(No Model.) 2 Sheets—Sheet 1.

R. R. ZELL.

STEAM BOILER.

No. 409,313. Patented Aug. 20, 1889.

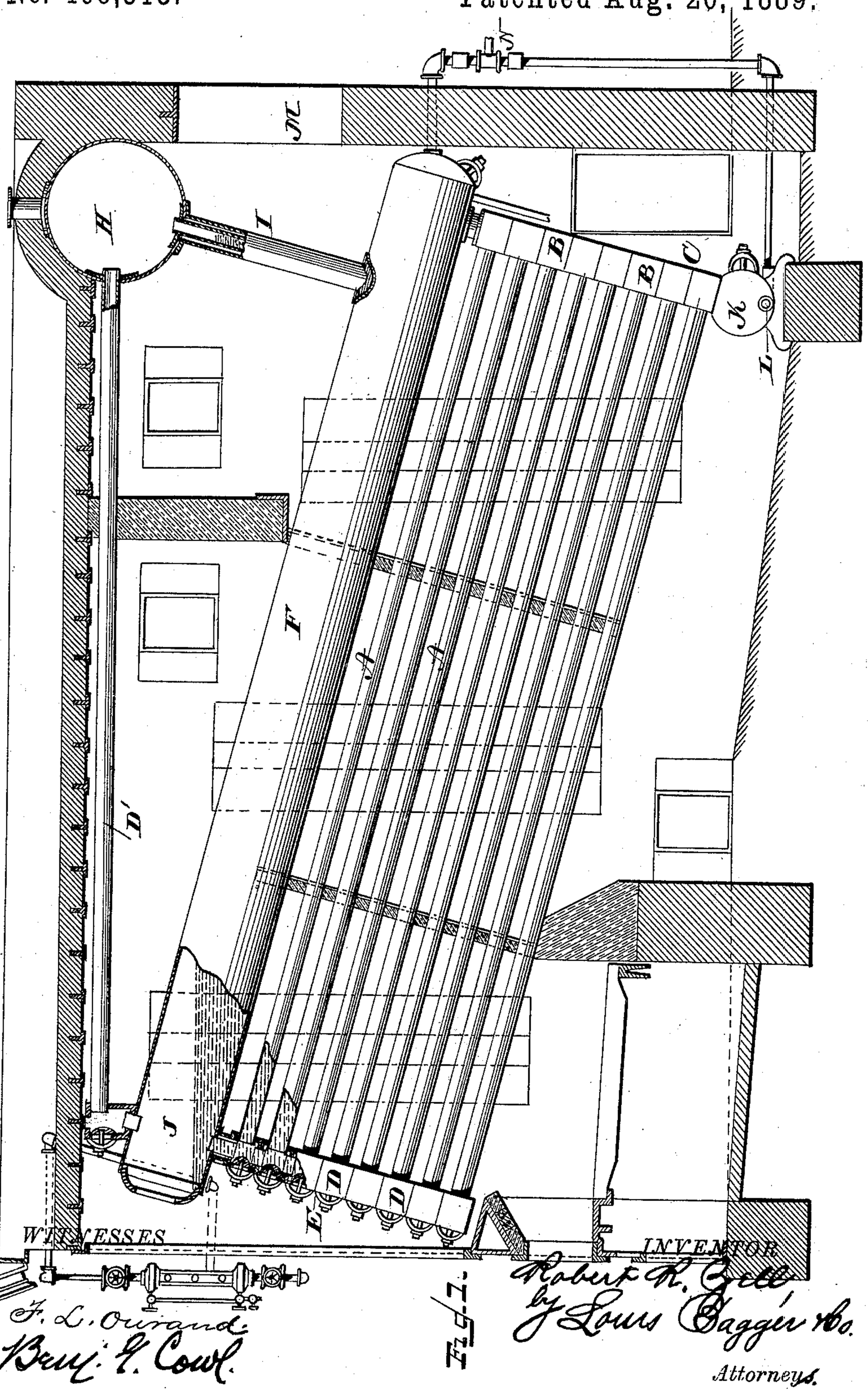

FIG. 1.

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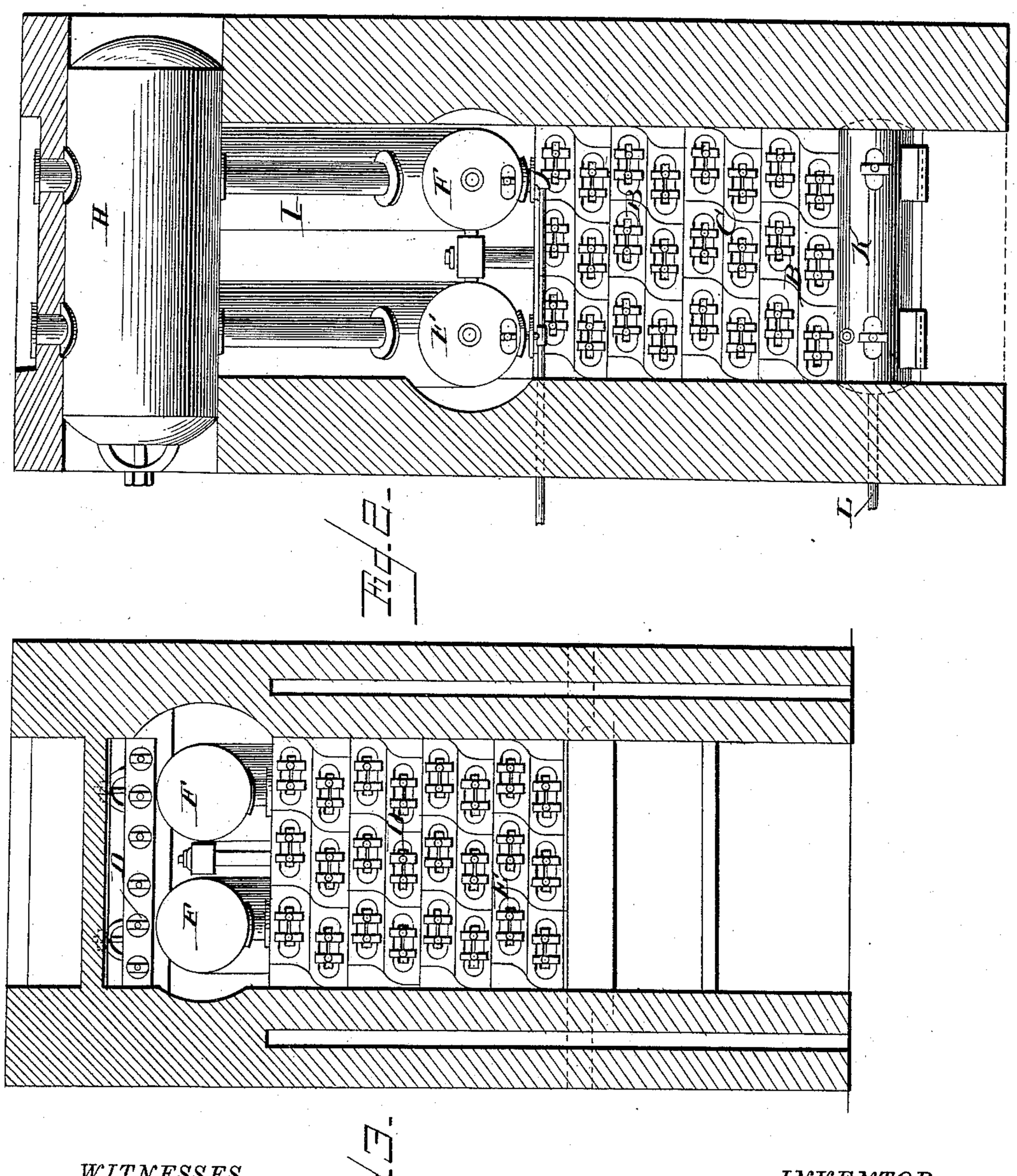

FIG. 2.

FIG. 1.

WITNESSES
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UNITED STATES PATENT OFFICE.

ROBERT R. ZELL, OF BALTIMORE, MARYLAND, ASSIGNOR TO JOSEPH V. CAMPBELL, OF SAME PLACE.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 409,313, dated August 20, 1889.

Application filed April 3, 1888. Serial No. 269,494. (No model.)

To all whom it may concern:

Be it known that I, ROBERT R. ZELL, a citizen of the United States, and a resident of Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Sectional Steam-Boilers; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification, and in which—

Figure 1 is a longitudinal vertical sectional view showing my new and improved sectional steam-boiler. Fig. 2 is a rear elevation of the same, and Fig. 3 is a front view.

The same letters of reference indicate corresponding parts in all the figures.

My invention relates to that class of boilers or steam-generators known as "sectional" boilers or "water-tube" boilers; and it consists in certain new and useful improvements in a boiler or steam-generator of this class, which will be hereinafter fully described and claimed.

Referring to the several parts by letter, A indicates the incline water-tubes, which communicate at their rear lower ends with the headers or boxes B, which form the rear water-leg C, while at their front upper ends the inclined water-tubes communicate with the front headers or boxes D, which form the front water-leg E.

Immediately above the inclined water-tubes are arranged the one or two large inclined drums F F. These inclined drums are arranged and secured directly above and over the inclined water-tubes A at the same inclination as shown in the drawings, and they communicate at their front and rear lower sides with the top of the front and rear headers or boxes as shown.

D′ indicates a series of horizontal steam-tubes, which are arranged above the inclined drums F F, and communicate at their forward ends with a manifold or series of headers arranged so as to provide for direct steam-connection between the drums F F and steam-tubes D′ at the front part of the forward ends of the said horizontal tubes, and communicate at their rear ends with the large steam-drum H, which is arranged transversely across and above the rear ends of the inclined drums F F, as shown, the bottom of this transverse steam-drum being connected to the top of the rear ends of the inclined drums F F by the short connecting-tubes I I, the various parts of the boiler being so arranged in relation to each other that the water will pass back through the inclined drums F F and allow the steam to separate at J J in the upper ends of the inclined drums F F, and the steam that separates from the heated water to pass into manifold above J J, then into the horizontal tubes D, and into the steam-drum H.

The lower end of the rear water-leg C is connected to the usual mud-drum K, which has the ordinary blow-off L. Suitable partitions extend across the series of water-tubes A, as usual in steam-generators of this class, for the purpose of compelling the flames and products of combustion from the furnace to traverse the entire series of tubes upward, downward, and again upward before reaching the flue or chimney through the aperture M, and the furnace is constructed with the usual bridge-wall to deflect the draft up between the tubes. The usual feed-pipes, &c., are of course provided.

The operation of my new and improved sectional steam-boiler is as follows: The series of inclined water-tubes A, and also the inclined drums F F, being filled with water, which in the said inclined drums reaches the water-line in the upper ends thereof, as shown in Fig. 1 of the drawings, the water, being heated, circulates as indicated by the arrows, and by employing the water-drums F F and arranging them in an inclined position directly over and parallel with the inclined water-tubes A the boiler will contain a large body of water to supply the steam-generating tubes underneath and establish a perfect water circulation. As the water thus circulates and the steam generates, the steam will separate from the water in the front upper ends of the inclined drums F F, and will pass through the manifold over the front ends of water-drums F F into the horizontal tubes D′, where it is superheated before entering the steam-drum H, from which it is discharged or fed to the

cylinders of the engine through the outlets N. As the rear ends of the inclined drums F F connect with the top of the rear water-leg C and discharge the hot water into the same, a constant circulation will be maintained, as denoted by the arrows, through the said inclined drums F F, rear water-leg C, inclined water-tubes A, and the front water-leg E, so that the water from the rear ends of the inclined drums F F is promptly circulated through the rear water-leg and the inclined water-tubes A.

The large body of water contained in this new and improved boiler renders it less sensitive to the effects of irregular firing and sudden drafts of steam. The steam, as described, separates from the water in the front ends of the large inclined drums and passes up through the manifold into the superheating-tubes and into the transverse steam-drum, the water flowing back to the lower or rear ends of the inclined water-drums F F. By this construction and arrangement I obtain all the advantages of large water capacity, and at the same time have perfectly dry steam by means of a separate steam circulation.

From the foregoing description, taken in connection with the accompanying drawings, the construction, operation, and advantages of my new and improved sectional steam-boiler will be readily understood. It will be seen that by my improved construction a large body of water is obtained in direct connection with the generating-tubes, and that the large body of water in the inclined drums will not be affected by hard firing, so that it will always steam readily, and a perfectly steady water-line will be carried and perfectly dry steam will be obtained, the construction of the boiler will be cheapened, and the facilities for cleaning and repairs increased.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a sectional steam-boiler, the combination of the inclined tubes expanded into headers or boxes at both ends, a water-drum at same inclination connected at its lower sides with the front and rear headers or boxes, and connected on the front top side with a manifold and on the rear top side with a steam-drum, said steam-drum being connected with the manifold on front end by tubes, substantially as and for the purpose set forth.

2. The combination, in a water-tube boiler having headers and inclined connecting-tubes, of a water-circulating and steam drum connected to said headers and arranged parallel to the said tubes, and a steam pipe or pipes connecting the upper inclined end of the drum with a steam-drum, all arranged within the furnace, substantially as set forth.

3. The combination, in a water-tube boiler having headers and inclined connecting-tubes, of a water-circulating and steam drum connected to the upper ends of said headers and parallel to the connecting-tubes, and a steam pipe or pipes connecting the upper inclined end of said drum with a steam-drum, substantially as described.

4. In a water-tube boiler, the combination, with the headers and inclined connecting-tubes, of a steam and water drum, as described, connected to the said headers and arranged parallel to the connecting-tubes, a manifold in communication with the upper inclined end of said drum, and a steam pipe or pipes connecting said manifold with a steam-drum, all as set forth.

5. The combination, in a water-tube boiler having headers and inclined connecting-tubes, of a steam-separating and water-circulating drum connected to the upper ends of said headers and parallel to the connecting-tubes, a manifold in communication with the upper inclined end of said drum, and a steam pipe or pipes connecting said manifold with a steam-dome, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereunto affixed my signature in presence of two witnesses.

ROBERT R. ZELL.

Witnesses:
HARRY S. ZELL,
EUGENE BLAKE.