

J. W. STEPHENS.
SCALE PREVENTER FOR BOILERS.
APPLICATION FILED NOV. 20, 1909.

973,989.

Patented Oct. 25, 1910.

2 SHEETS—SHEET 1.

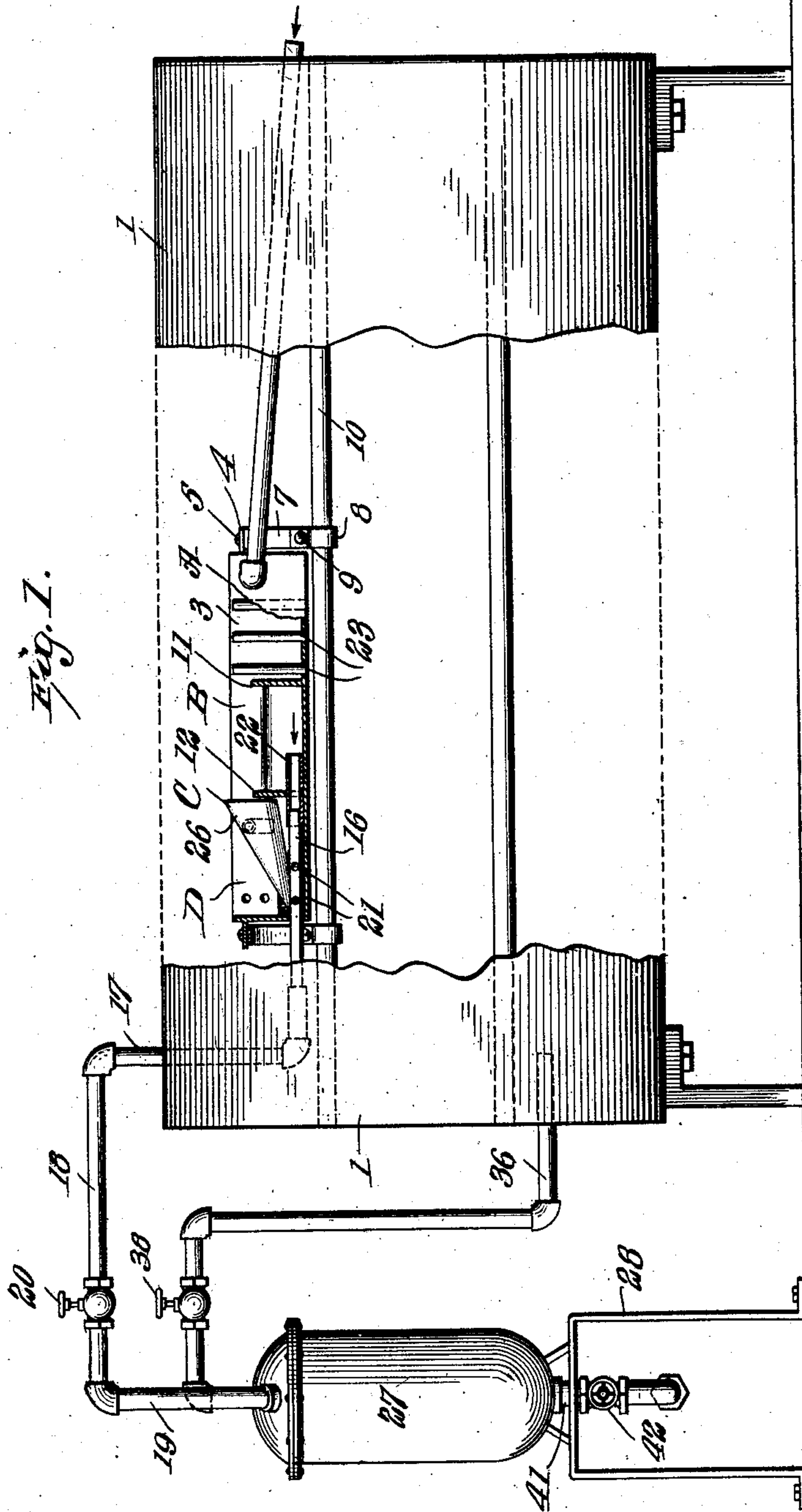


Fig. 1.

WITNESSES
C. M. Callaghan
C. E. Finner

INVENTOR
JOHN W. STEPHENS
BY *Wm. H. Co.*

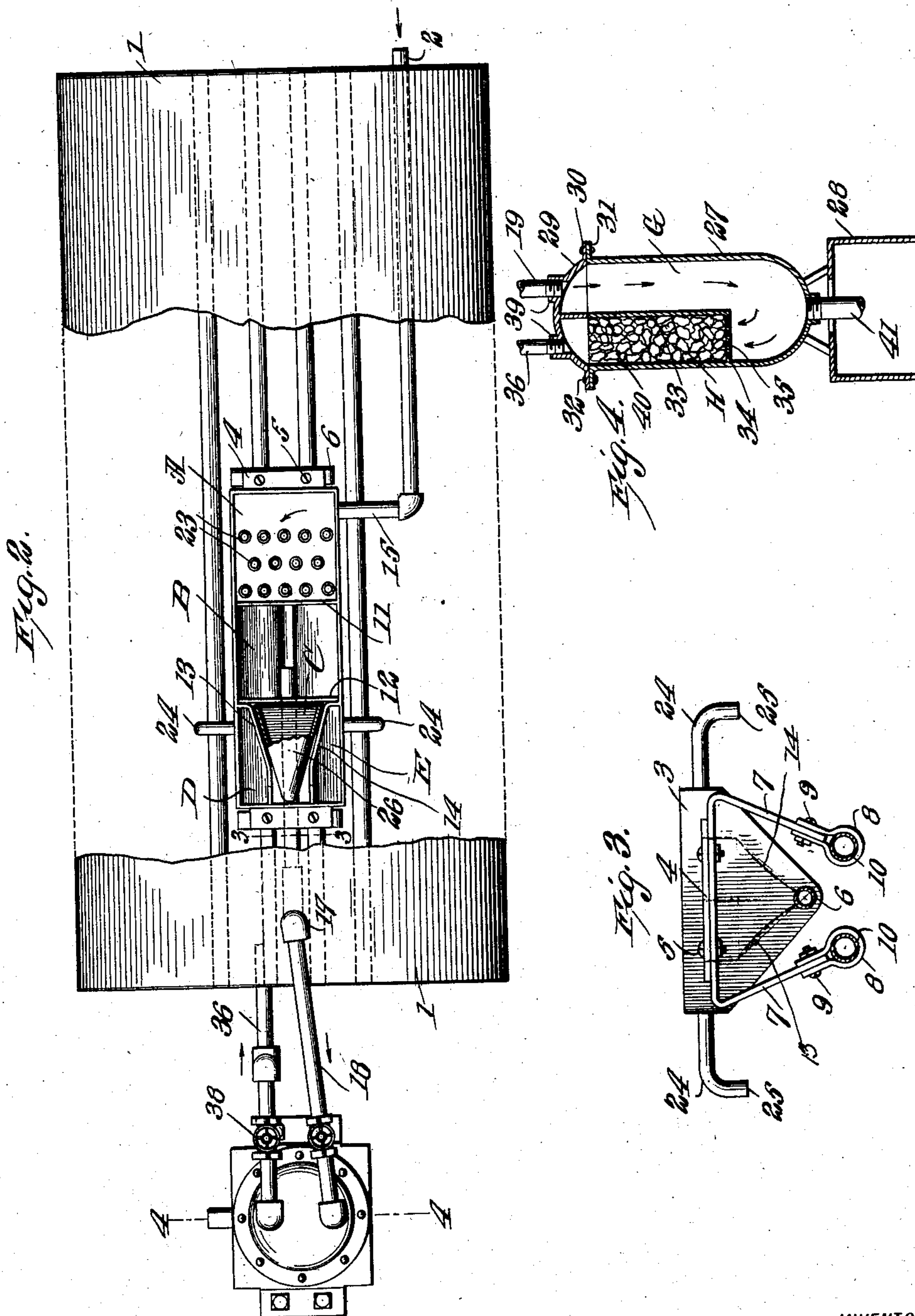
ATTORNEYS

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WITNESSES
E. M. Callaghan
C. E. Prunier

INVENTOR
JOHN W. STEPHENS
BY *Munroe & Co.*
ATTORNEYS

UNITED STATES PATENT OFFICE.

JOHN W. STEPHENS, OF STAUNTON, VIRGINIA.

SCALE-PREVENTER FOR BOILERS.

973,989.

Specification of Letters Patent.

Patented Oct. 25, 1910.

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To all whom it may concern:

Be it known that I, JOHN W. STEPHENS, a citizen of the United States, and a resident of Staunton, in the county of Augusta and State of Virginia, have made certain new and useful Improvements in Scale-Preventers for Boilers, of which the following is a specification.

My invention is an improvement in scale preventers for boilers, and consists in certain novel constructions and combinations of parts, hereinafter described and claimed.

The object of the invention is to provide a device for separating sediment and sediment producing salts from the feed water before it is admitted to the boiler proper, by preliminarily heating the feed water within the boiler passing it through a plurality of settling tanks and a skimming tank, removing the sediment from the boiler, filtering it and returning the purified water to the boiler.

Referring to the drawings forming a part hereof—Figure 1 is a side view of a boiler with the improvement in place, a part of the boiler being broken away. Fig. 2 is a plan view of Fig. 1. Fig. 3 is a section on the line 3—3 of Fig. 2, and Fig. 4 is a section on the line 4—4 of the same figure.

As is well known, when water containing sulfates, carbonates, etc., is heated to a high temperature, the salts are precipitated, and the resulting precipitate forms the scale on the boiler tubes and boiler, acting as an insulator and impairing the efficiency of the boiler. The embodiment of the invention shown in the drawings is intended to prevent this action by separating the salts from the water, collecting them and removing them from the water and the boiler. With this object in view, the feed water is introduced through the front end of the boiler 1, by means of a pipe 2, and is delivered into a separator to be presently described in detail, arranged at the rear end of the boiler.

The separator comprises an open top casing 3, having at each end near the top a lateral flange 4, to which is bolted by bolts 5 the body portion 6 of a yoke-shaped bracket. The arms 7 of the bracket are provided with bearing rings 8, bolted to the arms by bolts 9, and each ring encircles a boiler tube 10, thus securing the separator in place. It is obvious that the casing may be supported in any suitable manner, depending on the form

of the boiler, and it is made large or small to correspond with the size of the boiler.

The casing is provided with two transverse partitions 11 and 12 which divide the casing into three compartments, and the rear compartment is further sub-divided by partitions 13 and 14 into three compartments, making five compartments in all, designated A, B, C, D, and E, respectively. The inlet pipe 2 extends rearwardly, and communicates with the chamber A at one side and near its top by a lateral extension 15.

The bottom of the casing is hopper or V-shaped as shown more particularly in Fig. 3, and a discharge pipe 16 is arranged longitudinally of the bottom, the said pipe extending forwardly through the partition 12, and extending rearwardly to a point adjacent the rear head of the boiler, thence upwardly and out of the boiler as at 17, rearwardly as at 18, and downwardly as at 19 to a connection with a filter to be presently described, and a valve 20 is interposed in the portion 18 of the pipe.

The pipe 16 is provided in the chamber C with a plurality of lateral openings 21, and extends into a sleeve 22 which traverses the partition 12. Both of the partitions 11 and 12 are of lesser height than the walls of the casing as will be evident from an inspection of Fig. 1. The compartment A is provided with a plurality of vertical tubes 23, extending at their bottoms through the bottom of the casing, and having their tops approximately level with the top of the casing.

The compartments D and E are similar and similarly shaped, and such is provided with a lateral overflow pipe 24, opening from the compartment near its top, and having at its outer end a downwardly curved portion 25. The partitions 13 and 14 are also of lesser height than the walls of the casing.

The compartment C as shown in Figs. 2 and 3 is substantially triangular in shape with its apex to the rear, and the compartment is covered by a shield or hood 26 which is substantially semi-conical in shape and is arranged with its large end toward the front and connected to the pipe 16 at the rear. All three of the compartments C, D and E, communicate with the pipe 16 through the openings 21 in the said pipe.

The separator is practically a settling

device. When the feed water enters the compartment A, the flow is checked by the partition 11, until the water is high enough to pass thereover, and the settling is assisted by the tubes 23, which offer an obstruction to the flow of the water. The feed water begins to be heated as soon as it enters the boiler, and the tubes 23 assist in the heating, permitting the heat to pass through them, and sub-dividing the water, so that a larger amount is brought into contact with the heated pipes. The feed water flowing over the partition 11 into the compartment B is again checked by the partition 12, and the sediment, which is separated, passes into the pipe 16, while the water passes over into the compartment C, being heated to yet higher temperature in the compartment B.

As is known, when water of the character in question is heated to a certain temperature, a scum forms on the surface, and the hood or shield 26 acts as a skimmer for this scum, skimming it off and passing it down into the tube 16, while the skimmed water passes into the side compartments D and E.

A portion of the feed water is discharged from the compartments D and E into the boiler, and the remainder passes with the sediment through the sections 17, 18 and 19 of the discharge pipe into the filter, which comprises a substantially cylindrical casing 27, arranged near the rear end of the boiler and supported on a bracket 28.

The casing 27 is provided with a cover 29, having a flange 30, which rests upon a flange 31 on the casing, and the flanges are secured together by rivets 32, the pipe 19 passing through the cover. The casing (Fig. 4) comprises a compartment G and a compartment H, the latter being spaced above the bottom of the casing, and the said compartments are separated by a wall comprising a vertical portion 33, and a horizontal portion 34, the latter having a plurality of openings therethrough.

A return pipe 36 leads from the upper end of the compartment H through the cover 29 and communicates with the rear end of the boiler near its bottom as at 37, and a valve 38 is arranged in the said pipe. The cover is provided with nipples 39, and the pipes 19 and 36 are threaded into the nipples, as shown in Fig. 4. The compartment H is also provided with a suitable filtering material 40, such as charcoal or the like, and the compartment G with a blow off pipe 41 in the bottom of the casing provided with a valve 42.

The water and sediment passing from the separator through the pipes 16, 17, 18 and 19 under pressure from the boiler flows downwardly into the compartment G of the filter, upwardly through the openings 35, through the filtering material 40, and is returned to the lower part of the boiler, free

from sediment forming salts, and somewhat cooled by its passage through the filters, the cooling assisting in the circulation. When the compartment G contains too much sediment, it may be blown off by opening the valve 42.

The pipe 41 has a capacity equal to the aggregate capacity of the pipes 19 and 36, in order that the blowing off may be thoroughly done. When it is desired to blow off the filter both valves 20 and 36 are opened, and the steam and water under pressure is admitted through both pipes 19 and 39, and passes out through the pipe 41, which is of a capacity to receive the discharge from both pipes. The flow of the water is indicated by the arrows in Figs. 1, 2 and 4, and is continuous when the valves 20 and 38 are open, and the filter may be cut off from the circulation by closing the said valves, for cleaning or other purposes.

The separator is preferably constructed of a plurality of sections secured together in any suitable manner, and is supported above or at the normal level of the water. The hood or shield is arched being substantially a semi-conical shell arranged with its large end toward the direction in which the feed water flows, so that the sediment strikes the inner face of the shell and is deflected toward the bottom of the compartment.

The shield is in effect an arched baffle plate inclined toward the direction of travel of the water, and the partitions are substantially vertical baffle plates. The vertical tubes act as baffles, as do also the inclined bottom walls of the casing.

I claim:

1. The combination with the boiler, of a separator comprising a casing having an open top and a trough shape bottom, a plurality of spaced transverse baffle plates of lesser height than the casing walls, dividing the casing into a front, an intermediate and a rear compartment, a feed water pipe delivering to the front compartment, a plurality of substantially vertical tubes extending upwardly through the bottom of the casing in the front compartment, a discharge pipe in the bottom and leading from the intermediate compartment through the rear compartment and outside of the boiler, a plurality of substantially longitudinal baffle plates of lesser height than the casing wall dividing the rear compartment into a central and side compartments, a skimming device in the said central compartment, over-flow pipes leading from the side compartment to the boiler, said discharge communicating with said central and side compartments, a filter outside the boiler to which the discharge pipe delivers, and a return pipe leading from the filter to the boiler.

2. In a device of the character specified, a

separator provided with means for supporting the same within a boiler above the normal water level, said separator comprising a casing having an open top, a plurality of transverse baffle plates of lesser height than the walls of the casing dividing said casing into a plurality of compartments, a feed water pipe delivering to the front compartment, a plurality of substantially vertical tubes extending through the bottom of the front compartment a discharge pipe in the bottom leading from the intermediate compartment, a plurality of substantially longitudinal baffle plates dividing the rear compartment into central and side compartments, a skimming device in said central compartment, the discharge pipe communicating with said central and side compartments and leading from the boiler, an overflow pipe leading from each of the side compartments and delivering into the boiler, a filter to which the discharge pipe delivers, and a pipe leading from the filter to the boiler.

3. In a device of the character specified, a separator, comprising a casing having an open top, and adapted to be supported in a boiler above the water level, baffle plates of lesser height than the casing walls dividing said casing into a plurality of compartments, a feed water pipe delivering to the front compartment, a plurality of substantially vertical tubes extending through the bottom of the front compartment, a plurality of substantially longitudinal baffle plates dividing the rear compartment into a central and side compartment, over-flow pipes leading from the side compartments, a skimming device in the central compartment, and means for removing the sediment from the casing.

4. In a device of the character specified, a separator comprising an open top casing, transverse baffle plates of lesser height than the casing dividing said casing into a plurality of compartments, a feed water pipe delivering to the front compartment, a skimming device in another of the compartments, baffle plates in said compartment, over-flow pipes leading therefrom, and means for conducting the sediment from the casing.

5. In a device of the character specified, a separator comprising a casing adapted to be arranged in the boiler above the water level, a plurality of baffle plates in the casing, overflow pipes leading from the top of the casing, a filter, and means for removing the sediment from the casing and passing it through the filter.

6. In a device of the character specified a casing, a plurality of substantially vertical baffle plates in the casing, a substantially horizontal transversely arched baffle plate, one of whose ends is lower than the other, means below said baffle plate for removing

the sediment from the casing, and overflow pipes at the level of said plate.

7. In a separator of the character specified, a casing having at one end a substantially V-shaped compartment, an arched shield or hood over the compartment the arch of the said shield gradually decreasing in height toward the apex of the compartment, means for feeding water to the opposite end of the casing and means below the hood for removing the sediment.

8. The combination with the boiler of an open top casing supported within the boiler above the normal water level, partitions of lesser height than the casing walls dividing said casing into a plurality of compartments, a feed water pipe delivering to the casing, a filter outside of the boiler, a valved blow off pipe in the bottom of the filter, a pipe leading from the filter to the boiler below the water level, and a plurality of overflow pipes leading from the casing to the boiler.

9. The combination with the boiler of an open top casing supported within the boiler above the normal water level, partitions of lesser height than the casing walls dividing said casing into a plurality of compartments, a feed water pipe delivering to the casing, a filter outside of the boiler, a pipe leading from the separator to the filter, a pipe leading from the filter to the boiler below the water level, and a plurality of overflow pipes leading from the casing to the boiler.

10. The combination with the boiler, of a casing supported in the boiler above the normal water level, a feed water pipe delivering to the casing, a plurality of overflow pipes leading from the casing to the boiler, said casing having a plurality of settling compartments, a filter outside of the boiler, means for conducting a portion of the water and the sediment from the casing to the filter, and means for returning the filtered water to the boiler.

11. In a device of the character specified, a separator comprising a casing having an open top means for supplying feed water at one end thereof, a plurality of substantially vertical transverse baffle plates spaced apart from each other in the casing, a plurality of substantially longitudinal baffle plates at the opposite end of the casing, and an arched baffle plate intermediate the last named plates, said plate being inclined and arranged with its concave side downward, and means below said plate for removing the sediment.

JOHN W. STEPHENS.

Witnesses:

WM. H. AST,
BESSIE H. CRAWFORD.