

No. 872,077.

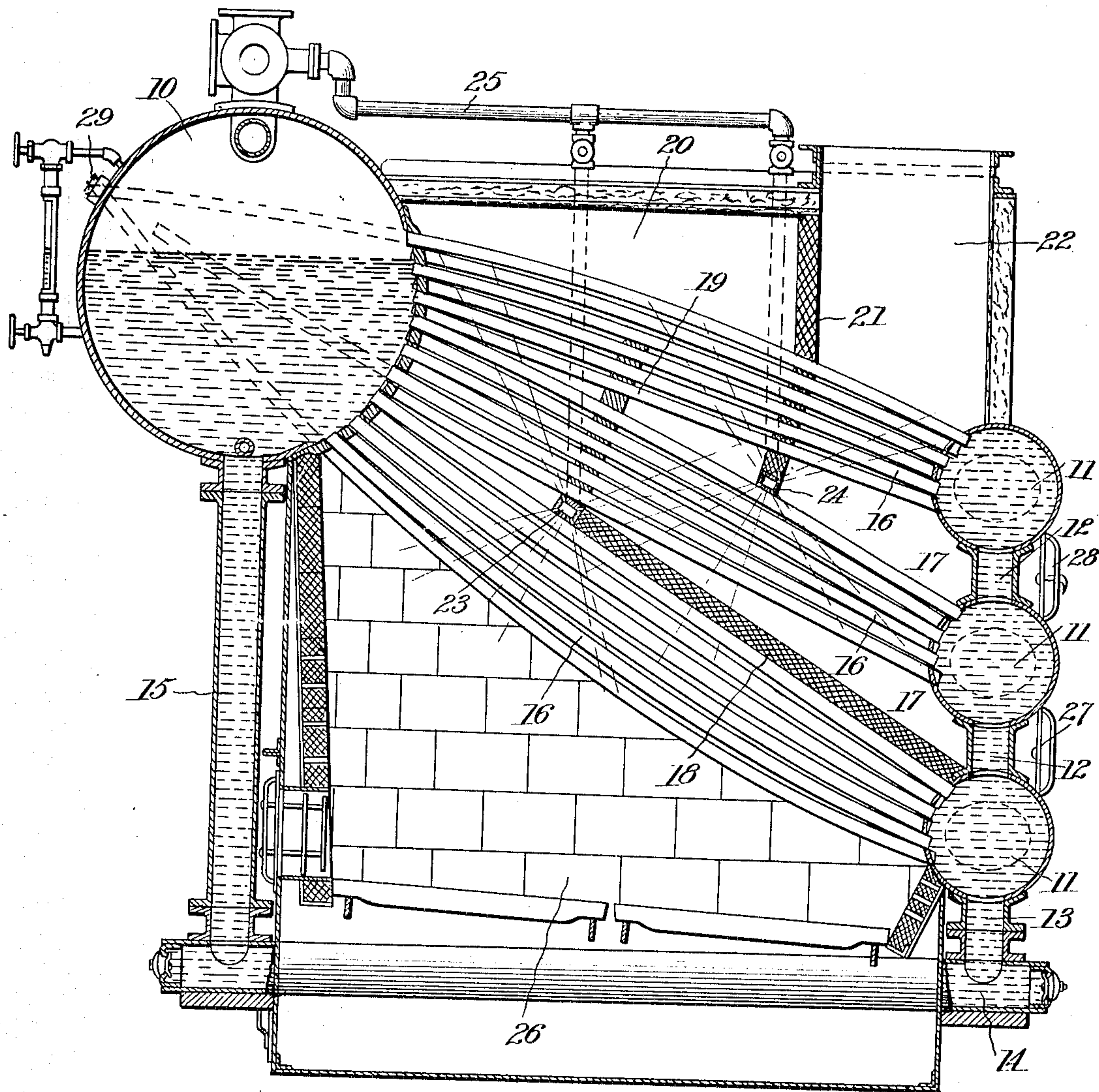
PATENTED NOV. 26, 1907.

C. D. MOSHER.
STEAM BOILER.

APPLICATION FILED DEC. 17, 1906.

3 SHEETS—SHEET 1.

Fig. 1.



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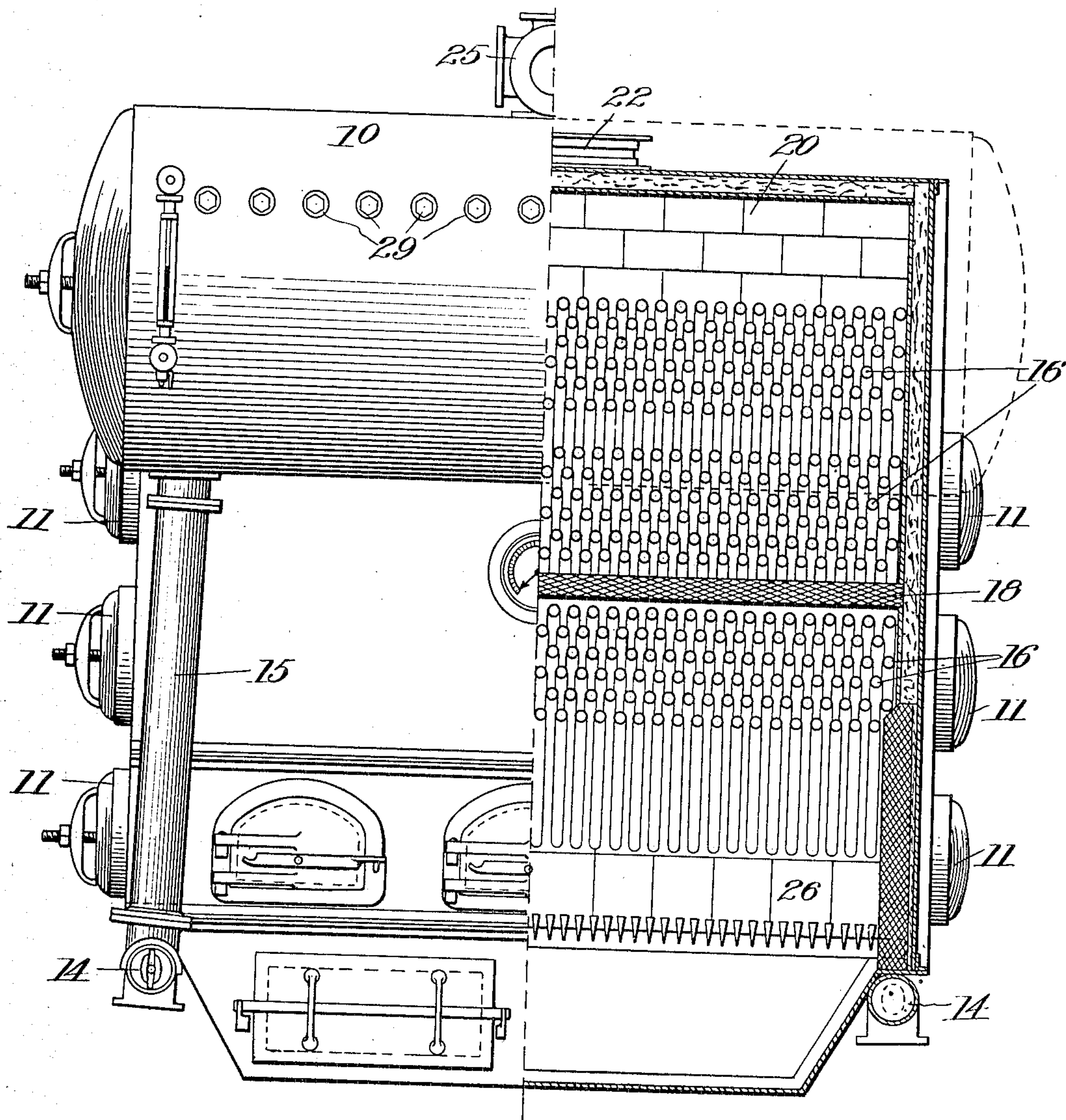
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3 SHEETS—SHEET 2.

Fig. 2.



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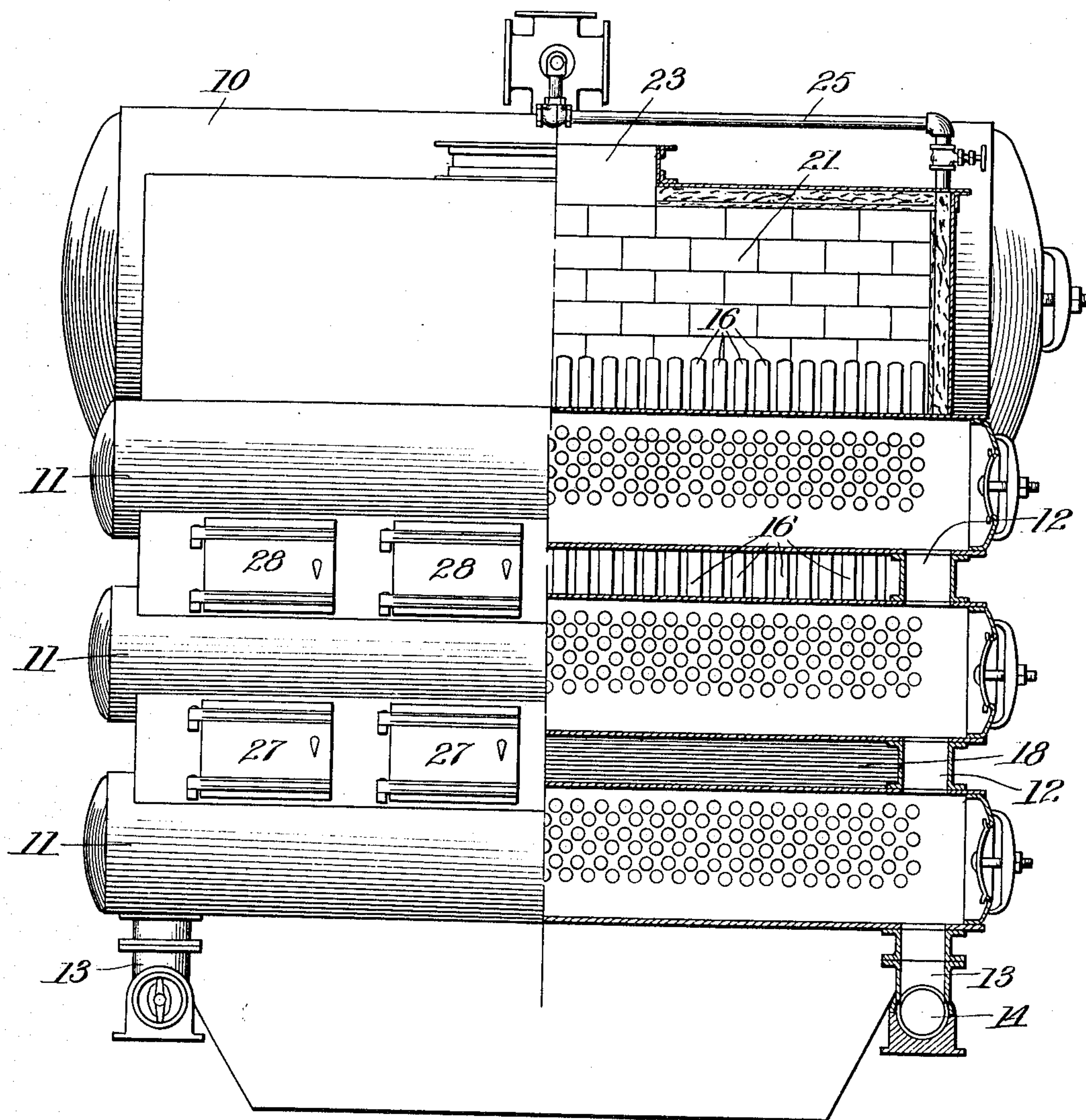
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3 SHEETS—SHEET 3.

Fig. 3.



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UNITED STATES PATENT OFFICE.

CHARLES D. MOSHER, OF NEW YORK, N. Y.

STEAM-BOILER.

No. 872,077.

Specification of Letters Patent.

Patented Nov. 26, 1907.

Application filed December 17, 1906. Serial No. 348,298.

To all whom it may concern:

Be it known that I, CHARLES D. MOSHER, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification.

This invention relates to the type of water-tube steam-boilers embodying a single transverse steam-and-water drum at the front of the boiler, a parallel water-drum structure at the rear of the boiler, and a series of inclined tubes connecting the water-drum structure with the steam-and-water drum. Although this style of boiler is light, simple, compact, highly efficient, and inexpensive to build, operate, and repair, some difficulty has heretofore been experienced in giving the furnace-gases a sufficient time-contact with the tubes, especially when running under forced draft, and it has also frequently been found necessary to flatten the tube-sheets of one or more of the drums in order to admit a sufficient number of straight or nearly straight tubes and lead them in substantially normal to the tube-sheets.

My improvements involve the subdivision of the water-drum structure into a plurality of drums of a smaller diameter than that of a single drum which would take the same number of tubes, thereby strengthening the water drums; permitting them to be made by a simple process of manufacture, allowing the total tube-group to be subdivided into a series of sub-groups with spaces between to permit soot accumulation and the introduction of baffles, permitting access to the interior of the tube-group through the water-drum structure, and spreading the rear end of the tube-group fan-wise to allow for straight or nearly straight tubes which will enter a cylindrical steam-and-water drum nearly at right-angles. This construction also facilitates the location of permanent blast-pipes for dislodging soot, and also enables the tubes to be withdrawn through a narrow zone of holes located in the front wall of the steam-and-water drum and provided with removable covers. Other incidental advantages will appear in the succeeding description.

Of the accompanying drawings, Figure 1 represents a vertical longitudinal section of a water-tube steam-boiler embodying my im-

provements. Fig. 2 represents a front elevation thereof, partly in section. Fig. 3 represents a rear elevation, partly in section.

The same reference characters indicate the same parts in all the views.

10 is the transverse horizontal steam-and-water drum located at the front end of the boiler and 11, 11 are three parallel horizontal cylindrical water-drums located in a vertical tier at the rear of the boiler and connected with each other (as here shown) by short vertical pipes 12 of large diameter near the two ends of the drums, giving the three drums a common water-space. The lowermost drum is connected by two short pipes 13 with two horizontal pipes 14 extending from front to rear along the sides of the boiler and connected at their front ends by two upright pipes or down-takes 15 with the steam-and-water drum 10, for providing an external return circulation. Other forms of connection between the drums may be substituted to accomplish the same purpose as the large-diameter pipes 13.

The evaporating-tube-group is composed of three sub-groups of tubes 16 connecting the three water-drums 11 with the steam-and-water drum 10 and having considerable upward pitch or inclination, the lowest group having the steepest pitch and the upper group the least pitch so that the entire group is spread somewhat fan-wise. This enables the upper ends of the tubes to enter the tube-sheet of the steam-and-water drum 10 very nearly normal or at right-angles without requiring said tube-sheet to be flattened or requiring any great curvature in the tubes, and also directs the tubes toward a narrow zone in the front wall of drum 10 through holes in which the tubes may be withdrawn as herein-after described. The water-drums 11 may also be cylindrical since each receives the ends of only a portion of the total number of tubes, and their small diameter strengthens them and permits their bodies to be made out of single-piece pipe if desired.

Between the three sub-groups of tubes 16 are two wedge-shaped open spaces 17 giving access to the interior of the group and affording space for the accumulation and withdrawal of soot and cinders. These spaces further constitute secondary chambers in which the gases distribute themselves and in which any unburned gases have an oppor-

tunity for completing their combustion without contact with the tubes, especially with long-flaming fuels or when operating under forced draft. In the lower space 17 is located a refractory baffle 18 overlying the lower sub-group of tubes and extending from the lower water-drum 11 about two-thirds of the distance toward the steam-and-water drum 10. From its upper edge an upright transverse baffle 19 extends across the middle sub-group of tubes and the upper free space 17 and part way across the upper group of tubes, for the purpose of leading the furnace-gases across the upper portions of all the tubes into a space 20 in the casing above the tube-group, from which the gases return downwardly across the upper sub-group of tubes and into the middle sub-group, thence around the lower edge of a second upright baffle 21 and upwardly across the rear portion of the upper sub-group of tubes into a stack 22 located at the rear of the boiler.

At the lower edges of the baffles 19 and 21 I prefer to locate permanent steam-blast pipes 23, 24 supplied with steam from a pipe 25 connecting with the steam-drum and having a series of steam outlets or perforations so directed as to sweep the tubes in practically all directions and dislodge any accumulation of soot or cinders. The dislodged dust will fall into the furnace 26 located below the water-tubes and into the lower free space 17 onto the baffle 18, from which it may be removed through doors 27 in the rear casing aligned with the space between the lower and middle water-drums 11. Similar doors 28 afford access to the space between the middle and upper drums to the upper free space 17. The blast-pipes 23, 24 may be squared as shown and rest for support on the upper rows of tubes in the two lower sub-groups, whereby they are also somewhat protected from burning out.

For the removal and replacement of tubes I prefer to provide a series of holes in the front shell of the steam-and-water drum 10 filled by removable covers 29 and so located with reference to the tubes 16 that a large number of tubes may be removed through any one hole. The covers 29 are shown as screw-plugs, but any suitable form of cover or filler may be used. The arrangement for withdrawal of tubes may be as in patent to Blechynden No. 658,615, showing a single row of holes for a group of curved tubes, or as in my Patent No. 657,783 showing straight tubes and several rows of holes, but in any case my present fan-wise arrangement of tubes enables the zone of holes to be narrowed.

It will be seen that the free spaces 17 in the interior of the tube-group afford increased facilities for manipulating the tubes in passing them through the plug-holes, and if it is not desired to provide holes for tube-

removal these interior spaces will still simplify the matter of obtaining access to an interior defective tube.

It will be noted that the location of transverse baffles 19, 21 and longitudinal baffle 18 as described, gives a long heating circuit to the gases and yet leaves the entire length of the lower sub-group of tubes accessible to the action of radiant heat from the furnace and the passage of the gases among these lower tubes. The joining of the ends of all of the water-tubes into a single steam-and-water drum has many advantages which have been demonstrated in steam-boilers, especially in the matter of free circulation, rapid liberation of steam bubbles into a single steam-space, and low cost of construction. It further affords a lofty combustion-chamber for the furnace and gives a steep pitch to the tubes, which promotes rapid circulation and egress of steam bubbles.

I am aware of British patent 23,777 of 1897 to Sampson, and U. S. patent 638,716 to Hoxie, and I do not claim what is disclosed in said patents. An advantageous effect due to my construction of elevated drum and the plurality of lower water-drums and the connecting water-tubes and the baffles, is not obtainable by either Sampson or Hoxie.

I claim:—

1. A water-tube boiler comprising a furnace, an elevated drum, a plurality of lower water-drums, a group of water-tubes connecting the elevated drum with the lower drums, and baffles for leading the gases upward among all of the tubes adjacent to the elevated drum and then downwardly among some of the same tubes.

2. A water-tube boiler comprising a furnace, an elevated drum, a plurality of lower water-drums, a group of water-tubes connecting the elevated drum with the lower drums and composed of sub-groups of tubes leading to the respective lower drums and located in successive positions with respect to the path of the furnace gases, and baffles for leading the gases upward among all of the tubes adjacent to the elevated drum and then downwardly among some of the same tubes.

3. A water-tube boiler comprising a furnace, an elevated drum, a plurality of lower water-drums, a group of water-tubes connecting the elevated drum with the lower drums and composed of sub-groups of tubes leading to the respective lower drums and located in successive positions with respect to the path of the furnace gases, baffles for leading the gases upward among all of the tubes adjacent to the elevated drum and then downwardly among some of the same tubes, and transverse blast-pipes located at the edges of said baffles and having steam outlets for directing a spreading steam-blast among the tubes.

4. A water-tube boiler comprising a furnace, an elevated drum, a plurality of lower water-drums, a group of water-tubes connecting the elevated drum with the lower
5 drums and composed of sub-groups of tubes leading to the respective lower drums and located in successive positions with respect to the path of the furnace gases, a baffle extending from the lower one of the plurality
10 of lower water-drums and located between the lowermost and next higher of the sub-groups of tubes, an upright transverse baffle extending from the upper end of the last

named baffle across most of the tubes of the upper groups, and a second upright baffle 15 extending across the rear portion of the upper sub-group of tubes and located between the first-mentioned upright baffle and the upper one of the plurality of lower water-drums.

In testimony whereof I have hereunto set 20 my hand in the presence of two subscribing witnesses, the 12th day of December, 1906.

CHARLES D. MOSHER.

Witnesses:

R. M. PIERSON,
G. BLAKE.