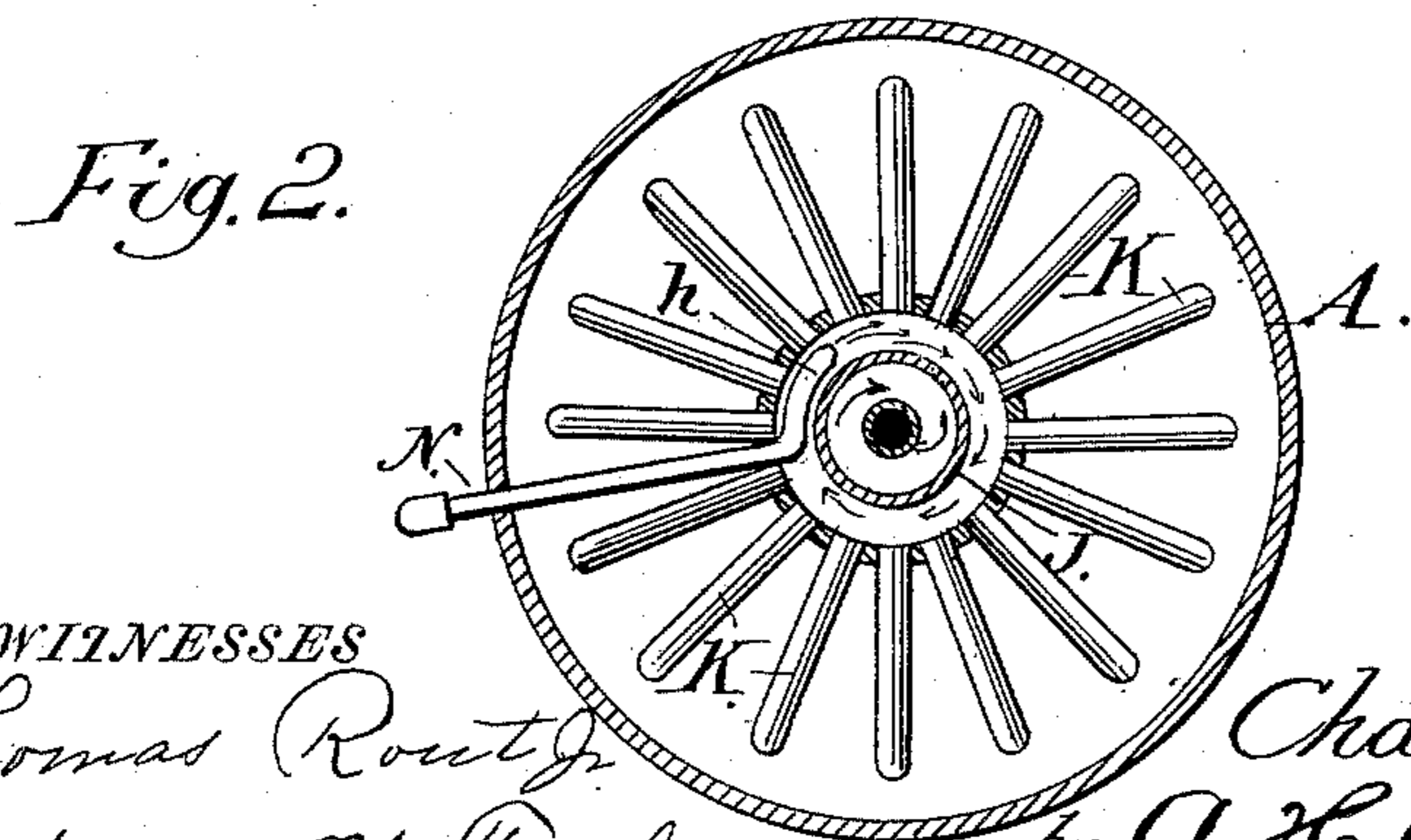
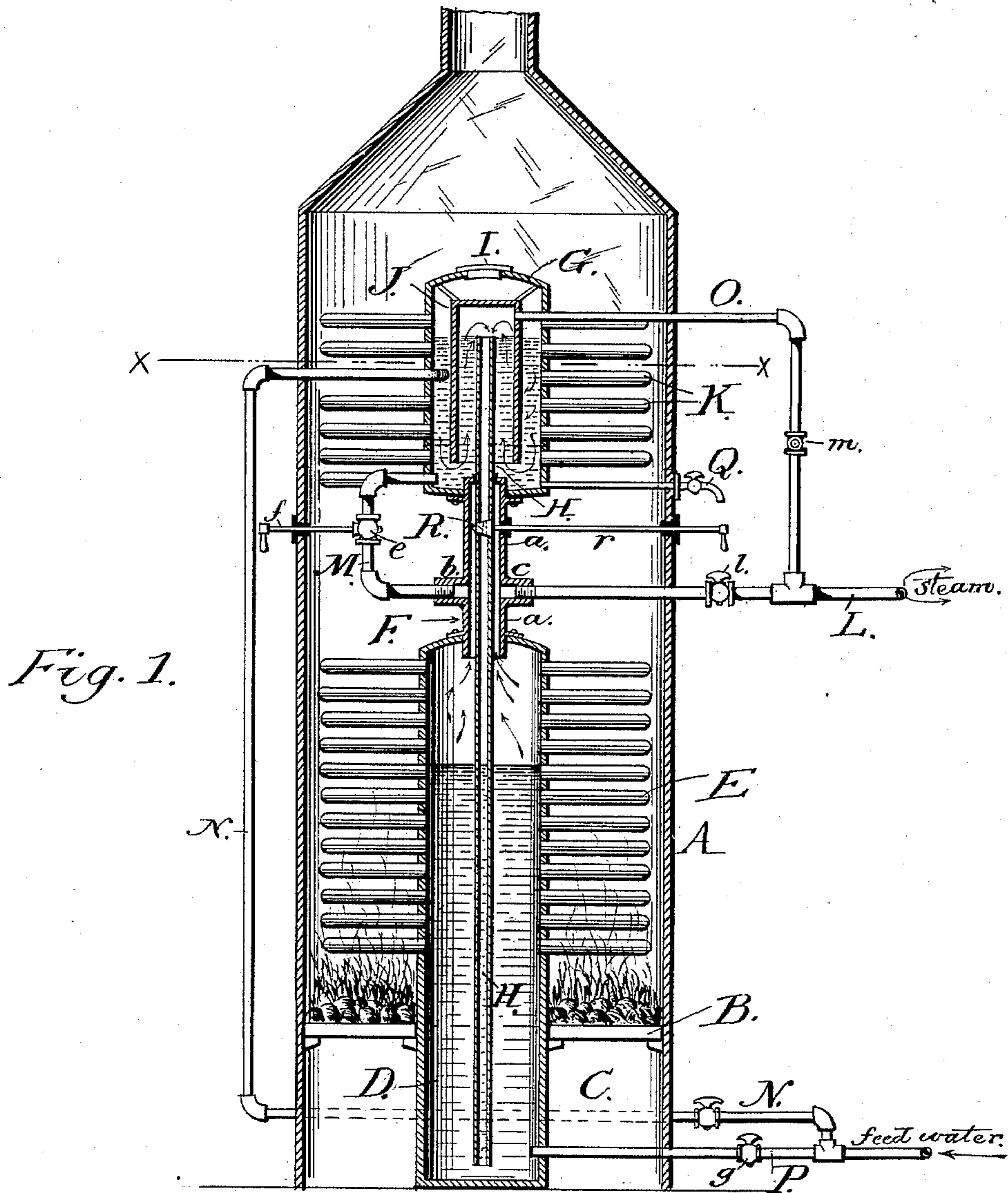


(No Model.)

C. HALLETT.
BOILER.

No. 483,612.

Patented Oct. 4, 1892.



WITNESSES
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BOILER.

SPECIFICATION forming part of Letters Patent No. 483,612, dated October 4, 1892.

Application filed February 20, 1892. Serial No. 422,290. (No model.)

To all whom it may concern:

Be it known that I, CHARLES HALLETT, a citizen of the United States, residing at Riverhead, in the county of Suffolk and State of New York, have invented certain new and useful Improvements in Boilers, as set forth in the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a vertical sectional view of a boiler embodying my invention. Fig. 2 is a horizontal sectional view on the line $x x$ of Fig. 1.

My invention relates to boilers generally, and particularly to that class denominated "porcupine" boilers, in which the boiler has a vertical series of radially-disposed horizontal water-tubes located in the path of the ascending gases and products of combustion from the fire-boxes. It is an improvement on my former patent, No. 402,441, granted to me April 30, 1889, for an improvement in boilers; and it consists, essentially, in connecting with and supporting above and outside of the main boiler, but within the exterior casing of the boiler, a supplemental boiler or heater having horizontal tubes radially disposed in vertical series and in connecting said supplemental boiler or heater with the feed-water supply, whereby the water may be heated by the ascending products of combustion and thence fed to the main boiler.

My invention also contemplates connecting the steam-space of the main boiler with the supplemental boiler, whereby said boiler may also serve as a superheater for steam when the feed-water supply is cut-off, thereby enabling me to utilize the waste heat and gases which have passed the main boiler on their way to the stack or flue for this purpose.

My invention further consists in the interposition of pipes and valves between the main and supplemental boilers and feed-water and steam supply to cut off or direct the flow of either steam or water, and also in a means for promoting the circulation of the water and enabling the supplemental boiler to be cut off from the main boiler without affecting the latter and to be removed and replaced when desired.

My invention also consists of the construc-

tions and combinations of devices which I shall hereinafter fully describe, and specifically set forth in the claims.

To enable others skilled in the art to which my invention appertains to make and use the same, I will now describe its construction and indicate the manner in which the same is carried out.

Referring to the accompanying drawings for a more complete explanation of my invention, A represents the outer shell or casing of the boiler, which may be of the usual form and constructed of any suitable material and is provided with grate-bars B and ash-pit C, as shown.

Within the outer shell or casing A the main boiler D is centrally located and provided with a vertical series of horizontally-arranged radially-disposed tubes E, having their inner ends open and communicating with the interior of the main boiler D, as fully disclosed in my said former patent. The upper head of the main boiler is pierced to receive the lower open end of a coupling F, having four branches $a, b, c,$ and $d,$ respectively, and which has its upper end closed, suitable flanges being formed on the coupling to enable it to be riveted to the upper head of the main boiler and to the lower head of the supplemental boiler G. This supplemental boiler G is of cylindrical or other form, having its lower end seated upon and riveted to one of the flanges on the coupling F, which latter has its upper closed end passing into the bottom of the supplemental boiler through a stuffing-box of usual form, and through this coupling passes a vertical pipe H, connecting with both boilers and having both ends open and communicating with the interior of said boilers, as shown. The upper head of the supplemental boiler is provided with a manhole I, through which access may be had to the interior of the boiler, and within the latter is secured an open-bottom chamber J, concentric with the pipe H and walls of the supplemental boiler and interposed between the same, as shown. The supplemental boiler is separate and independent of the main boiler and is supported by the coupling F above the latter and in the path of the ascending gases

and products of combustion, and it is provided with a vertical series of horizontal radially-arranged water-tubes K, similar to those on the main boiler, and which receive the full effect of the heat and gases which have passed the main boiler, and are on their way to the stack. By thus locating the supplemental boiler at the point indicated I am enabled to utilize the heretofore waste heat for superheating water or steam within the supplemental boiler, as I will hereinafter indicate.

One of the branches *c* of the coupling F has fitted to it the main steam-pipe L, while from the other branch *b* leads a pipe M, which leads to the lower portion of the supplemental boiler and is provided with a valve *e*, whose stem *f* extends through a stuffing-box in the outer casing or shell A to the outside of the boiler, whereby it may be operated to turn the valve and open or cut off communication between the two boilers when desired, and also to flush or clear the supplemental boiler. The pipe P connects with the feed-water supply and enters through the lower part of the casing or shell to the main boiler, and it has a valve *g* for controlling the supply at this point. A pipe N connects with the feed-water pipe P and extends upwardly to a point near the upper end of the supplemental boiler and has its upper end *h* passing through the shell or casing and entering the supplemental boiler, as shown, said end *h* being curved and located within the space formed by the concentric chamber J and inner wall of the supplemental boiler, so as to impart a rotary motion to the water discharging through the pipe N into said boiler. A steam-pipe O has its inner end communicating with the upper portion of the chamber J, and from thence it leads outward and connects with the main steam-pipe L, said pipes L and O each having a controlling-valve *l* and *m*, respectively. From the lower part of the supplemental boiler leads a blow-off pipe Q, and within the pipe H is a valve R, whose stem *r* extends through stuffing-boxes in the coupling F and shell or casing A and is provided with means by which it may be turned to open or close the connecting-passage between the main and supplemental boilers.

From the description of the arrangement and construction of parts heretofore given it will be seen that by interposing the supplemental boiler within the upper portion of the shell or outer casing and above the main boiler, where it will receive the full effect of the heretofore waste gases and products of combustion escaping to the main flue or stack, and by introducing the pipe connections between the two boilers and the feed-water supply I am enabled to form of the supplemental boiler a superheater of the feed-water and also a medium by which steam may be superheated when the feed-water supply is cut off from the said boiler; also, in the event of accident or leakage of the tubes of the supplemental boiler or from any other cause the

supplemental boiler may be shut off from the main boiler without affecting the operation of the latter.

In using the main boiler only the feed-water is brought into the boiler through the pipe P, the valve in the latter being open and the valve in the pipe N being closed. The water rises in the main boiler, filling its tubes, but leaving a steam-space above in communication with the lower open end of the coupling F, whereby steam generated within the boiler passes into the hollow coupling, which, being closed at the top, forms a steam-chamber. As the supplemental boiler is in the path of the intense heat from the fire-boxes, it will be desirable to conduct the steam from the steam-chamber in the coupling F to said boiler to prevent the latter and its tubes burning out. Therefore I use the pipe M, which leads from the branch *b* of the coupling, and open its valve to permit the steam to pass directly to the boiler, where it becomes superheated by the ascending gases and heat and finally escapes through pipe O to the main steam-pipe, it being understood in such cases as above noted that the valve R in the pipe H is closed to cut off communication between the two boilers.

Instances often occur when these boilers are used in places where the feed-water is highly charged with alkali, which, entering the boiler, operates injuriously upon it and often converts the water into a thick foam, which retards the successful operation of the boiler and also causes a deposit of lime and sedimentary material within the boiler. For the purpose of relieving the main boiler from the objections and injuries incident to the use of such waters as above my supplemental boiler is especially useful, as by closing the valve in the pipe P, opening the valves into the pipes H and N, and closing the valves in the pipes M and O, I introduce the feed-water into the supplemental boiler. The end of the pipe N being curved, the water enters the latter boiler and is given a rotary motion and then passes up between the chamber J and the pipe H, thereby accelerating the circulation in the tubes, and enters the pipe H and finally flows through this pipe to the main boiler. The steam which is generated in the main boiler now passes into the chamber in the coupling and finally passes out through the main steam-pipe, whose valve is open, while whatever steam may arise in the supplemental boiler passes through pipe O to the main steam-pipe. In the event of sedimentary deposit in the supplemental boiler the valves in the pipes H, N, O, and P and the main steam-pipe are closed and the valve in the pipe M is opened, when the steam from the main boiler passes through pipe M into the supplemental boiler, near its lower portion, and blows out the sediment through the blow-off cock Q; also, by closing the valves in all of the pipes and opening the draw-off Q the water in the supplemental boiler may be drawn off when

desired. I am thus enabled to use the supplemental boiler as a superheater for feed-water or steam, and utilize the heretofore-wasted gases and products of combustion as the heating medium and can at all times control the circulation and operate the said main boiler with or without the supplemental boiler.

By constructing the supplemental boiler as described and fitting it to the coupling, which in turn is fitted to the outside of the main boiler, the said supplemental boiler simply becomes an attachment which may be cheaply constructed and applied and removed and replaced without difficulty.

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

1. The combination, with a main boiler connected with the feed-water supply, of a supplemental boiler detachably fitted to and above the main boiler and having radial tubes located in the path of the gases and products of combustion which have passed the main boiler, a pipe connecting the supplemental boiler with the feed-water supply, and a pipe connection between the main and supplemental boilers, substantially as herein described.

2. The combination, with a main boiler connected with the feed-water supply, of a coupling fitted to the exterior of its upper head, having its upper end closed and its lower end open and provided with branches, a supplemental boiler fitted to and supported by the coupling and having radial tubes located in the path of the gases and products of combustion which have passed the main boiler, a pipe connecting with the steam-chamber of the coupling and delivering the steam from the main boiler to the supplemental boiler, a main steam-pipe, and a steam-pipe leading from the supplemental boiler and connecting with the main steam-pipe, substantially as herein described.

3. The combination, with the main boiler connected with the feed-water supply, of a coupling fitted to the upper head of said boiler, a supplemental boiler fitted to and supported by the coupling and provided with radial tubes, said coupling being closed at its upper end and open at its bottom, a feed-water pipe leading to the supplemental boiler, a connection between the main and supplemental boilers, a steam-pipe leading from the steam-cham-

ber of the coupling, and a second steam-pipe leading from the supplemental boiler to the main steam-pipe, substantially as herein described.

4. The combination of main and supplemental boilers, each of which connects with the feed-water supply, a coupling forming a connection between said boilers, having its lower end open and in connection with the steam-space of the main boiler, a pipe passing through the coupling and forming a connection between the two boilers, a valve in said pipe for cutting the supplemental boiler off from the main boiler, and steam-pipes leading from the steam-space of the coupling and the supplemental boiler, respectively, substantially as herein described.

5. A supplemental boiler adapted to be detachably fitted upon the main boiler and having radial water-tubes, a chamber J within the boiler, having a closed upper end and open bottom, a pipe leading from the feed-water supply to the supplemental chamber between the inner wall of the same and the outer wall of the chamber J and having its discharge end curved to impart a rotary motion to the water, a coupling fitted to the supplemental boiler, having a closed upper end and an open lower end adapted to enter the steam-space of the main boiler, a steam-pipe leading from the chamber J and a steam-pipe leading from the coupling, and a valve-controlled pipe leading from the interior of the chamber J through the coupling to the main boiler, substantially as herein described.

6. The combination of a main boiler, a supplemental boiler having radial tubes, a coupling supporting the latter boiler above and outside of the main boiler, having its lower end open and receiving steam from the main boiler, a valve-controlled pipe M, leading from the steam-space of the coupling to the lower portion of the supplemental boiler for flushing the latter, a draw-off cock from the supplemental boiler, through which sedimentary deposits may be drawn off, and a valve-controlled pipe communicating with both boilers, whereby one may be cut off from the other, substantially as herein described.

CHARLES HALLETT.

Witnesses:

T. WALTER FOWLER,
CHAPMAN W. FOWLER.