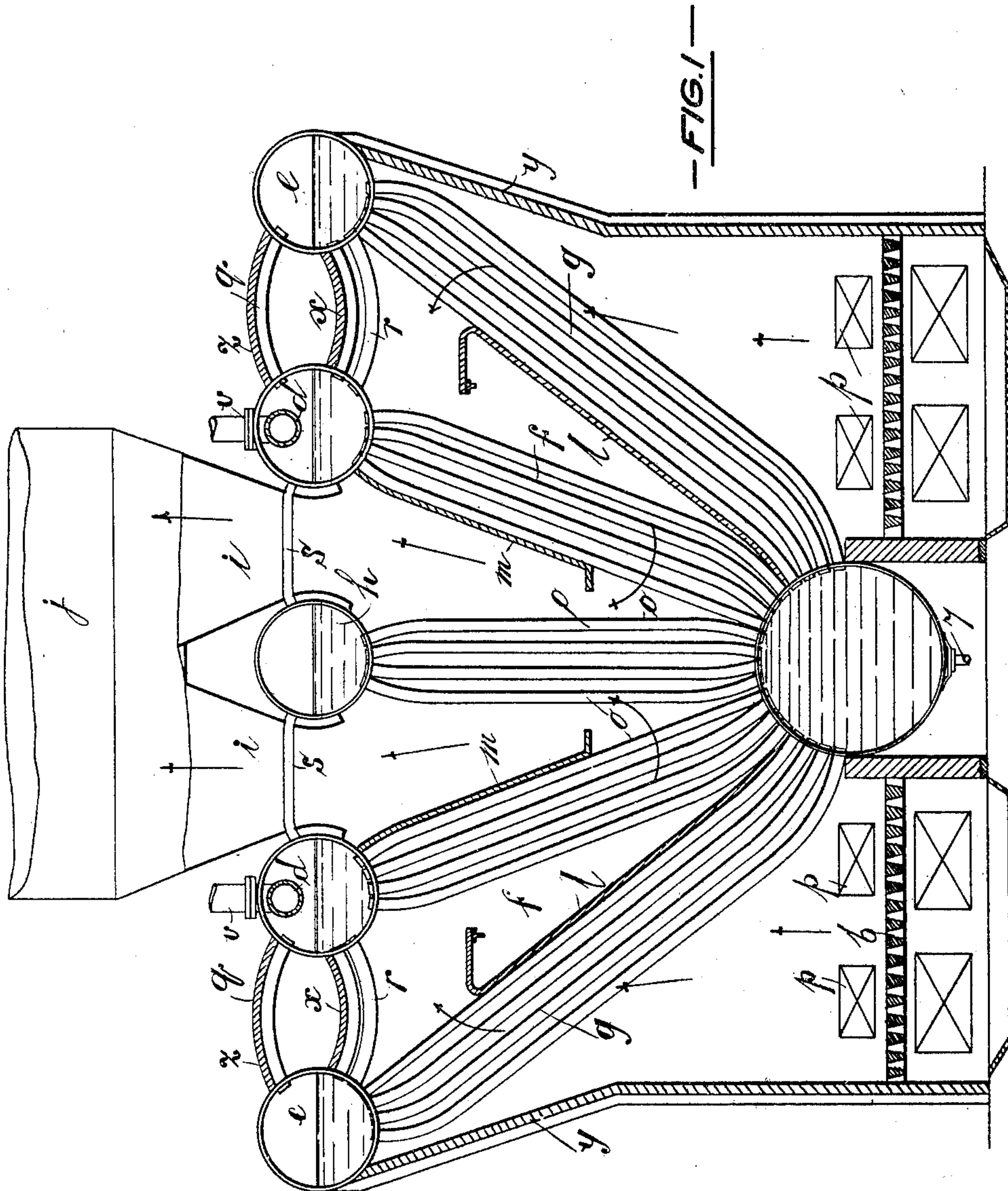
Patented Aug. 27, 1901.

J. COWAN.
WATER TUBE BOILER.

(Application filed Mar. 28, 1901.)

(No Model.)

7 Sheets—Sheet 1.



Attest:
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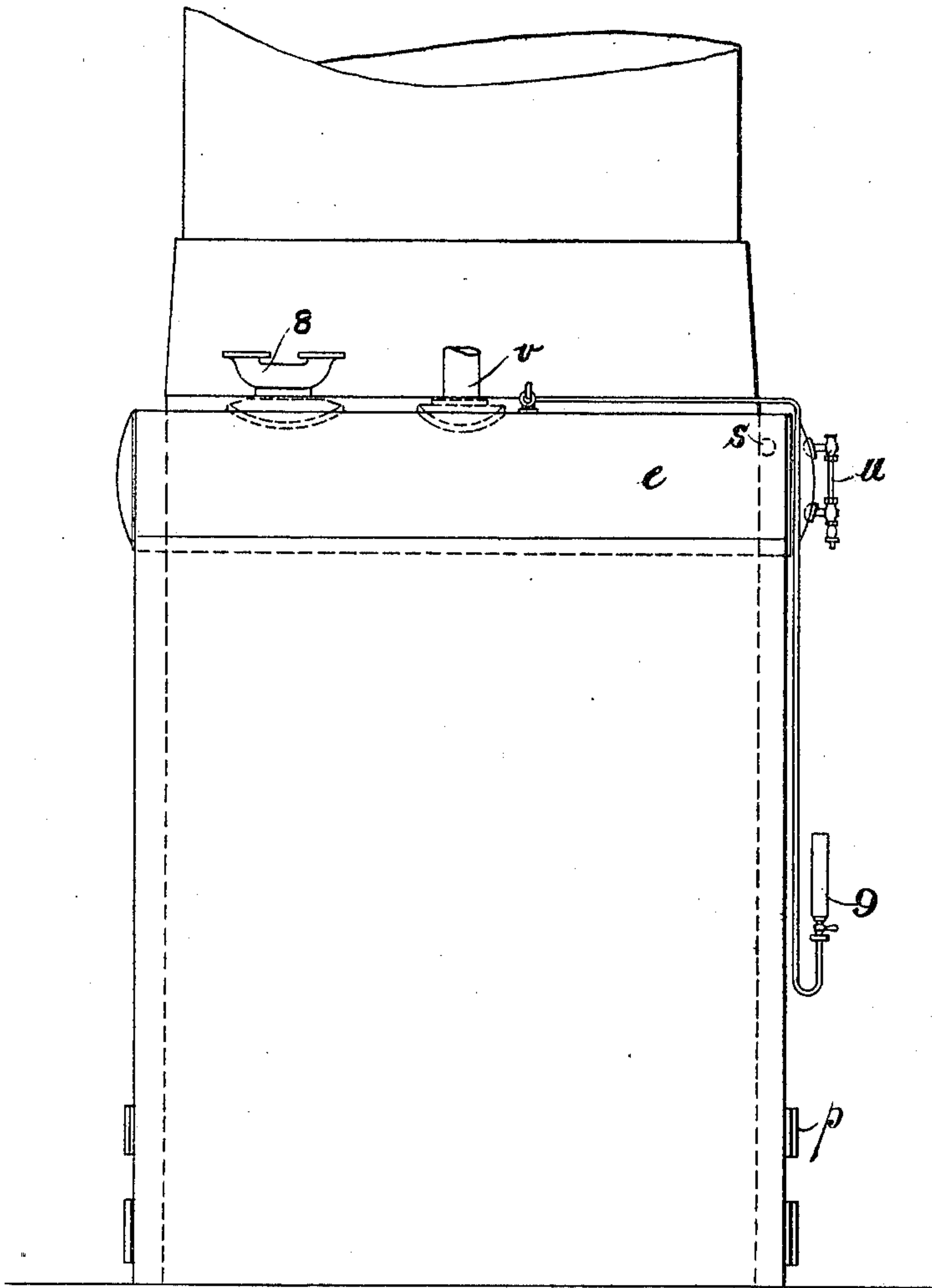
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— FIG. 2 —

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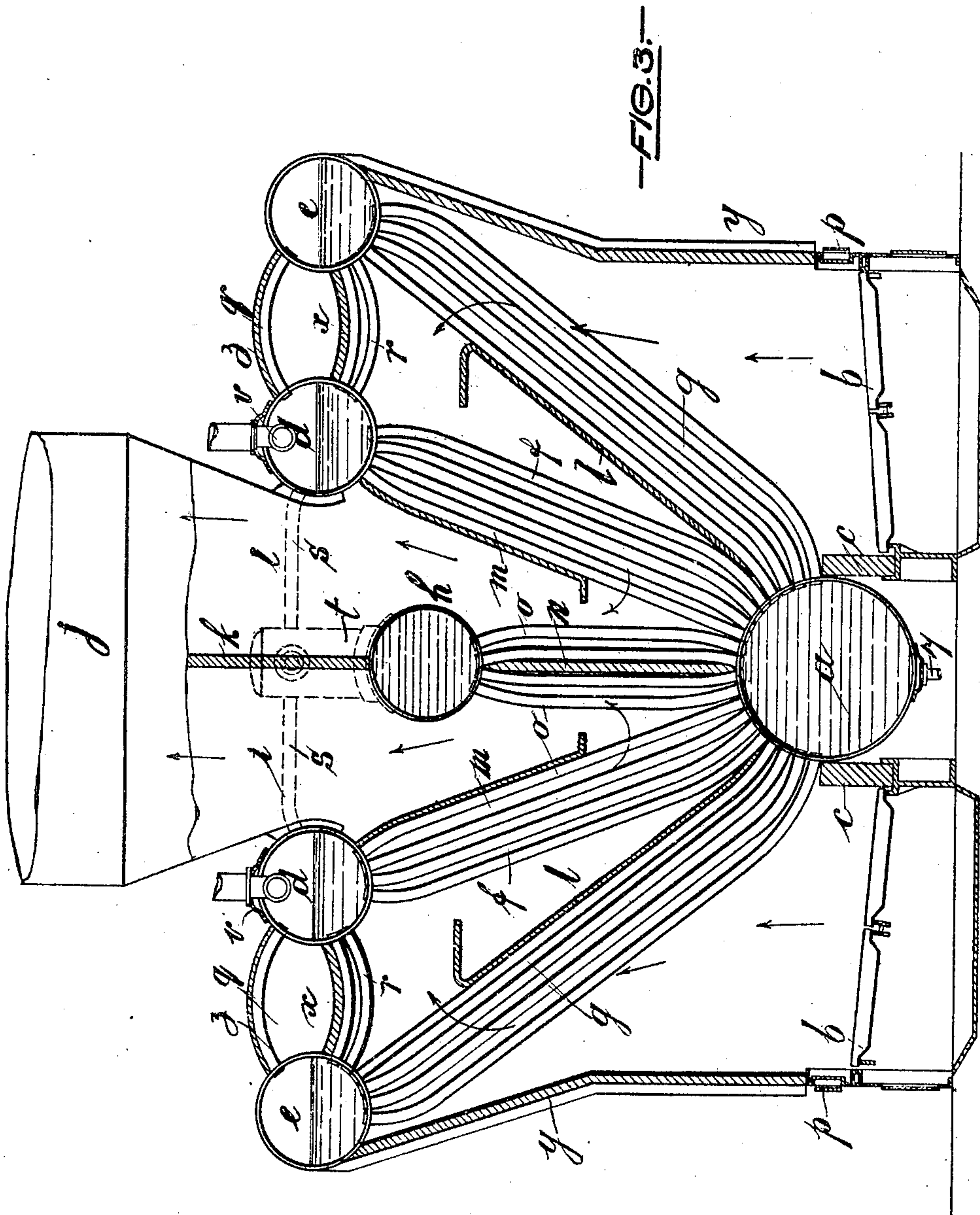
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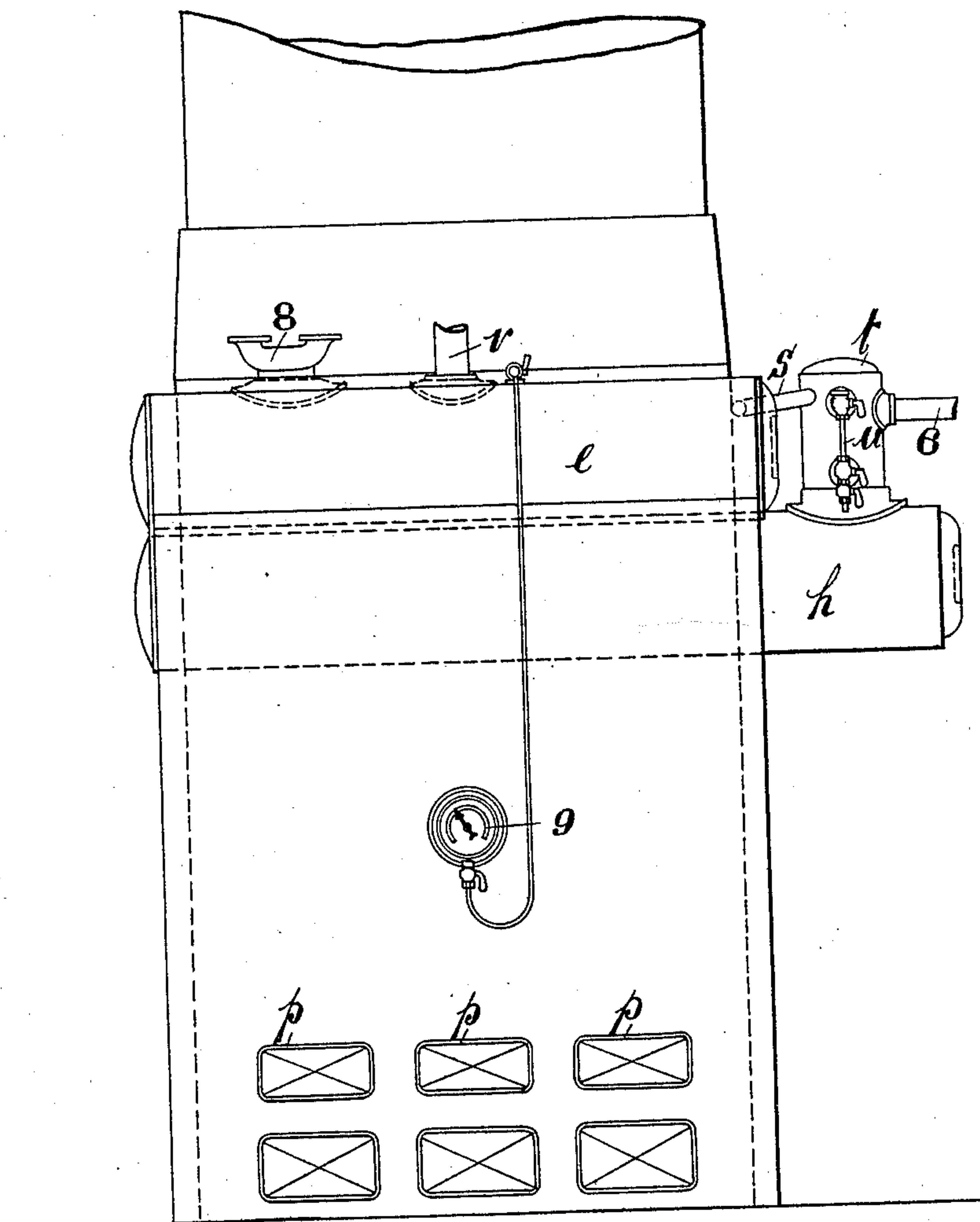
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(No Model.)



—FIG. 4—

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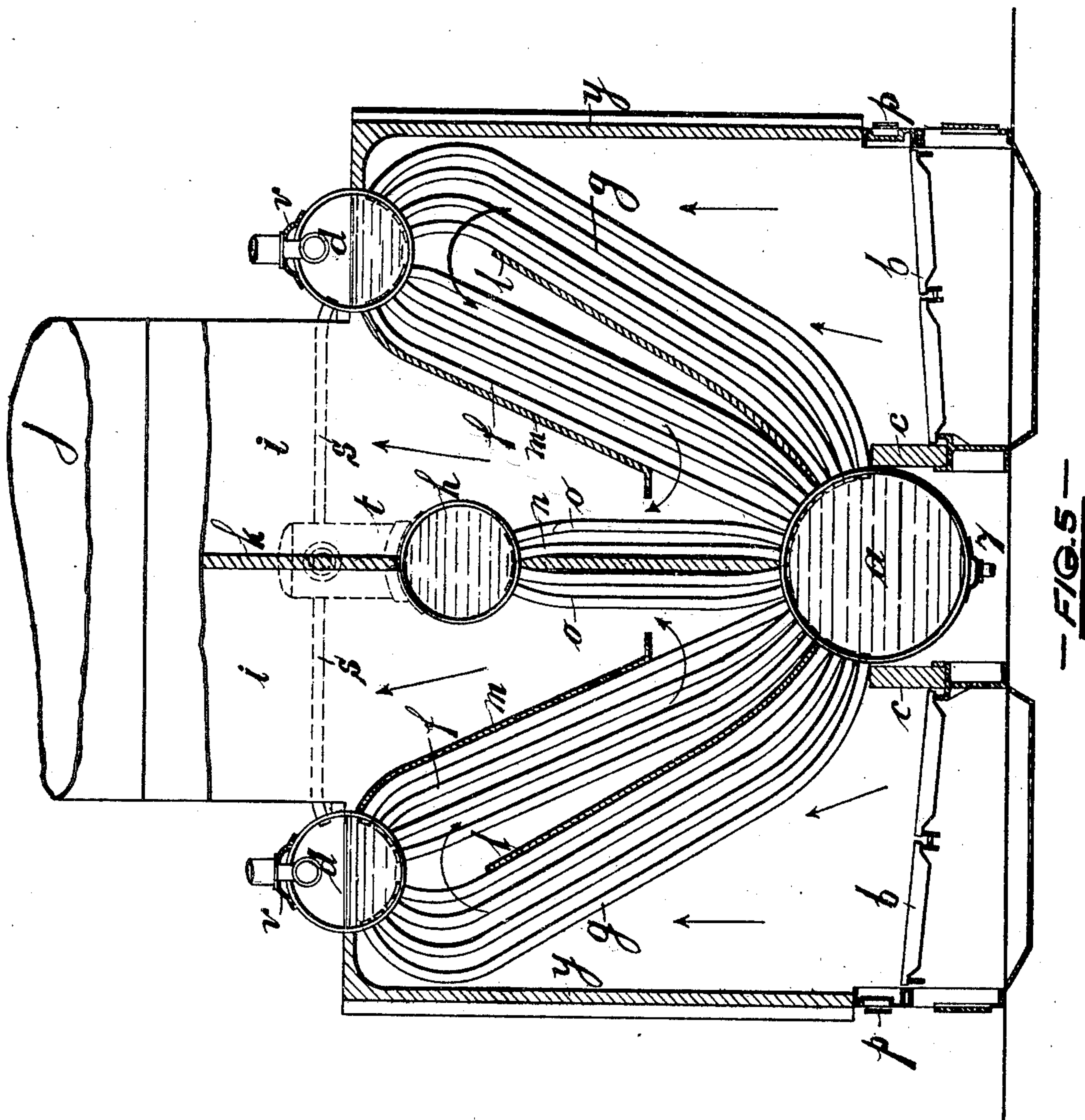
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(Application filed Mar. 28, 1901.)

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7 Sheets—Sheet 5.



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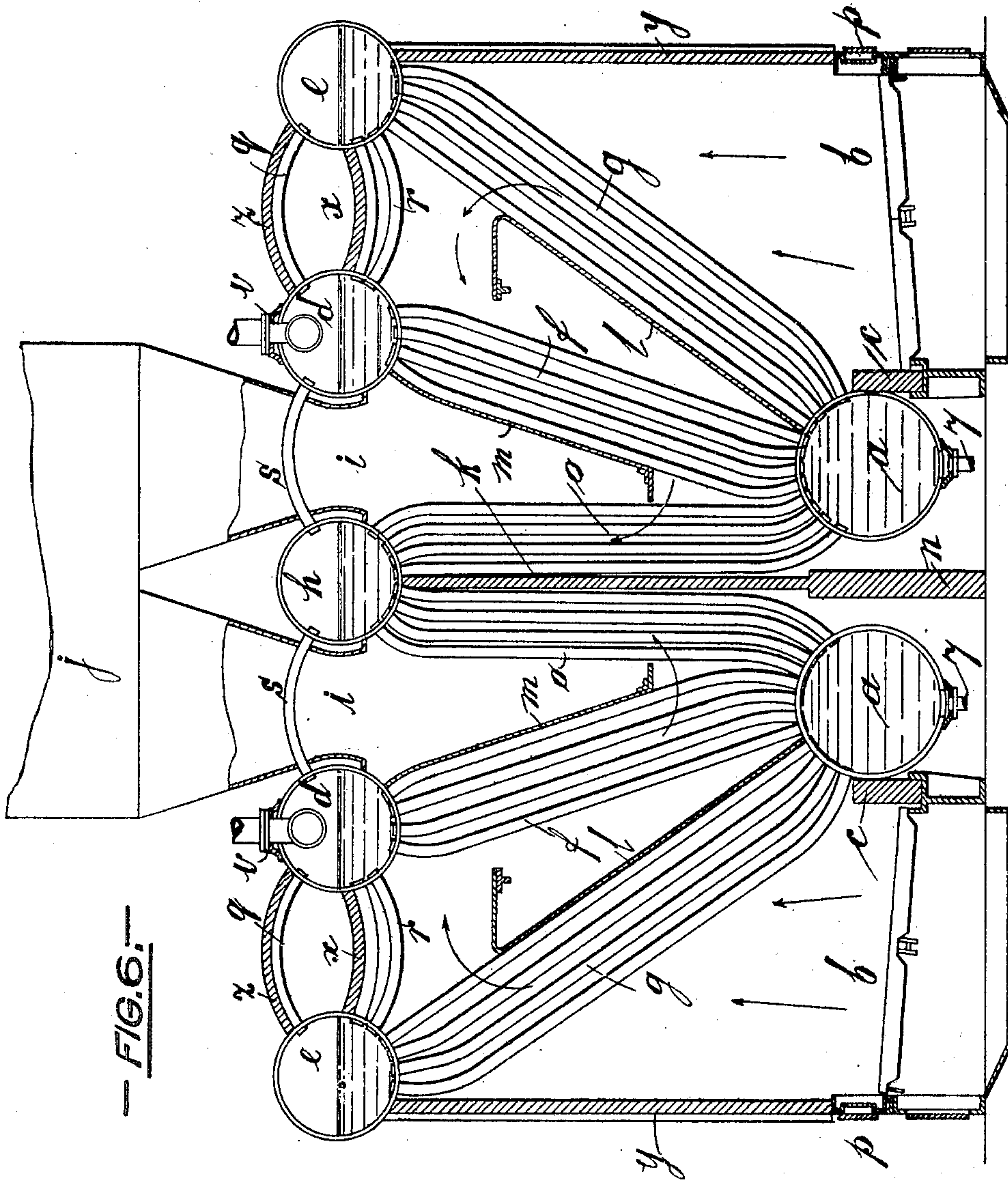
Patented Aug. 27, 1901.

J. COWAN.
WATER TUBE BOILER.

(Application filed Mar. 28, 1901.)

(No Model.)

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— FIG. 6. —

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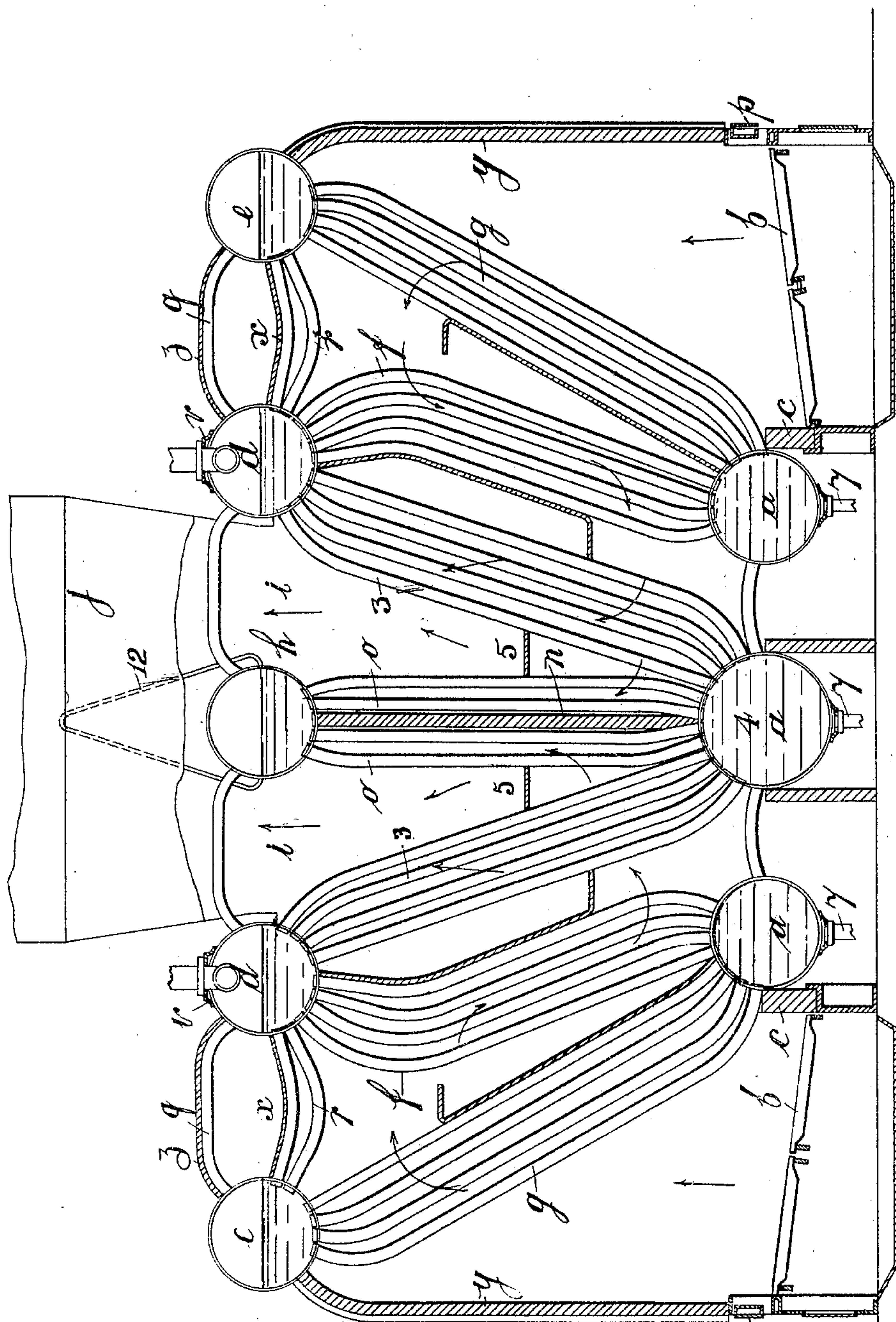
Patented Aug. 27, 1901.

J. COWAN.
WATER TUBE BOILER.

(Application filed Mar. 28, 1901.)

(No Model.)

7 Sheets—Sheet 7.



UNITED STATES PATENT OFFICE.

JOHN COWAN, OF EDINBURGH, SCOTLAND.

WATER-TUBE BOILER.

SPECIFICATION forming part of Letters Patent No. 681,623, dated August 27, 1901.

Application filed March 28, 1901. Serial No. 53,351. (No model.)

To all whom it may concern:

Be it known that I, JOHN COWAN, managing director of the Stirling Boiler Company, Limited, a subject of the King of Great Britain and Ireland, residing at 2 St. Andrew Square, Edinburgh, Scotland, have invented certain new and useful Improvements in Water-Tube Boilers, (for which I have made application for patent in Great Britain, No. 17,328, bearing date September 29, 1900,) of which the following is a specification.

My invention relates to improvements in water-tube boilers in which the main part of the heating-surface consists of tubes joining a number of upper steam and water drums with lower water-drums, and relates more especially to a new type of boiler of that general class adapted for shipboard. Owing to the comparatively limited space available for boilers in steamships and to the various conditions which restrict the possible arrangements of boilers—such, for instance, as the necessity for fore and aft firing and for getting satisfactory disposition of the uptake between the top of the boiler and the root of the funnel, while retaining a very low temperature of the flue-gases—it becomes very difficult to construct a boiler having both a very large heating-surface and a very large grate area which will comply with all the necessary conditions.

My invention has for its object to construct a simple boiler fulfilling these conditions.

My invention consists in an improved form and construction of boiler fired from both ends or sides, such boiler having a lower water-space constituted by one or more drums longitudinally disposed between the two fire-grates, an upper steam and water space constituted by drums symmetrically disposed on each side of a central feed-drum, which latter may or may not be on the level of the upper drums, the main heating-surface being formed by banks of tubes connecting the upper and lower drums, and a smoke-stack or exit-flue arranged to occupy the spaces between the upper drums and the central feed-drum.

Referring now to the accompanying seven sheets of drawings, Figure 1 is a vertical section, and Fig. 2 a front elevation, of the first modification of my improved boiler. Figs. 3

and 4 are vertical section and front elevation, respectively, of a modified form of the boiler shown in Figs. 1 and 2; and Fig. 5 is a vertical section of another form of the same boiler. Figs. 6 and 7 are vertical sections of a second and third modification, respectively, of my improved boiler.

The same letters and numerals of reference are used to indicate similar parts throughout the several figures of the drawings.

In carrying my invention into effect according to the first modification (illustrated in Figs. 1 and 2) I construct a double-ended marine boiler with one central bottom water-drum *a*, which lies between the two fire-grates *b*, only a fire-brick partition *c* being provided on each side between the grates *b* and the drum *a*. Above each grate *b* I dispose two steam and water drums *d* and *e* and connect these each, respectively, by banks of tubes *f* and *g* with the lower water-drum *a*. Immediately over this drum *a* and at or about the same level as the steam and water drums *d* and *e* I arrange a feed-water drum *h*. In order to shield the upper part of this feed-water drum from the hot gases in their passage to the smoke-stack *j*, I provide shield-plates *l*, which also divide the space between the drums *d* and *h*, forming the uptake, into two divisions *i*, leading to the smoke-stack *j*. The fire-grates *b* may be placed at each side of the boiler, as shown in Fig. 1, or, if preferred, at the end, as seen in Fig. 3. I arrange fire-resisting baffle-plates *l* and *m*, in some cases steel baffle-plates, and a central partition *n*, so that the furnace-gases from each fire must pass, as indicated by the arrows in Fig. 1, up through the first bank of tubes *g*, down through the second bank of tubes *f*, up through one half of the tubes *o*, connecting the bottom drum *a* and the feed-water drum *h*, and thence to the smoke-stack *j*. The breadth of the boiler may be extended to any desired degree, and both the grate area and the heating-surface thereby increased to a corresponding extent.

To save space where a series of boilers have to be placed in double stoke-holes, I may, as shown in Figs. 1 and 3, so arrange the boiler that the front drum *e* and the upper portion of the furnace-front *y* on each side somewhat overhang, the height of the over-

hanging portions being such that they will not interfere with the handling of the fuel in the stoke-hole. The steam and water drums d and e of each pair I connect together above and below the water-level by suitable banks of tubes q and r , respectively, and these two pairs I connect together by pipes s , entering the steam spaces only, such pipes being, as shown in Fig. 2, arranged outside the uptake-flue f . Above the banks of tubes r are partitions or walls x of refractory material, which prevent the furnace-gases having access to the pipes q , while above the banks of tubes q are inclosing walls or casings z . For drawing off steam I provide on drums d steam outlets or nozzles having dry-pipes or suitable baffle-plates attached to them, or I may provide a steam nozzle or dome on one of the drums d and connect the other drum with this nozzle by a pipe clear of and outside the uptake i . I sometimes place the feed-water drum h at a lower level than the steam and water drums d and e , so that it shall be full of water. This modification is illustrated in Figs. 3 and 4. In this case I may arrange the feed-drum h to project beyond the drums a , d , and e , (see Fig. 4,) and on the projecting portion of the drum I may provide a dome t , on which the water-gages may be placed. The steam-spaces of the drums d may then be connected with the dome t by the pipes s . Since in this form of boiler the drum h is full of water, it is not necessary to shield it from the furnace-gases. The shield 12, Fig. 1, may be therefore dispensed with; but a division-wall k is provided along the length of the drum h , dividing the uptake i into two portions, so that the firing of either half of the boiler shall not seriously affect the firing of the other half. In other respects the boiler may be the same as that described with reference to Figs. 1 and 2. In some forms of my boiler having this lowered feed-water drum I may, however, arrange the dome t on the feed-water drum h without projecting the latter beyond the other drums; but in this case I form a suitable pocket or recess in the uptake-flue i to accommodate the dome, or I may put the water-gages on the drums d , and thus dispense altogether with a dome on the feed-drum. In some cases I may omit the drums e , as clearly shown in Fig. 5, and when this is done the tubes joining drums a and d are divided by the partition l to form the two banks of tubes f and g , as before. A lowered feed-water drum, as shown here, may be used; but one such as is shown in Fig. 1 is preferable, while the fire-doors may be placed either at the sides or ends of the boiler, as desired.

According to a second modification, as illustrated in Fig. 6, I may increase the heating-surface of the boiler by dividing the bottom water-drum a into two smaller water-drums, the arrangement of the boiler otherwise being left the same. This enables the number of the tubes o between the feed-water drum h and the lower water-drums a to be practically

doubled, as a separate bank of these tubes now passes from the feed-drum to each of the water-drums a .

According to a third modification, where I desire to still further increase the heating-surface I provide the bottom water-space, as shown in Fig. 5, in the form of three separate drums a . This enables an extra bank of tubes 3 to be provided between the steam and water drum d on each side and the central drum 4 of the lower water-drums a . In this case the central drum 4 also acts more effectively as a mud-drum, providing a comparatively quiescent space, in which mud or similar matter is deposited, such space being out of the most violent circulation. In this arrangement also I provide additional baffle-plates 5 for directing some of the furnace-gases through the tubes o .

The hereinbefore-described boilers are provided with the necessary feed-water inlets 6, blow-off outlets 7, safety-valves 8, and steam-pressure gages 9, the safety-valves 8 and pressure-gages 9 being mounted on or connected to the drums d or other suitable parts of the boilers. (See Figs. 2 and 4.)

My improved boilers may be used for land purposes where an exceedingly compact boiler having great capacity is desired.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a water-tube boiler adapted to be fired from both ends or sides, a single lower water-space, a feed-water drum and a steam and water space on each side above the water-space, tubes connecting the feed-water drum with all the steam and water spaces with the water-space below, and partition-walls adapted to divide the tubes into banks and form flues disposed symmetrically, one set to each fire-grate, as set forth.

2. In a water-tube boiler adapted to be fired from both ends or sides, the combination with a lower water-drum of a feed-water drum above them, tubes connecting the feed-water drum with the lower water-drum, a partition between these tubes dividing them into two equal sets, a plurality of connected upper steam and water drums symmetrically disposed relatively to the feed-water drum, banks of tubes connecting the steam and water drums above with the water-drum below, and partitions between the banks of tubes adapted to direct the furnace-gases through them to the uptake, substantially as set forth.

3. In a water-tube boiler adapted to be fired at both ends or sides, the combination with two lower water-drums of a feed-water drum above them, tubes connecting the feed-water drum with the two lower water-drums, a partition between these tubes dividing them into equal sets, a plurality of upper connected steam and water drums symmetrically disposed relatively to the feed-water drum, banks of tubes connecting the steam and

water drums above with the two water-drums below, and partitions between the banks of tubes adapted to direct the furnace-gases through them to the uptake, substantially as set forth.

5 4. In a water-tube boiler adapted to be fired at both ends or sides, the combination with a plurality of lower water-drums of a feed-water drum above them, tubes connecting the
10 feed-water drum with the lower water-drums, a partition between these tubes dividing them into equal sets, a plurality of upper connected steam and water drums symmetrically dis-

posed relatively to the feed-water drum, banks of tubes connecting these steam and
15 water drums above with the lower water-drums, and baffle-plates between the banks of tubes adapted to direct the furnace-gases through them to the uptake, substantially as set forth.

20 In witness whereof I have hereunto set my hand in presence of two witnesses.

JOHN COWAN.

Witnesses:

D. MACFIE,
ALEX SIMPSON.