

(No Model.)

2 Sheets—Sheet 1.

W. D. EWART.
STEAM BOILER.

No. 556,140.

Patented Mar. 10, 1896.

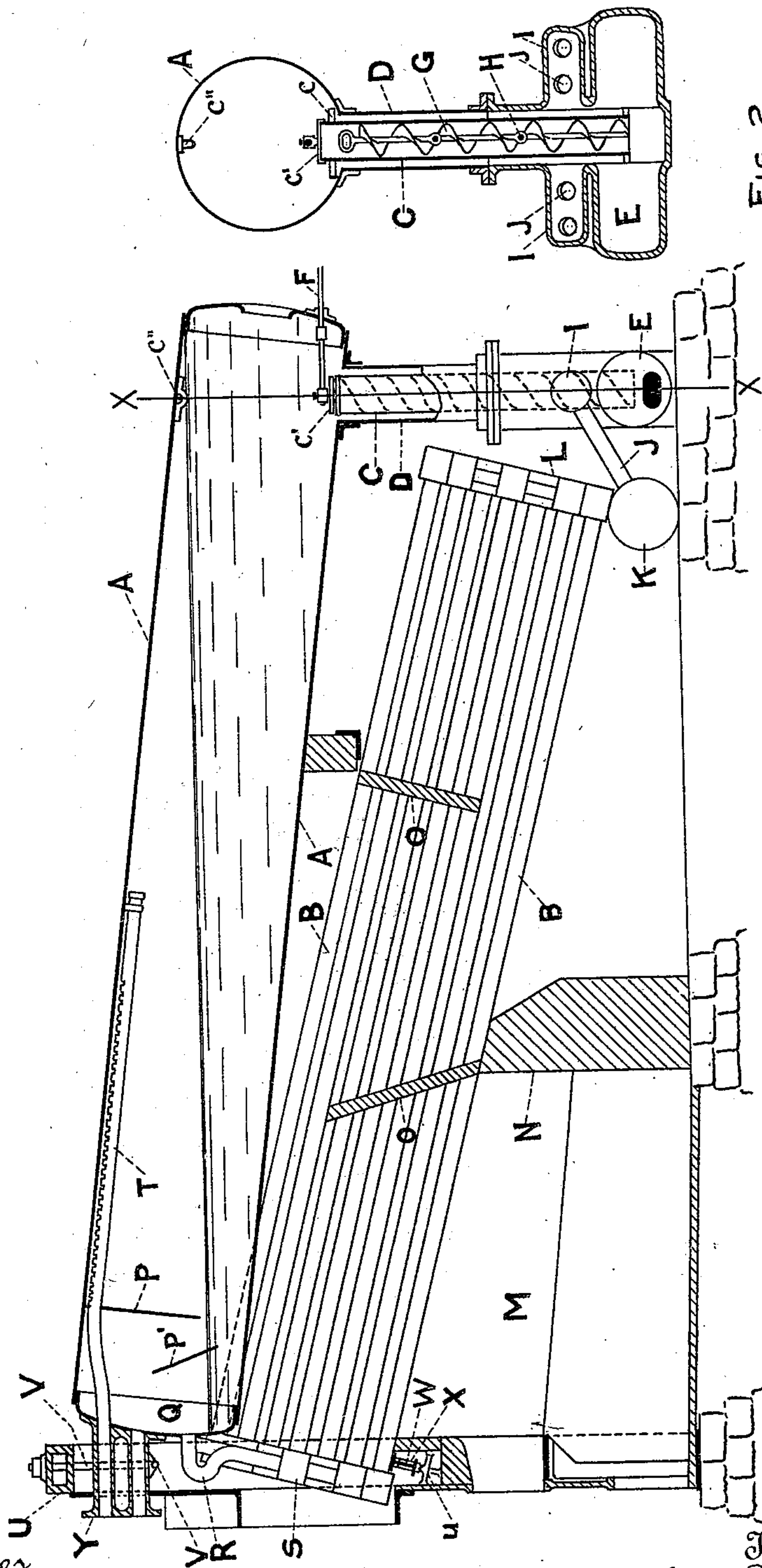


FIG. 2.

FIG. 1.

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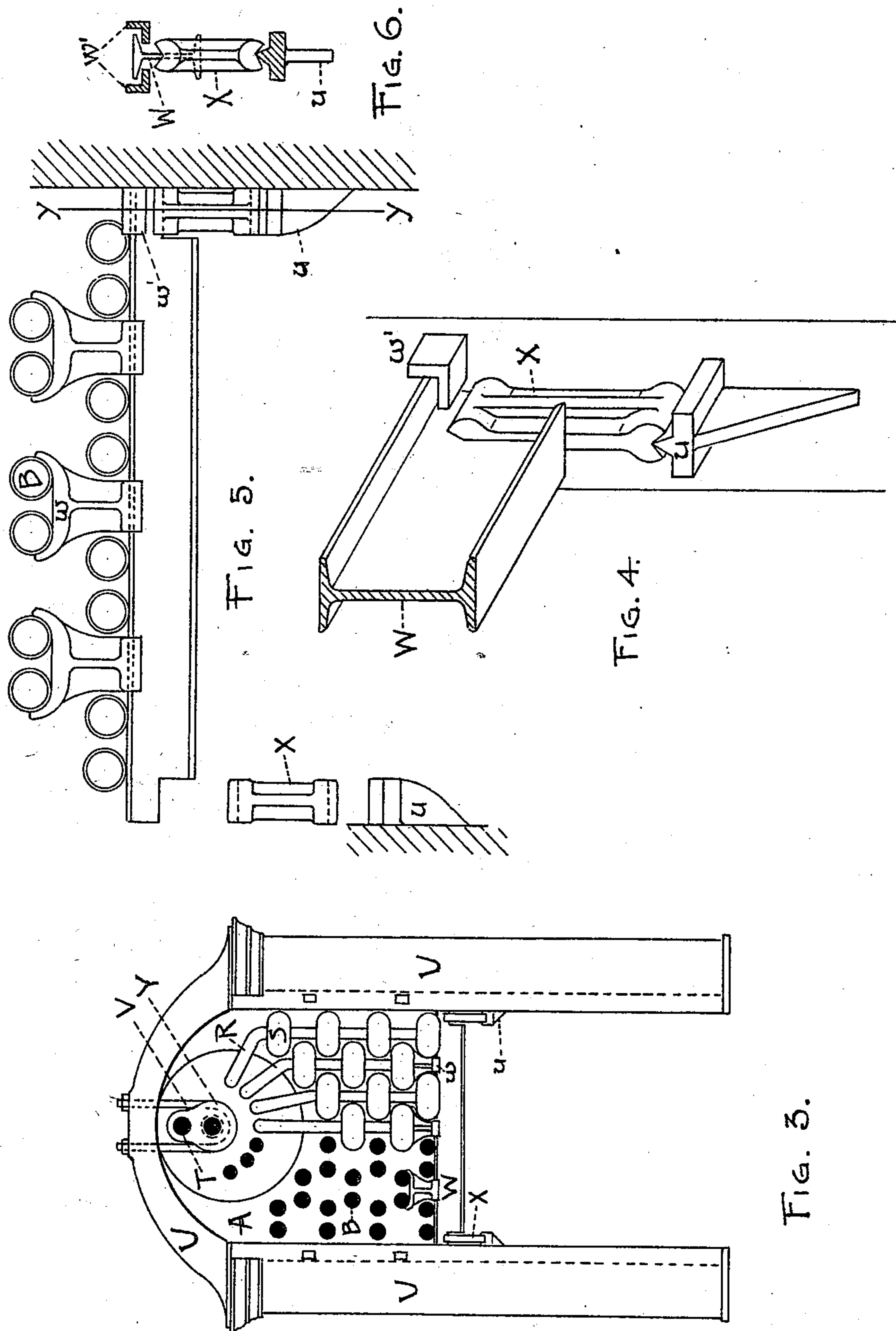
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2 Sheets—Sheet 2.

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UNITED STATES PATENT OFFICE.

WILLIAM D. EWART, OF CHICAGO, ILLINOIS.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 556,140, dated March 10, 1896.

Application filed September 10, 1894. Serial No. 522,601. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM D. EWART, a citizen of the United States, residing at Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification.

My invention relates particularly to water-tube boilers, and has for its principal objects a more economical heating and purifying of the feed-water, an improved method of supporting the weight of the boiler and its contents and of arranging the parts of the boiler with reference to each other, and a more thorough separation of the steam from the water.

To these ends my invention consists in details of arrangement and construction of parts, as fully set forth hereinafter.

To enable those skilled in the art to which my improvements relate to understand and practice the same, I will now proceed to describe my invention more fully, referring to the accompanying drawings, which form part of this specification, and in which similar letters refer to similar parts throughout the several views.

Figure 1 is a side elevation in section showing a boiler embodying some of my improvements. Fig. 2 is a cross-section of the boiler shown in Fig. 1, taken on the line *xx*. Fig. 3 is a partial front view of the boiler, showing some of the headers and connections removed at the left-hand side and illustrating especially the manner of supporting the battery of water-tubes and the steam and water drum by the boiler-front framework. Figs. 4, 5, and 6 are detail views of the parts used in supporting the battery of water-tubes, Fig. 4 being a perspective view on a large scale, Fig. 5 a front view on a smaller scale, and Fig. 6 a cross-section of Fig. 5 at the line *yy*, looking in the direction of the arrow.

A is a steam and water drum.

B B are water-tubes.

C is a casing or receptacle through which the feed-water is supplied to the boiler. It is shown located within downtake D, and open at the bottom to deliver into settling-chamber E. The water entering this receptacle through pipe F passes down over lodging-surfaces shown in the form of a spiral G, which is preferably in sections, jointed, as at H, for ready removal. The water passes from chamber E up around the casing into exten-

sions I I, from which it goes through pipes J to supply-drum K, which connects with rear headers, L, of water-tubes B.

M is the furnace, N the bridge-wall, and O O are baffle-walls to divert the hot gases.

P is a partition near the front head, Q, of the steam and water drum, forming a compartment into which the steam and water are received above the water-line through bent pipes or nipples R from front headers, S.

T is a steam-pipe extending through front head, Q, and partition P without communicating with the separating-compartment, and acting as a "dry pipe" to carry steam from the body of the steam and water drum.

U is the boiler-front framework, from the top of which the steam and water drum is self-adjustably suspended by a sort of sling or hanger V.

The front end of the battery of water-tubes is supported on a cross-bar W which rests self-adjustably on links X, which are in turn supported by ledges or brackets *u* in the boiler-front framework U.

Y is preferably a casting secured to head Q for the accommodation of steam-pipe T and the safety-valve duct or other outlets. It also serves, in connection with hanger V, to support the front end of the steam and water drum.

In boilers as ordinarily constructed much trouble has been experienced with deposits from the water which are released at various temperatures and which gather at different points, especially in the water-tubes, finally clogging them up if not attended to frequently. Outside purifiers are often employed to put the feed-water into good condition for use in the boiler, but these are generally of expensive construction, relatively expensive to operate separately, and do not deliver the water into the boiler circulation at a sufficiently high temperature. Efforts have been made to introduce the feed-water at some point where it will be rapidly heated by surrounding steam or the rising steam and water in the front of the boiler; but the result is the condensation of the steam to such an extent as to destroy some and make the balance what is called "wet steam," or at least prevent the production of as dry steam as might otherwise be obtained.

By introducing the feed-water below the water-level through a suitable receptacle

whose exterior is exposed to the large body of very hot water which is descending the down-take in the circulation of the boiler, I heat the feed-water rapidly, and yet without deteriorating the quality of the steam. By providing in this receptacle suitable lodging-surfaces to receive the deposits which are released from the water as its temperature rises, I practically overcome many of the difficulties heretofore experienced. The water in the downtake is under the boiler-pressure, and really heated considerably above the normal boiling-point of 212° , and thus enabled to cause hard water in the feed-water receptacle to deposit its lime, &c., before going into the circulation at all.

I prefer to extend the purifying-receptacle down into a settling-chamber or mud-drum which will receive the loose particles by gravity, the purifying-receptacle largely taking care of chemical deposits and the settling-chamber receiving the sediment. This chamber is usually provided with blow-off cocks and hand-holes for cleaning purposes.

To distribute to the water-tubes evenly the water which descends in the downtake and that which rises around the purifying-receptacle from the settling-chamber, I provide the extensions I, from which pipes J connect with the supply-drum K, which in turn connects with the bottom of each rear-header section and furnishes water to the battery of water-tubes. Drum K is preferably provided with blow-off cocks to clean out any sediment which may possibly be carried beyond settling-chamber E.

I prefer to make the downtake and the feed-water receptacle cylindrical in form for simplicity of construction. The feed-water receptacle may extend up into the rear of the steam and water drum, providing it is kept submerged below the water-level so as not to affect the steam; but it is preferably made long enough to be well exposed to the water which is descending in the downtake, for while this is very hot and able to perform the purifying work economically and efficiently it is about the least-heated water in the circulation, and loss of heat-units at this point does not tax the efficiency of the steam-making portion of the boiler as much as would be the case if the feed-water were received elsewhere.

The purifying-receptacle is shown suspended by lugs or ears *c* and provided with a removable cap *c'*, through which connections are made with supply-pipe F. I prefer to use for the lodging-surfaces a spiral somewhat in the form of an ordinary screw conveyer, made in sections, so that when cap *c'* is removed the sections can be pulled up out of the receptacle and taken away through a manhole in the rear head of the boiler to be cleaned. The spiral can be made to present considerable lodging-surface within small limits of space, while it allows the water and sediment to pass freely down and has other advantages

in practical use. Slight ledges or projections on the spiral surface can be used to make centers of accumulation of deposits when desired. I have shown a clip or hook at *c''* on the inside of the boiler, directly above the purifying-receptacle, to which can be fastened such tackle as may be desirable to use in handling the lodging-plates or the receptacle itself. The latter also can be formed in removable sections in any well-known manner.

It will be seen that my downtake forms a solid rear support carrying practically the most of the weight of the water in the steam and water drum independently of the water-tubes or their headers, with which the downtakes in other boilers are so closely combined. The battery of water-tubes rests at the rear on supply-drum K. This arrangement makes the steam and water drum and the battery of tubes more independent of each other and aids me in securing more freedom for differences in expansion and contraction which necessarily result from the greater exposure of the water-tubes to the direct heat of the fire. My further provision for this is in separately and self-adjustably supporting the front ends of these portions of the boiler by hanger V for the steam and water drum and cross-bar W with links X to carry the battery of water-tubes. Cross-bar W is shown made of a steel beam notched out at the ends and set into forks in the links X. The lower ends of these links are shown supported on brackets *u*, which are provided with ridges or knife-edge bearings to permit freedom of movement.

w w are shown as castings acting as supplementary supports for those header-sections whose lowest headers do not reach down to the level of the cross-bar in the arrangement of headers and water-tubes.

I would here mention that the novel arrangements of headers and water-tubes herein illustrated and the advantages of same are more fully set forth and definitely claimed in an application filed by me May 15, 1894, Serial No. 511,312.

w' w' are safety-ledges on framework U, used at each end of cross-bar W and placed far enough apart to permit the necessary forward and backward movement of the bar in expansion and contraction of the water-tubes, but in proper position to catch the bar in case of an accident to link X or bracket *u*.

The front headers are shown connected upwardly with the front head of the steam and water drum by bent pipes or tubes R expanded into same, the general structure and connections being such as to permit a certain degree of flexibility without danger of leakage. My boiler-front framework furnishes these front supports without the necessity for the usual separate overhead beams, thus saving head-room and expense of extra framework. I am further aided in this general arrangement by having my connections R from the front headers, S, enter drum A above the water-line, for this permits setting drum A

farther down into the battery of tubes, some of the highest tubes in the middle rows being dispensed with. Head-room is saved and side space around the lower part of drum A is utilized, and the separate supports are brought nearly into a vertical line with the natural position of the boiler-front framework. The steam and water drum is also thereby brought nearer to the fire without material loss of tube-heating surface.

For the more thorough separation of the steam and water, I provide that the delivery into drum A shall be made above the water-line, so that there will be as little water as possible in the way of the rising steam. Near the head through which the steam and water are received I place a partition P, which closes considerable of the steam-space against a too sudden rush of combined steam and water, thus forming a sort of separating-compartment, which gives an opportunity for the water to fall and pass away at about the water-level, while the steam rises and then passes into the main portion of the drum by a descending course after the separation has been effected. To check any tendency to foam or form waves I put in a sort of wave-breaker, as at P', open below for the passage of water underneath and above for the passage of the steam. Pipe T receives steam only in the quiet portion of the drum and is provided with a series of holes in the top, through which the steam is drawn without a concentration at any one point. This arrangement avoids a rush of water along with the steam, and makes pipe T practically a dry pipe.

While I have shown and described my improvements about as I prefer to embody them, it is evident that some features could be varied within reasonable limits without departing from the spirit of my invention. A few of these variations have been indicated in my description, and others will be apparent on examination—as, for instance, in the shape or size of the feed-water receptacle, shape, number and arrangement of lodging-surfaces therein, exact size and location of partition P, &c. I do not therefore wish to be limited to the exact proportions, sizes, and relative arrangements which I have shown; but,

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

1. In a water-tube boiler, the water-tubes, a steam and water drum, a downtake from the said drum connected with the said tubes, and a feed-water receptacle through which the water is delivered to the boiler, said receptacle having its exterior exposed to the water within said downtake, substantially as and for the purpose set forth.

2. In a water-tube boiler, the water-tubes, a steam and water drum, a downtake from the said drum connected with the said tubes, a feed-water receptacle whose exterior is exposed to the water within said downtake,

and lodging-surfaces within said receptacle adapted to receive deposits from the feed-water, substantially as set forth.

3. In a water-tube boiler, the water-tubes, a steam and water drum, a downtake from the said drum connected with the said tubes, a feed-water receptacle whose exterior is exposed to the water within said downtake, and removable lodging-surfaces within said receptacle adapted to receive deposits from the feed-water, substantially as set forth.

4. In a water-tube boiler, the water-tubes, a steam and water drum, a downtake from the said drum connected with the said tubes, a feed-water receptacle whose exterior is exposed to the water within said downtake, and a spiral lodging-surface within said receptacle adapted to receive deposits from the feed-water, substantially as set forth.

5. In a water-tube boiler, the water-tubes, a steam and water drum, a downtake from the said drum connected with the said tubes, a feed-water receptacle whose exterior is exposed to the water within said downtake, and a settling-chamber into which said receptacle discharges, substantially as and for the purpose set forth.

6. In a water-tube boiler, the water-tubes, a steam and water drum, a downtake from the said drum connected with the said tubes and arranged to serve as a rear support for the said steam and water drum, a boiler-front framework from the top of which the steam and water drum is adjustably suspended, and an adjustable cross-bar for separately supporting the battery of water-tubes, substantially as and for the purpose set forth.

7. In a water-tube boiler, the steam and water drum, the water-tubes, a flexible connection between said drum and the said tubes, and a boiler-front framework adapted to furnish separate self-adjustable supports for the front ends of the said tubes and drum, substantially as set forth.

8. In a water-tube boiler, the combination with a battery of water-tubes, of a steam and water drum, a head for said drum, connections between the tubes and the head through which the steam and water are delivered to the drum above the water-line, and a partition in the drum near said head extending downward above the water-line and forming a compartment for the separation of the steam and water, substantially as set forth.

9. In a water-tube boiler, a steam and water drum, a head for the said drum through which the steam and water are received above the water-line, a partition near said head forming a compartment for the separation of the steam and water, and a steam-pipe extending through the said partition and head without communicating with said separating-compartment, substantially as set forth.

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Witnesses:

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