

No. 666,071.

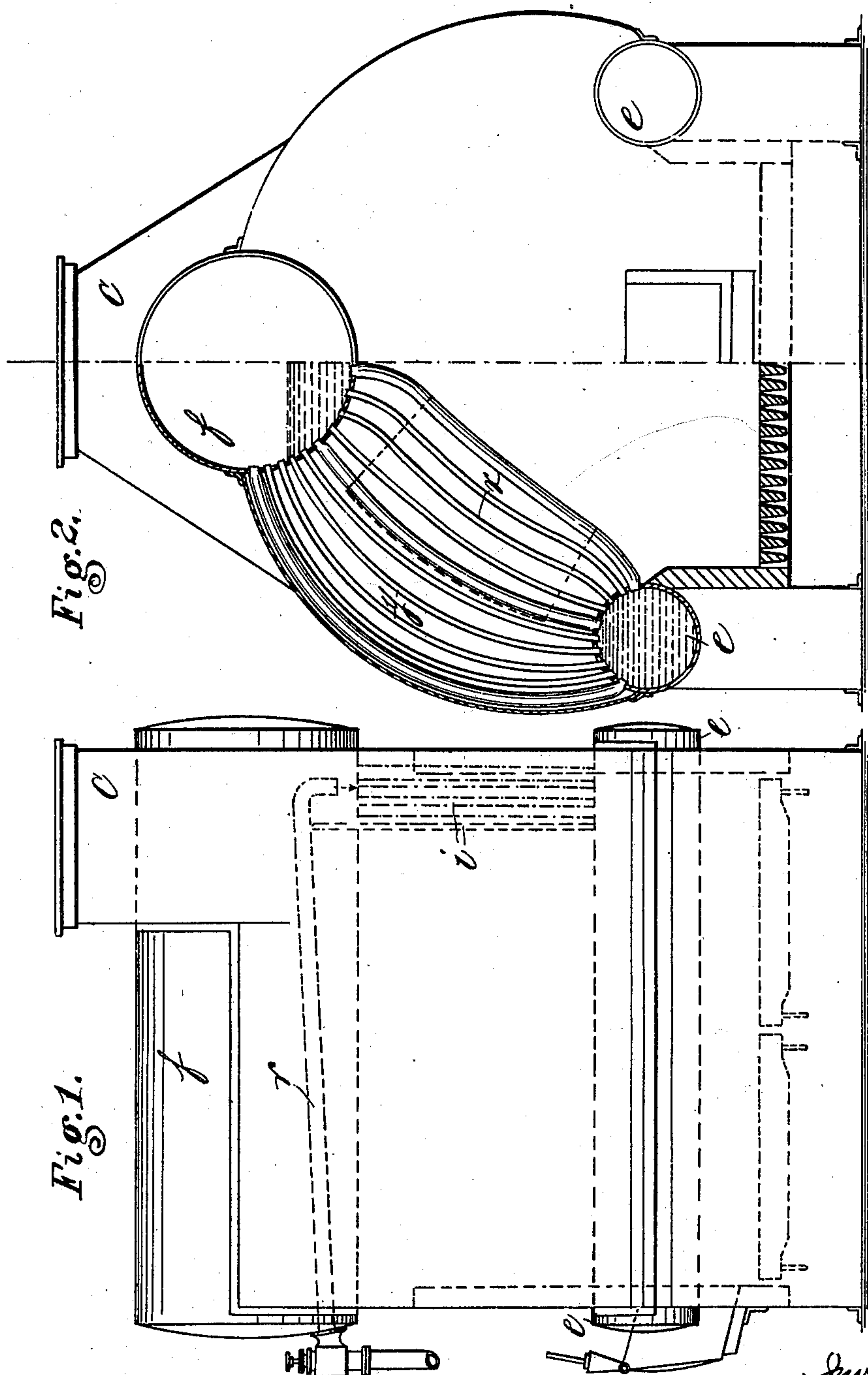
Patented Jan. 15, 1901.

R. SCHULZ.
STEAM BOILER.

(Application filed June 9, 1900.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses.
Attest
B. H. Sommers

Inventor.
Richard Schulz
by *[Signature]* atty.

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2 Sheets—Sheet 2.

Fig. 3.

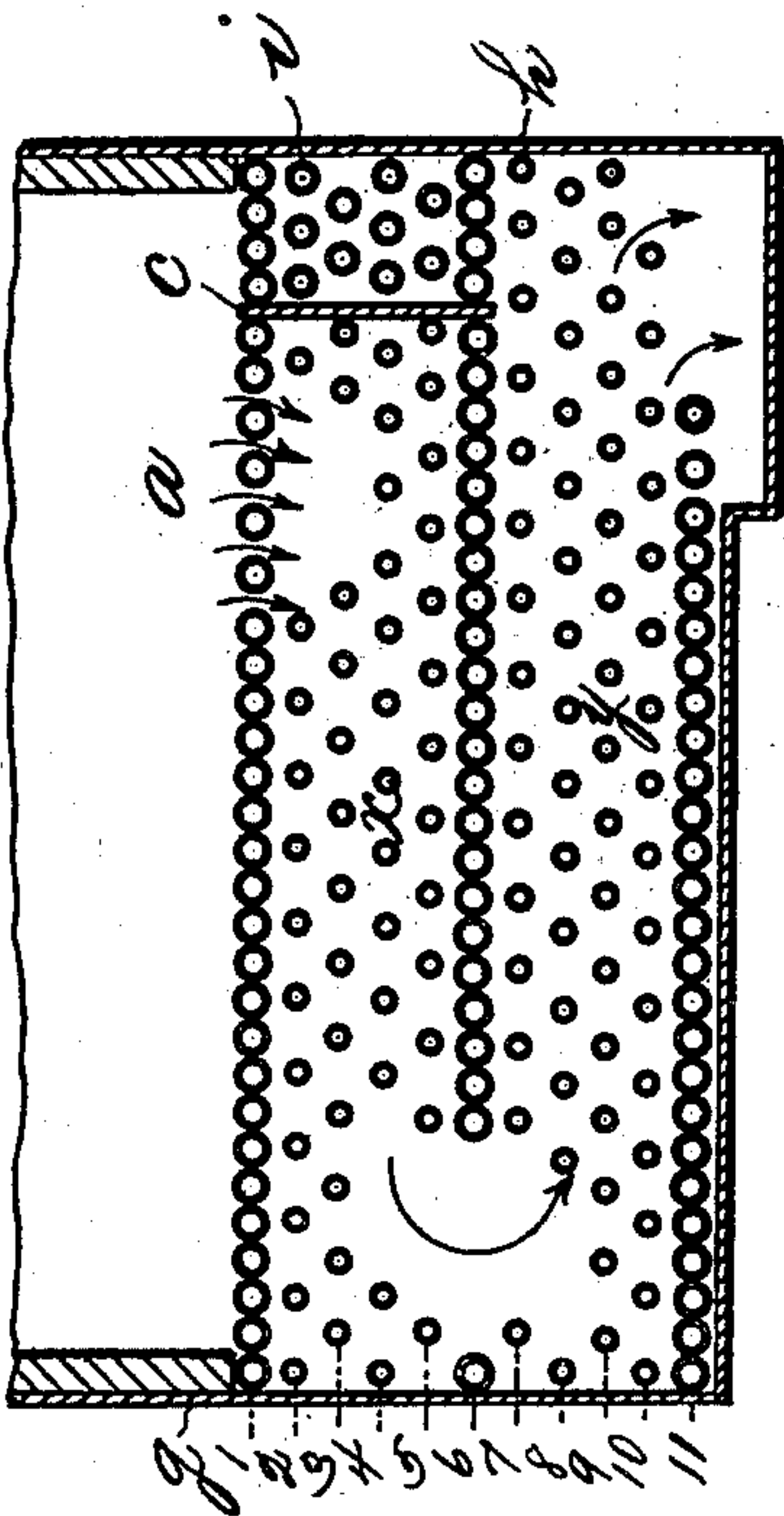
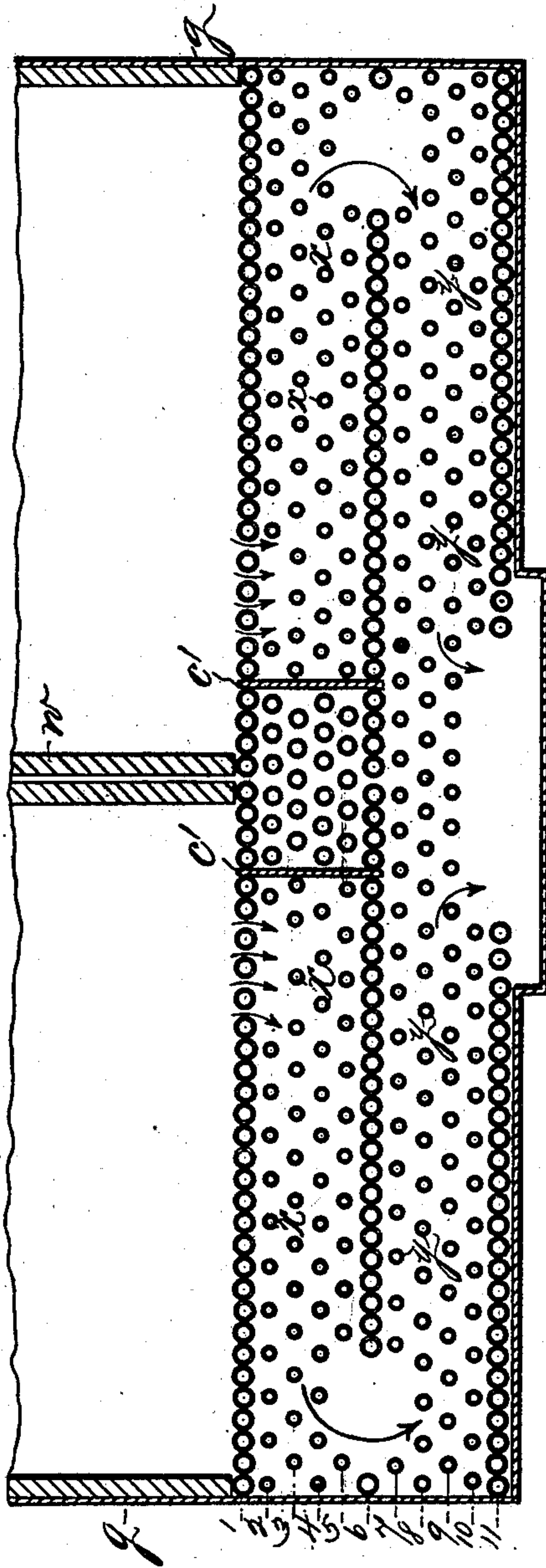


Fig. 4.



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UNITED STATES PATENT OFFICE.

RICHARD SCHULZ, OF BERLIN, GERMANY.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 666,071, dated January 15, 1901.

Application filed June 9, 1900. Serial No. 19,737. (No model.)

To all whom it may concern:

Be it known that I, RICHARD SCHULZ, a subject of the Emperor of Germany, residing at Berlin, Germany, have invented certain
5 new and useful Improvements in Steam-Boilers; 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
10 make and use the same, reference being had to the accompanying drawings, and to letters and figures of reference marked thereon, which form a part of this specification.

This invention has relation to water-tube
15 steam-generators of that type in which a plurality of boilers—namely, an upper and one or more lower boilers—are connected by tubes of comparatively small diameter, some of said tubes being arranged to form flue-walls for
20 the circulation among the tubes of the products of combustion from the furnace.

In order to induce a proper circulation of the water from the upper to the lower boiler or boilers, it has been the practice to connect
25 the same by circulating-tubes of comparatively large diameter located outside of the boiler casing or housing to protect the same against the furnace-heat. This arrangement presents, however, serious difficulties, the
30 boilers employed being usually made of comparatively thin sheet metal and of comparatively small cross-sectional area. While the apertures for the circulating-tubes are comparatively large relatively to said cross-sectional area, it becomes necessary to strengthen
35 the boilers at the point of connection with the circulating-tubes by providing the latter with abnormally large bolt-flanges, while the connections must be made with the greatest
40 care, if accidents are to be avoided. Furthermore, these circulating-tubes of comparatively great cross-sectional area form a substantially rigid connection between the upper and lower boilers, which is a very undesirable feature, in view of the greater ex-
45 pansibility and elasticity of the bent tubes of comparatively small diameter.

The object of my invention is to avoid the difficulties referred to, and this I accomplish
50 by the use of a plurality (a group) of water-circulating tubes of substantially the same diameter as that of the other boiler-tubes

and by locating them within the boiler casing or housing, either at one or both ends or at the longitudinal center of the boilers and so
55 as not to be under the direct influence of the furnace heat; but that my invention may be fully understood I will describe the same in detail, reference being had to the accompanying drawings, in which—

Figure 1 is a like view of a similar generator in which the water-circulating tubes are arranged in accordance with my invention. Fig. 2 is a part vertical transverse section and part front elevation of the boiler shown
60 in Fig. 2. Fig. 3 is a fragmentary longitudinal horizontal section showing one group or system of generating and circulating tubes, and Fig. 4 is a like view showing the generating and circulating tubes arranged for a gen-
65 erator having two furnaces with or without an intermediate lower boiler.

In lieu of the external circulating-tube or water-leg connecting the upper and lower
70 boilers I provide a group of water-circulating tubes *i*, Figs. 1 and 3, which, as therein shown, are located at one end of the system of bent tubes *x y*, rows 1, 6, and 11 of these tubes being arranged close together to form
75 flue-walls and passages therethrough for the products of combustion. These passages are formed, as usual, by suitably spacing a number of the wall-forming tubes, as shown in Fig. 3. The passages *a*, formed between suit-
80 ably-spaced tubes of the row 1 of such, which constitutes the inner flue-wall, instead of being at the extreme rear end of the furnace are formed forwardly of said rear end, and be-
85 tween said inner flue-wall and the intermediate flue-wall formed by the row of tubes 6 at the extreme rear end I arrange a group of
90 water-circulating tubes *i* of substantially the same diameter as that of the other boiler-tubes and protect the same against the direct action of the furnace heat by means of a sheet-metal
95 partition *c*, so that said water-circulating tubes are practically contained within a chamber whose inclosing walls are formed by the inner and intermediate flue-walls, the partition *c*, and the outer sheet-metal closure *h*.
100

As shown in Fig. 3, the intermediate flue-wall formed by the tubes 6 has a passage at its forward end leading to the space containing the tubes of the group *y*, the outer row

11 of which forms the outer flue-wall, so that the products of combustion will flow through passages *a* in the inner flue-wall near its rear end, thence forwardly along the inner flue and among the tubes therein to the forward end of said inner flue, thence into the outer flue and among the tubes therein to the rear end of said outer flue, and thence laterally into the smoke-box and chimney C.

10 The forward end of the flues is closed by a sheet-metal wall *g*, which latter and the opposite closing wall *h*, or so much thereof as may be necessary, are in practice made removable, while the partition-wall *c* is likewise removable, so that by withdrawing the latter either inwardly into the furnace-space or outwardly into the smoke-box and by removing the closures *g* and *h* ready access is afforded to the flues and tubes therein for purposes of

20 cleansing or for other purposes. The described arrangement of water-circulating tubes also enables me to supply the feed-water directly thereto through a pipe *r*, Fig. 1, which is likewise of great advantage in that the feed-water is thereby prevented from reaching the more highly-heated generating and circulating tubes and is gradually heated by its passage through tubes *i* from the upper to the lower boiler or boilers.

30 Inasmuch as those tubes of the system *y* which communicate with the water-space of the upper boiler are exposed to the action of the less-heated products of combustion, they also perform the function of circulating-tubes.

35 The advantages in the use and the described arrangement of the small water-circulating tubes *i* are manifold. They form part of the system of tubes, and being located within the boiler casing or housing the length of the boiler can be materially reduced, so that relatively to a given grate area the boiler will occupy a smaller space longitudinally than is the case with a boiler having a large circulating-tube located outside of the boiler-casing, while the external cleaning after removal of small sections of the boiler casing or housing is possible. Furthermore, in the construction of the boiler the small circulating-tubes *i* require only the same simple labor in

40 their connection with the boilers as the other tubes, the cutting of large openings in the boilers and the consequent weakening of the same being avoided, so that the use of a number of such small tubes contributes materially to the security of the boiler, while said tubes are equally as elastic as those of the tube systems *x y*, so that the detrimental rigid connections between the boilers hereinbefore alluded to is also avoided.

60 The boiler may of course be constructed with two furnaces, as shown in Fig. 4, or by omitting the intermediate furnace wall or walls *w* a single furnace of large grate area is obtained.

65 When the boiler is provided with two furnaces, as shown in Fig. 4, or with a very long single furnace, I prefer to locate the circu-

lating-tubes *i* at the longitudinal center of the system of tubes *x y*, as shown, and isolate the same from direct action of the products of combustion by removable partitions *c' c'*, the flow of the products of combustion being in opposite directions along the flues, said products passing into the smoke-box from the outer flue of the longitudinal center of the boiler. This arrangement is especially advantageous in marine boilers, because the level of the boiler-water, even during the greatest pitching and rolling of a vessel, suffers but little change at the longitudinal center of the boiler.

In some constructions it may be advantageous to arrange water-circulating tubes at each end of the boilers, and, as will be readily understood, this can be easily done.

I have shown and described my invention in its application to boilers having horizontal flues formed by some of the tubes. It is obvious, however, that it may be applied to boilers in which the tubes are arranged to form vertical or up-and-down flues.

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

1. A boiler, comprising an upper and one or more lower boilers, water-tubes connecting the same, a group of circulating-tubes connected with said upper and lower boilers and arranged among the water-tubes close to the source of heat, and protecting-walls encompassing said circulating-tubes, for the purpose set forth.

2. A boiler comprising an upper and one or more lower boilers, bent water-tubes connecting the same, a group of bent circulating-tubes arranged among the water-tubes close to the source of heat, and protecting-walls encompassing said circulating-tubes, for the purpose set forth.

3. A boiler, comprising an upper and one or more lower boilers, bent water-tubes connecting the same, some of said tubes arranged to form a flue for the circulation of the products of combustion, said flue provided with inlet leading to the source of heat-supply, a group of bent circulating-tubes connecting the upper and lower boilers and located close to the flue-inlet, between two water-tube flue-walls, and partition-walls extending from flue-wall to flue-wall inclosing said group of circulating-tubes, for the purpose set forth.

4. A boiler comprising an upper and one or more lower boilers, and tubes connecting the same, some of said tubes arranged to form flues for the circulation of the products of combustion; in combination with a group of water-circulating tubes connecting the water-spaces of the boilers and located in a chamber within the boiler casing or housing, some of the walls of said chamber formed by flue-walls, substantially as and for the purpose set forth.

5. A boiler comprising an upper and one or more lower boilers, and tubes connecting

the same, some of said tubes arranged to form flues for the circulation of the products of combustion; in combination with a group of water-circulating tubes connecting the water-spaces of the boilers and located in a chamber within the boiler casing or housing, said chamber formed by the inner and intermediate flue-walls and having removable end walls, substantially as and for the purpose set forth.

6. A boiler comprising an upper and a plurality of lower boilers, tubes connecting said upper with said lower boilers, some of said tubes arranged to form flues, and openings to the inner flue on opposite sides of its longitudinal center, and openings from the outer flue at said longitudinal center; in combination with a group of water-circulating tubes located in the inner flue at its longitudinal center between the openings leading thereto from the furnace, and a removable partition at each end of said group of tubes, substantially as and for the purpose set forth.

7. A boiler comprising an upper and one or more lower boilers, tubes connecting said upper with said lower boilers, some of said tubes arranged to form flues for the circulation of the products of combustion from the furnace to the chimney, and water-circulating tubes of small diameter connecting the upper and lower boilers, said tubes contained within the boiler casing or housing out of direct contact with said products of combustion; in combination with a boiler feed-pipe in the upper boiler arranged to discharge the feed-water immediately above the upper end of said water-circulating tubes, substantially as and 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.

RICHARD SCHULZ.

Witnesses:

MAX. C. STAEHLER,
WOLDEMAR HAUPT.