J. VAN OOSTERWYCK.

STEAM GENERATOR.

APPLICATION FILED SEPT. 30, 1909.

981,722. Patented Jan. 17, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

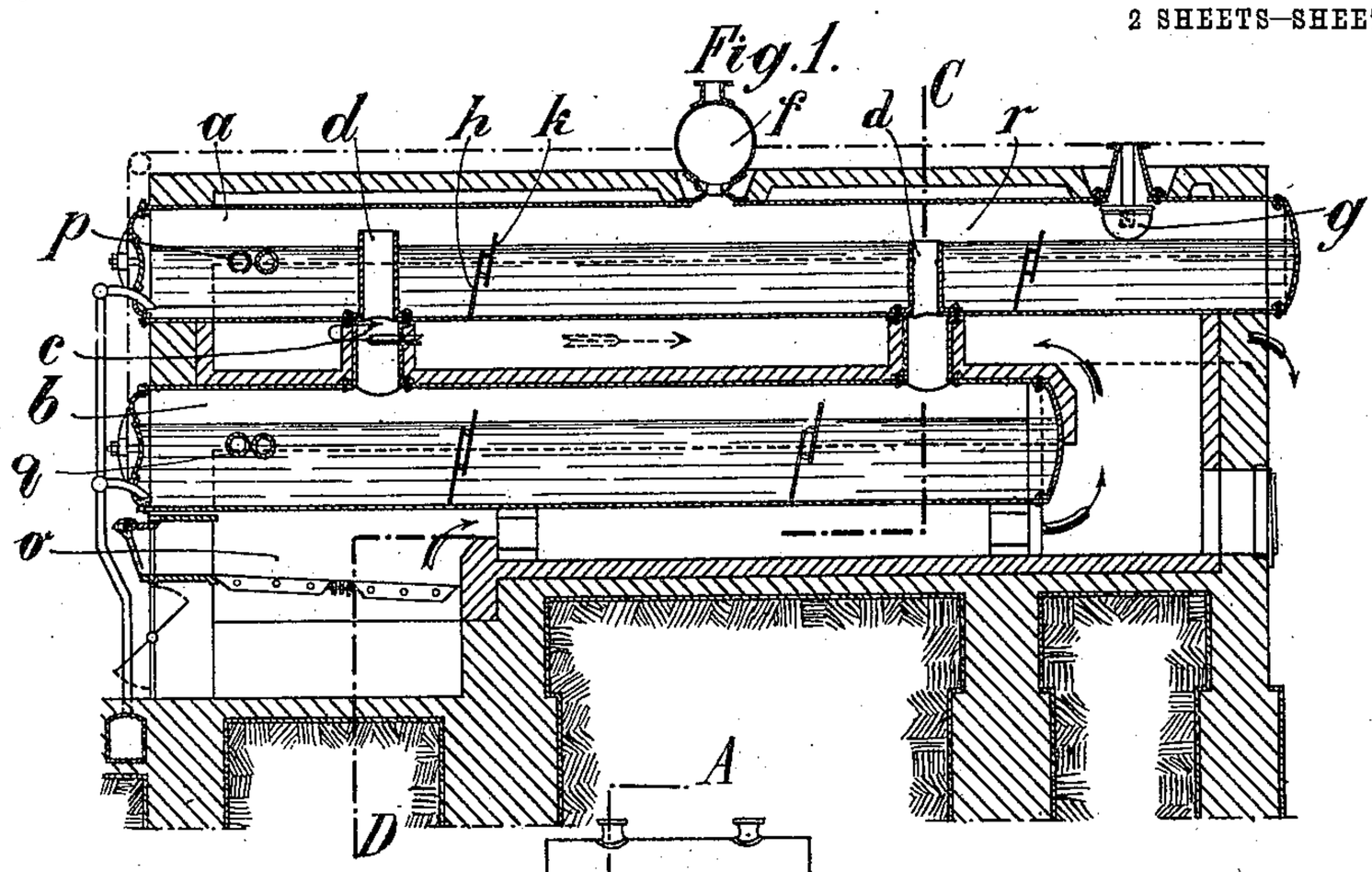


Fig. 2.

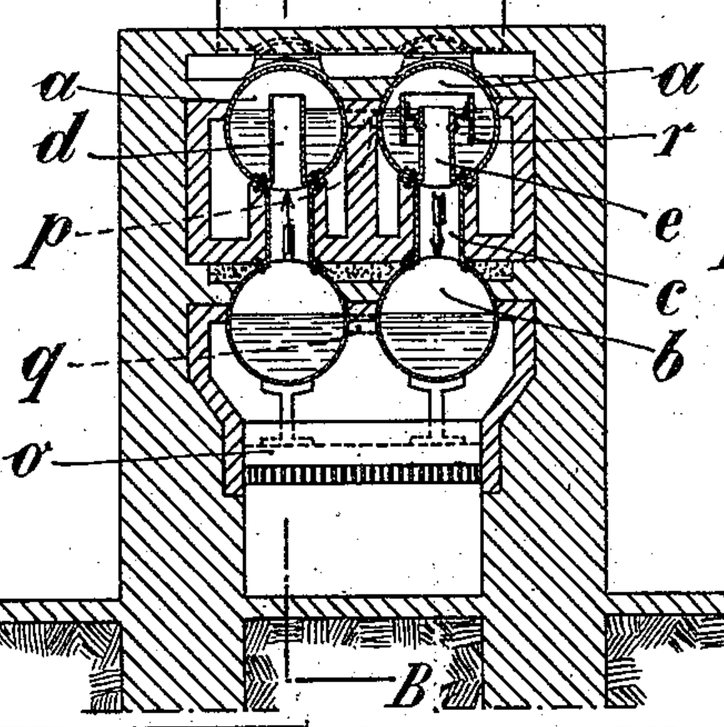
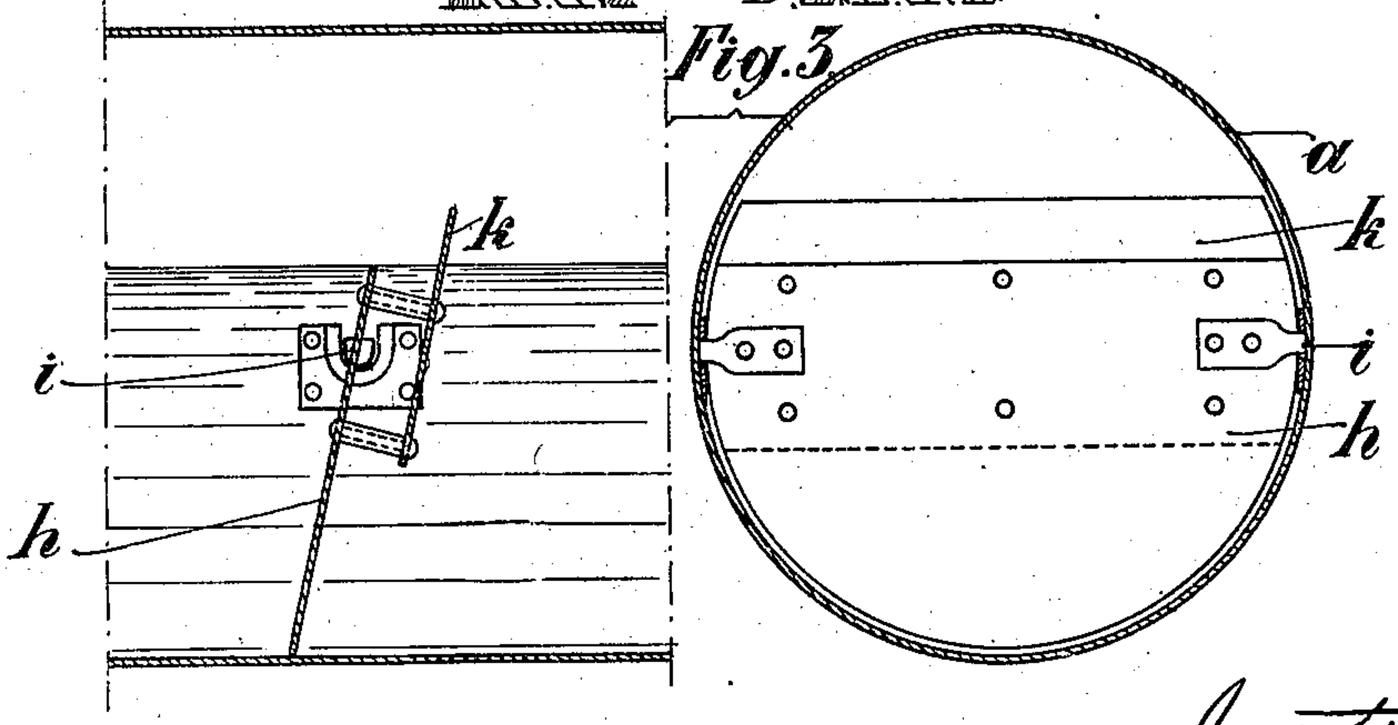


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 4.

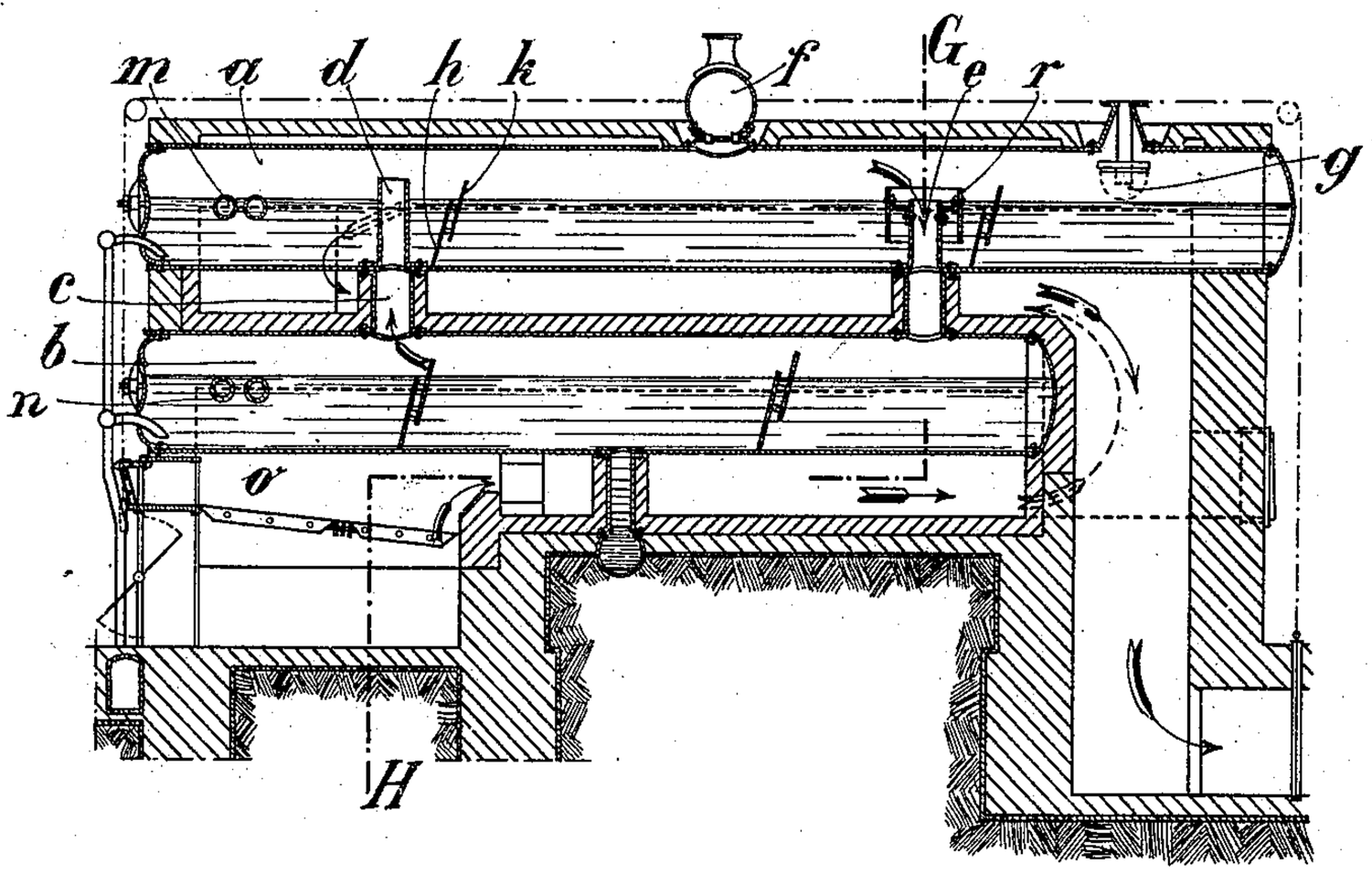
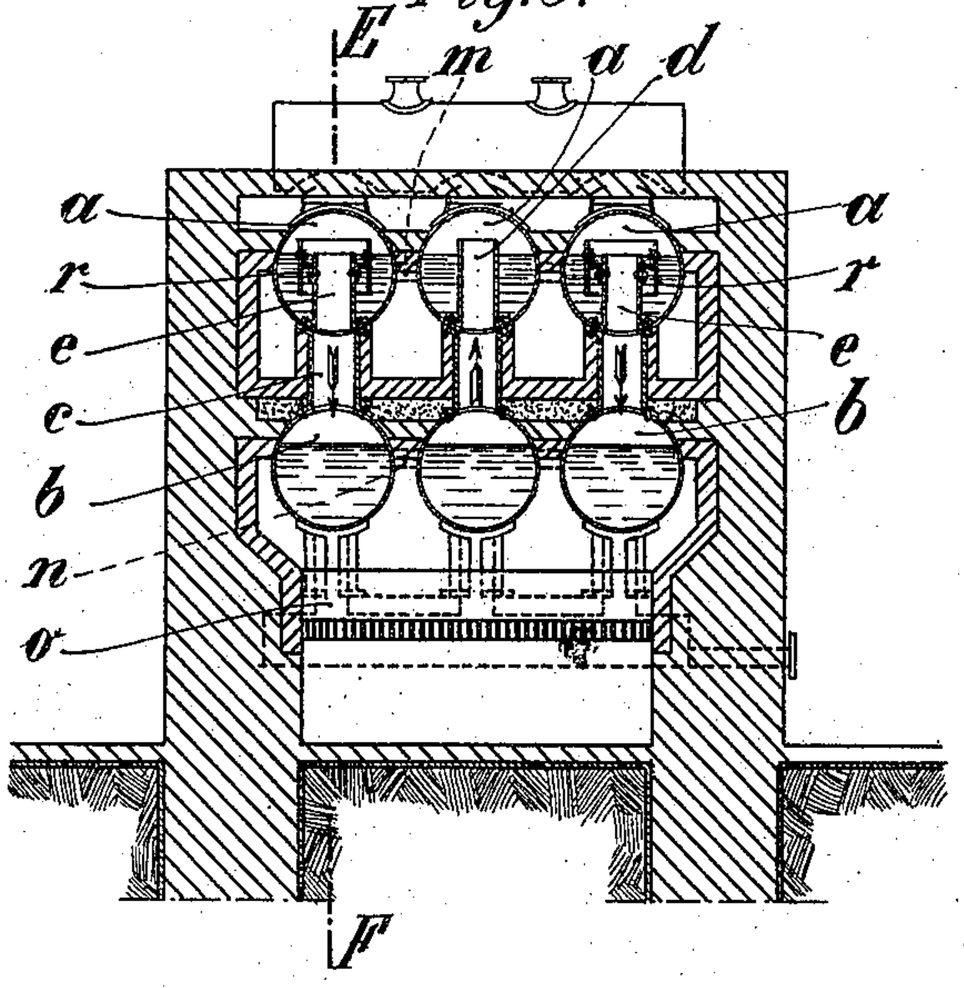


Fig. 5.



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UNITED STATES PATENT OFFICE.

JEAN VAN OOSTERWYCK, OF LIEGE, BELGIUM.

STEAM-GENERATOR.

981,722. Specification of Letters Patent. **Patented Jan. 17, 1911.**

Application filed September 30, 1909. Serial No. 520,375.

To all whom it may concern:

Be it known that I, JEAN VAN OOSTERWYCK, manufacturer, subject of the King of Belgium, residing at Liege, Belgium, have invented certain new and useful Improvements in Steam-Generators; and I hereby declare the following to be a full, clear, and exact description of the invention.

The object of the present invention is to provide improved means for the generation of steam.

The accompanying drawings represent by way of example, two forms of boilers constructed in accordance with this invention.

Figure 1 is a vertical longitudinal section on A—B (Fig. 2) representing a boiler having two sets of water tubes or drums. Fig. 2 is a transverse section on C—D (Fig. 1); Fig. 3 shows, upon a larger scale, in vertical section and plan, the means employed for the partitioning off or dividing-up of the drums or shells. Fig. 4 is a vertical longitudinal section substantially on the line E, F, of Fig. 5, showing a boiler including three sets of tubes or drums. Fig. 5 is a transverse section substantially on the line G, H, of Fig. 4.

The boiler is composed of a plurality of elements each formed by two superimposed and intercommunicating boiler tubes or cylindrical drums or shells *a* and *b*. The connection of the two drums is effected by short vertical tubes or passages *c* of which that at the one end of the drum carries at its upper end or within its interior an upright extension tube or pipe *d* for the passage of the generated steam, while that at the other end of the drum is fitted with a similar extension tube or pipe *e* for the passage of the feed-water from the one drum to the other. The position and arrangement of these steam and feed-water tubes or passages *d*, *e* has considerable influence on the efficient working of the boiler as hereinafter described. The steam tube *d* is situated at the front above the fire-grate *o*, as complete evaporization takes place only above the fire-grate, the feed-water pipe *e*, on the contrary, is placed at the rear, so as to cause the water to traverse as long a distance as possible within the interior of the generator.

The vertical elements of the boiler, constituted by the drums or shells *a* and *b* communicate horizontally with each other in such a manner that the feed-water shall flow horizontally through the upper drums in a circuitous path before passing to the lower drums. In the case of a boiler having two vertical sets of tubes or drums (Figs. 1 and 2), the feed-water enters at *g*, into one of the upper drums *a*. It then passes into the adjacent drum *a* by the communicating passages *p*, and thence into the lower drums *b* which also communicate with one another by the passages *q*. In the case of a boiler with three elements (Figs. 4 and 5) the feed is preferably effected through the central drum *a*, as hereafter described. The flues are arranged so that the hot gases pass in an opposite direction to that of the water. The upper drums *a* are surmounted by a steam dome *f* for collecting the steam, provided with a safety valve.

The water-space of the drums or shells *a* and *b* is, at certain points, sub-divided transversely by means of separated partitions or baffle plates placed across the interior of the drums. By means of these partitions or baffles the water in each drum is divided into a plurality of bodies of different temperatures instead of having the entire body of substantially one temperature. That is, all of the water in the compartment or division nearest the inlet end of each drum will be cooler than the water in the compartment adjacent the outlet or discharge from the drum, whereas if the partitions or baffles were not employed the entire body of water throughout the drum would have substantially the same temperature. This division is effected by means of movable plates *h*, capable of pivoting about horizontal hinge pivots *i*. These movable plates moreover have the effect of preventing oil and magnesia, which collects upon the surface of the water, from entering the lower part of the generator. The movable partitions *h* preferably carry an additional plate or shutter *k*, fixed upon them, but separated therefrom by a short distance. This plate or shutter *k* causes the water charged with oil, scum or other material of less density than water, to accumulate at the upper level, so that only the clear water can descend to the bottom part of the boiler. The division or baffle plates *h* are of the same shape as the inside of the drum and their upper edges come at the same height as, or slightly below, the normal water level. The shutters *k* extend upward out of the water while their lower edges come just below the central axis

of the drum. The turning movement of the plates *h* about their pivots *i* is necessary in order to admit of the emptying of the boiler through a single outlet. With this object, the plates *h* are slightly inclined, as shown in the drawings; as each face is subjected to an equal pressure of water, they fall by their own weight either against the internal walls of the drum or against a special flange located within the latter. A water-tight partition is thus formed. When the outlet through which the boiler is emptied is opened (situated at the front of the boiler in the example represented) the different compartments empty themselves and by the force of the water the partitions *h* are caused to swing upon their pivots and open.

The feeding of the boiler is effected, as previously described, through one of the two upper shells or drums *a* in the case of a boiler having two elements, and through the middle drum *a* in the case of a boiler having three elements. The overflow feed-pipe *e* of drum *a* into which the feed water enters, is situated at a slightly higher level than the normal water level, and consequently also higher than the openings *m* (see Figs. 4 and 5) by which communication between the adjacent drums *a* is effected. By this means the water is prevented from descending directly into the corresponding lower drum *b*, and is first caused to flow through the lateral openings *m* into the two side drums *a*. In the latter the ends of the feed or overflow passages are situated at the height of the normal water-level, so that the filling of the lower drums or shells *b* or evaporators is effected through the two side shells *b* and through the passages *n*. Therefore it follows that at the upper row the central drum feeds the side shells, and at the lower level the side drums feed the middle one. A systematic heating is thus obtained. Without increasing the height of the overflow pipe in the feed drum, the cold water would descend directly into the lower drum without previously being warmed-up, and without being purified, owing to the resistance offered to the passage of the water through the horizontal connecting passages between the boilers, whose size is small. The steam passages *c* are placed over the fire-grate *o* at a point where the water is always sufficiently hot to prevent condensation in the tubes *d*. These latter extend to a certain level above the normal water level.

In order to prevent, in conjunction with the shutters *k*, the descent of impurities which float in the shells *b*, the upper extremities of the tubes *e* are surrounded by rings *r*, open at top and bottom, and separated a short distance from the said tubes. These rings *r* extend above the normal water level, similarly to the shutter plates *k*.

Having fully described my invention, what I desire to claim and secure by Letters Patent is:—

1. A steam generator comprising a plurality of elements, each including two drums arranged one above the other and connected by suitable vertical ducts, the upper drum of one element being provided adjacent one end with a suitable inlet, and water conduits connecting the upper and lower drums of said element with the corresponding drums of an adjacent element near the ends of said drums farthest from the inlet, whereby water is caused to circulate through all of the upper drums before passing to any of the lower drums.

2. A steam generator comprising a plurality of elements, each including two drums arranged one above the other, the upper drum of one element having a water inlet adjacent one end and communicating near both ends with the drum below it by conduits that extend above the water level in said upper drum, water conduits connecting the upper drums adjacent the opposite ends thereof from the inlet, means for conducting water from the upper to the lower drum, of a second element adjacent their ends nearest the inlet of the water drum of the first said element, and water conduits connecting the lower drums adjacent the ends thereof farthest from said inlet for the purpose described.

3. A steam generator, comprising a plurality of elements, each including two drums arranged one above the other, the upper drum of one element having a water inlet adjacent one end and communicating adjacent both ends with the drum below it through steam conduits that extend to points above the water level in the upper drum, lateral conduits connecting the upper drums below the water level therein, adjacent the ends farthest from the inlet, similar conduits connecting the lower drums, a water conduit connecting the upper drum of each element, except the one having the aforesaid inlet, with the drum below it, adjacent the end nearest said inlet, whereby the water is caused to circulate through all of the upper drums before passing to any lower drum, and a baffle surrounding the upper end of the water conduit that connects the two drums of an element.

4. A steam generator comprising a plurality of elements, each including two drums arranged one above the other, one of said upper drums having a suitable water inlet, tubular connections between the several upper drums, similar connections between the lower drums, and vertical tubes connecting the members of each element and constituting conduits for steam and feed water, all of the vertical tubes between said inlet drum and the drum below it extending above the water level in the upper drum, whereby the

water is caused to circulate through all of the upper drums before passing to any of the lower drums.

5. In a steam generator, the combination with a drum provided with suitable inlet and outlet openings, of a pivotally mounted baffle extending transversely across the water space within the drum between the inlet and outlet thereof, and adapted to automatically move about its pivot to permit the drum to be completely emptied when the outlet is opened.

6. In a steam generator, the combination with a drum provided with suitable inlet and outlet openings, of a pivotally mounted baffle extending transversely across the water space within the drum between the inlet and outlet thereof, said baffle comprising two members spaced apart and one of which extends above the level of the water in the drum.

7. In a steam generator, the combination of a substantially horizontal drum having suitable inlet and outlet passages, a baffle extending transversely of the interior of the drum with its upper edges above the level of water therein, said baffle being pivotally supported whereby it is adapted to be automatically rocked to permit the drum to be emptied when the outlet passage is opened.

8. In a steam generator, the combination of a plurality of drums and means connecting the drums so that the feed water is caused to circulate through all of the series, and transverse baffles extending across the water spaces in the drums and each comprising two members spaced apart and one of which projects above the level of water in the drum.

9. In a steam generator, the combination with a drum provided with suitable inlet and outlet openings, of a baffle plate extending across the water space within the drum to maintain therein two bodies of water of different temperatures, said baffle being adapted to automatically move into inoperative position as water is drawn from the drum to empty it.

10. In a steam generator, the combination with two drums arranged one above the other, the upper drum being provided with suitable water inlet and steam outlet openings, tubes connecting said drums and adapted, respectively, to conduct water from the upper to the lower drum and steam from the lower to the upper drum, and a baffle surrounding the end of the water conducting tube in the upper drum and extending above and below the level of water in said drum.

In testimony whereof I affix my signature in presence of two witnesses.

JEAN VAN OOSTERWYCK.

Witnesses:
PIERRE BROUHON,
A. PENDLETON CRUGER.