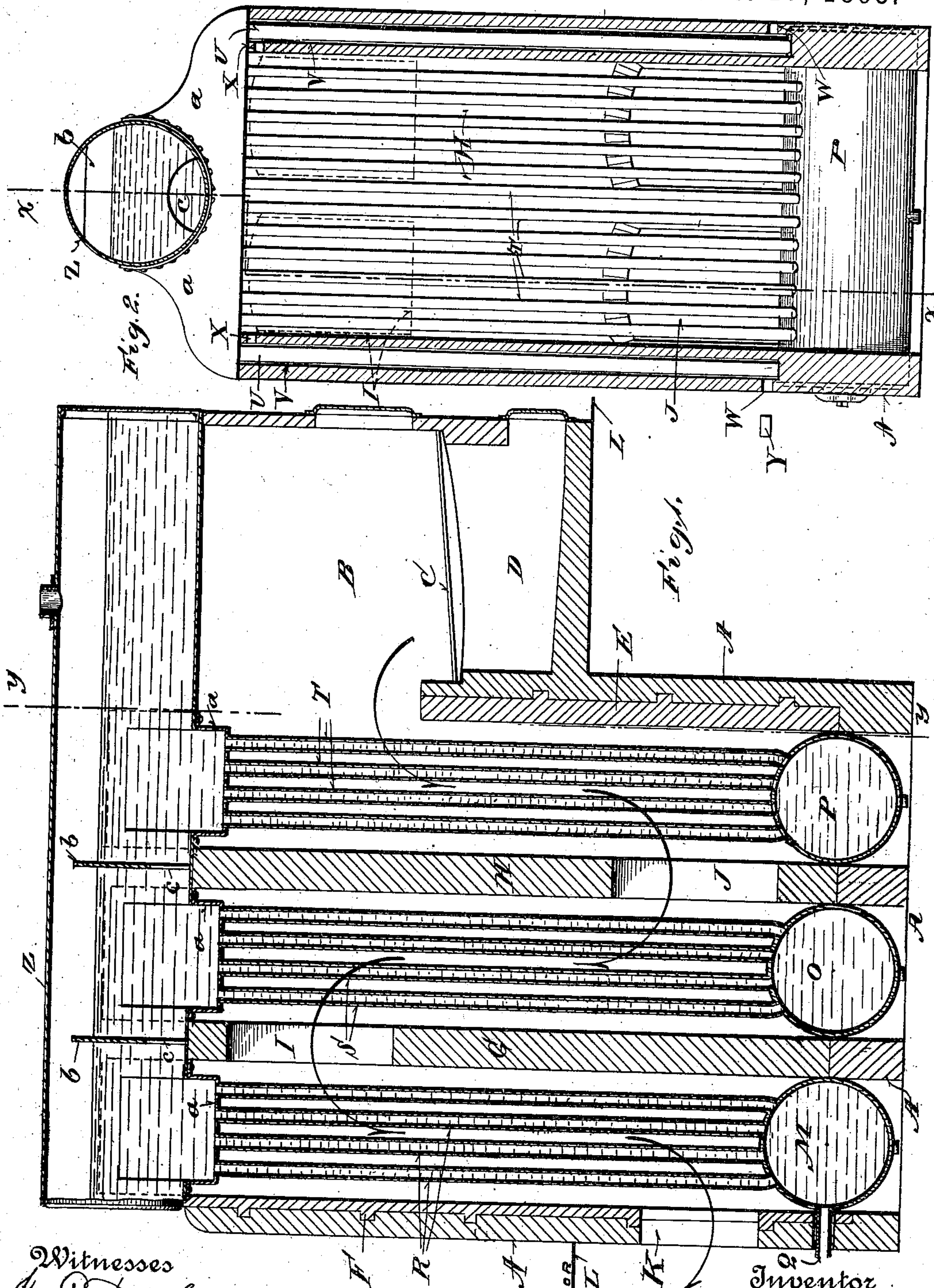


(No Model.)

A. S. KROTZ.
BOILER.

No. 551,589.

Patented Dec. 17, 1895.



Witnesses
Jas. C. Sawley
H. M. McKain.

Inventor
Alvaro S. Krotz
By his Attorney
H. A. Toulmin.

UNITED STATES PATENT OFFICE.

ALVARO S. KROTZ, OF SPRINGFIELD, OHIO, ASSIGNOR OF ONE-THIRD TO
EDWARD C. GWYN, OF SAME PLACE.

BOILER.

SPECIFICATION forming part of Letters Patent No. 551,589, dated December 17, 1895.

Application filed May 18, 1895. Serial No. 549,743. (No model.)

To all whom it may concern:

Be it known that I, ALVARO S. KROTZ, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Boilers, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to certain new and useful improvements in water-tube steam-boilers.

The particular object I have in view is to so manage the fire and hot gases or products of combustion that the tubes shall be wholly surrounded and enveloped thereby, as distinguished from the present method in such cases, wherein I believe the fact to be that whole rows of tubes in each battery are so backed with baffle-walls that the flames and heat cannot wrap around them, being permitted merely to strike against them, and being then baffled or deflected back by the baffle-walls. This object I accomplish by arranging my baffle or diverting walls wholly out of contact with any of the tubes and in a position between the banks of tubes in the respective batteries of the boiler.

Another object of my invention is to provide for cooling the down-current tubes by utilizing the natural draft of the apparatus to draw air from the outside into conduits in which such pipes are located. This results in superinducing a rapid return-current, which accelerates the speed of the circulating water.

A third object is to so construct a common head-tank for all the banks of tubes that it will readily receive the ends of the tubes and that the water in such tank will be retarded in speed as it passes from one battery to the next in the series of batteries, so that there shall be less tendency to disturb the individual circulation in the individual batteries.

In the accompanying drawings, on which like reference-letters indicate corresponding parts, Figure 1 is a vertical sectional view of a water-tube boiler embracing my improvements, the section being taken on the line x of Fig. 2; and Fig. 2, a transverse sectional view on the line $y y$ of Fig. 1.

A general structure A, of masonry, forms the setting for the boiler. This structure includes a fire-box B, grate-bars C, and an ash-pit D. The walls are lined with fire-brick or other refractory material E and F, adapted to withstand the heat, and at intervals I construct baffle or deflecting walls G and H of fire-brick or other refractory material and provide them with openings I and J for the passage of the flames and products of combustion to the stack-opening K, whence they are carried off by any form of smoke-stack. At this point it will also be observed that at L a line is indicated marked "floor." Considerable of the boiler is below this line. When so constructed the boiler will be useful particularly as a marine-boiler, the lower extension being beneath the floor, so as to get the weight well down in the hull of the vessel.

In the lower part of the structure I place transverse drums M, O, and P, the first being also the feed-drum, into which the water is introduced through a pipe Q from a suitable supply. Each of these drums has connected to it two sets or banks of tubes, one set being the up-current tubes shown at R, S, and T, and the other composed of down-current tubes. (Shown at U in Fig. 2.) The latter tubes are placed in conduits or passages V formed in the side walls and are subjected to inflowing currents of atmospheric air induced by the natural draft of the apparatus acting through apertures W and X, as shown in Fig. 2. The purpose of this construction is to cool the down-current tubes to some extent to superinduce the rapid descent of the water through these tubes, which results in accelerating the return or up current while not appreciably affecting the temperature to a degree injurious to the generation of steam. The apertures W may, if desired, be closed, say by a plug Y, though usually they will be left open. Now each of these respective sets of tubes proceeding from the respective drums connect with a tank Z, constructed after the fashion of a boiler and mounted upon the lower structure of the apparatus. This tank has two peculiarities, to wit: lateral chambers or extensions a , preferably flat on the bottom, so as to readily receive the two sets

of tubes of each drum. There are as many of these chambers as there are drums, and between each two chambers I place a partition *b*, having an opening *c* of such size as will permit the circulation of the water in the tank from every one bank of tubes to another, but which at the same time so retards any undue speed of the water in thus circulating that the vertical circulation in the tubes of the respective drums is not thereby interfered with or retarded. Thus while permitting of the intercommunication or circulation of the water in the tank over each bank of tubes, still anything like a rapid movement of the water is prevented, and thus the vertical circulation of the water (the more important direction of circulation) is given full opportunity to take place.

Referring again to the baffle-walls *G* and *H* and the sets of banks of tubes *S* and *T*, as also referring to the fire-wall *F* (which in effect is a baffle-wall) and the bank of tubes *R*, it will be seen that the flames and heat can and do wholly embrace and envelop all of the tubes of each bank, and that there is no place of contact between any of such tubes and any of such walls. This in practice produces marked results in the direction of a more intense heating of all the tubes, and particularly those which are nearest such walls, and which heretofore have been in immediate contact with them. A more rapid circulation hence follows, as also a quicker generation of steam. It will be further observed that the drums *M O P* and the tubes *R*, *S*, and *U* are suspended from the upper tank *Z*, which latter rests upon the walls, as indicated. Thus provision is made for the free expansion and contraction of the tubes without injury to the other parts or liability to displace them. The baffle-walls, being in vertical contact with the drums, act as guides for them to keep them in place, yet allow them to have a slight up-and-down movement without straining and tending to crack the parts. This idea of suspending the lower drums and tubes from the upper structure I

believe to be a new one, and accordingly lay claim thereto.

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

1. In a water tube boiler, the combination with two or more drums and their banks of tubes, of a water tank into which said tubes open, and a partition between each bank of tubes and within said tank and having an opening.

2. In a water tube boiler, the combination with a drum, a set of tubes connected thereto for the up current of water and a set of tubes connected thereto for the down current of water, a vessel with which all of said tubes connect and walls with conduits in which the second set of tubes are located, draft openings in said walls leading from the outer air to the conduits and from the conduits to the interior of the structure.

3. In a water tube boiler, the combination with an upper vessel supported by the walls of the apparatus, of the circulating tubes depending from said vessel and the drums suspended by said tubes, deflecting walls between the respective banks of tubes and the respective drums, said deflecting walls being out of contact with the tubes but in vertical contact with the drums and adapted to guide the drums.

4. In a water tube boiler, the combination with the upper vessel supported by the walls of the apparatus, of the circulating tubes depending from said vessel and the drums suspended by said tubes, and deflecting walls between the banks of tubes and the drums, said walls acting to guide said drums, and the arrangement affording provision for expansion and contraction.

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

ALVARO S. KROTZ.

Witnesses:

W. M. MCNAIR,
WARD SNYDER.