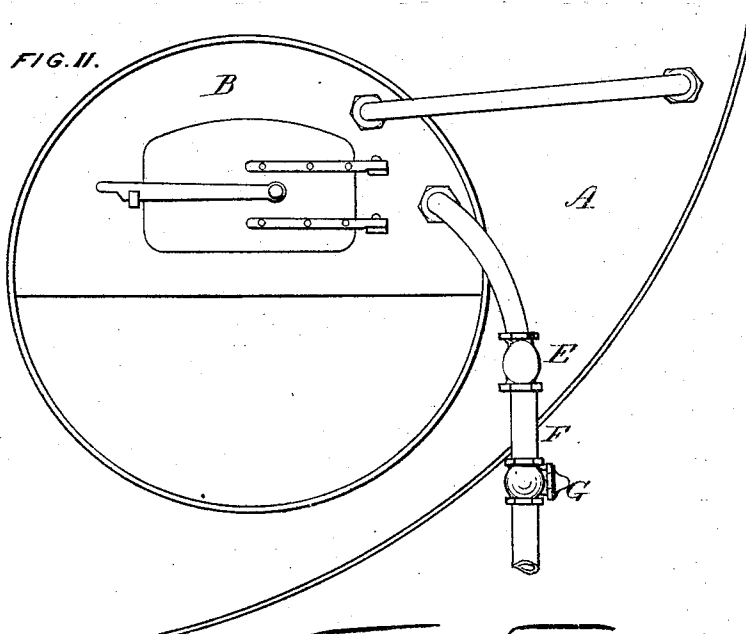
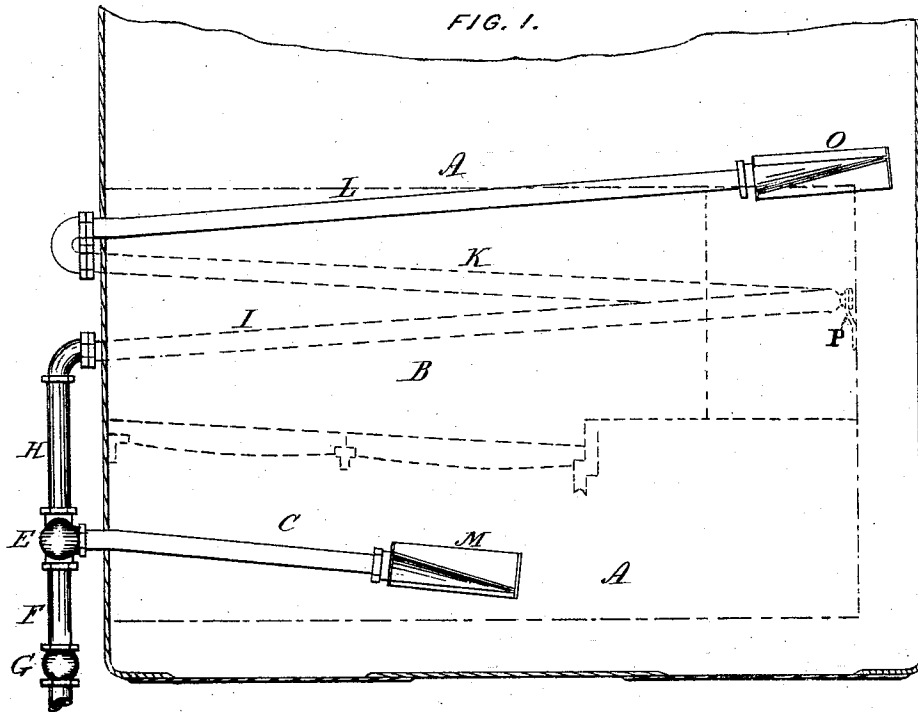


N. WIARD
Water-Circulating Devices for Steam-Boilers.
 No. 157,256. Patented Nov. 24, 1874.



WITNESSES
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Norman Wiard. INVENTOR
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FIG. III.

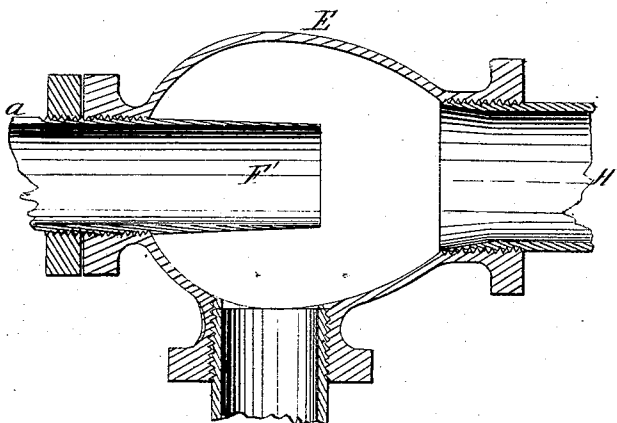


FIG. IV.

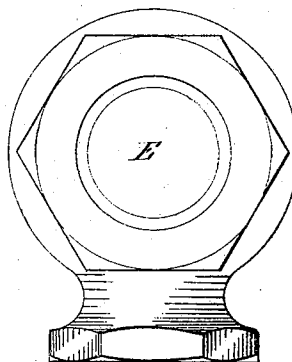


FIG. V.

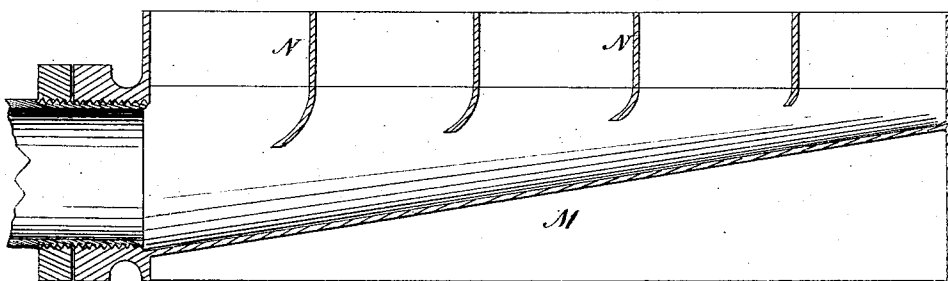
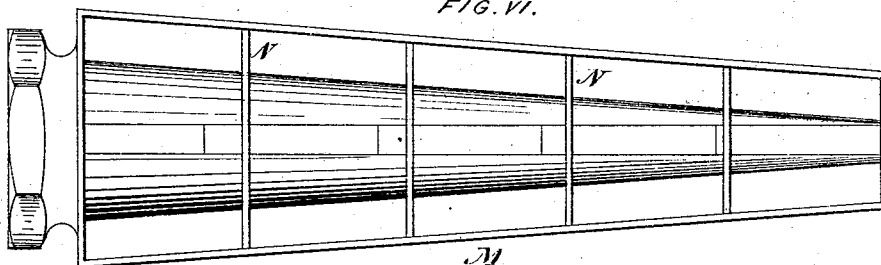


FIG. VI.



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FIG. VII.

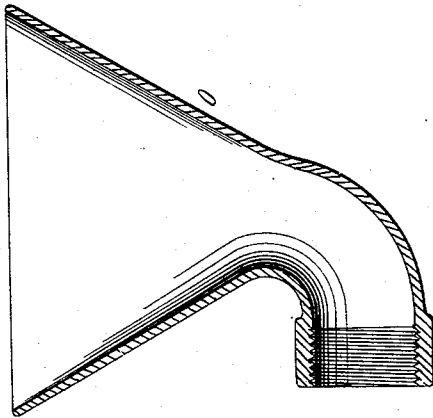


FIG. VIII.

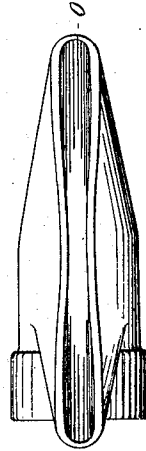


FIG. IX.

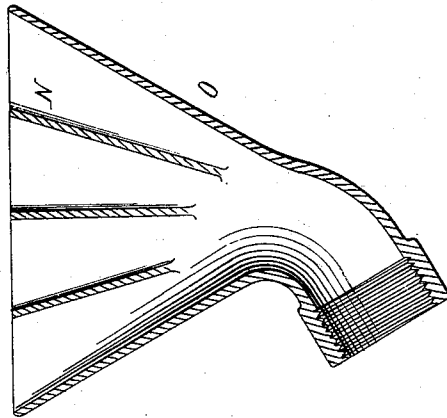


FIG. X.

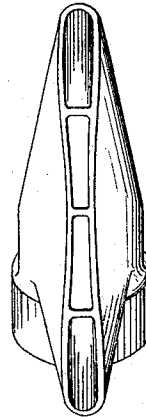


FIG. XI.

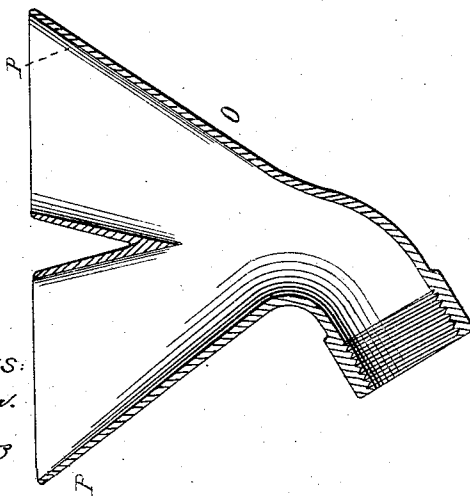
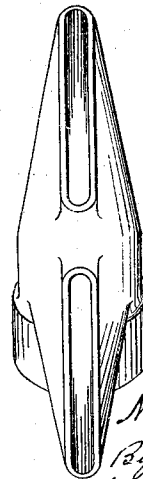


FIG. XII.



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INVENTOR:

Norman Wiard.

By his Attorney,

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UNITED STATES PATENT OFFICE.

NORMAN WIARD, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVEMENT IN WATER-CIRCULATING DEVICES FOR STEAM-BOILERS.

Specification forming part of Letters Patent No. **157,256**, dated November 24, 1874; application filed November 6, 1874.

To all whom it may concern:

Be it known that I, NORMAN WIARD, of Washington, in the District of Columbia, have invented certain new and useful Improvements in Croton Attachment, of which the following is a specification:

My invention relates to a new and improved "Croton" attachment for steam-boilers, or a device by means of which a continuous circulation of water may be kept up during the operation of generating steam, as will be hereinafter fully set forth.

My invention consists of a pipe or tube passing from the lower part of the boiler through the fire of the furnace by which it is heated, and into the upper part of the boiler, being provided at each end with induction and eduction attachments of peculiar construction, as will be hereinafter described, and connected with the feed-pipe or injector, by means of which water is supplied to the boiler.

My invention is designed for stationary, locomotive, marine, and steam-boilers in general. Its object is to keep up a continuous circulation of water through the boiler, so as to rapidly and safely generate the steam, and prevent the deposit of scale or sediment.

In the drawing, Figure 1 represents a vertical longitudinal section of a boiler and furnace supplied with my improved attachment. Fig. 2 represents a front view of the same. Figs. 3 and 4 represent a sectional and an end view of the injector; Fig. 5, a longitudinal section of the induction and eduction attachments; and Fig. 6, a top view of the same. Figs. 7 and 8 represent a modified form of the induction and eduction attachments having a continuous narrow slot. Figs. 9 and 10 illustrate attachments of a similar form having partition or division plates. Figs. 11 and 12 are sectional and top views of induction and eduction attachments having two distinct apertures or slots.

A represents the boiler, and B the furnace by which it is heated. C represents a pipe passing from the interior of the boiler, near or at the bottom, to the outside, where it is connected to and communicates with a hollow globe, E. F represents the feed-pipe, which also communicates with the globe E. This feed-pipe is provided with a globe, G, which

contains a check-valve, which closes automatically when the operation of the feeding-pump is stopped, and prevents any back flow of water from the boiler to said pump. The upper end of the pipe F extends into the globe E, forming an injector, F', as shown at Fig. 3, for the purpose to be hereinafter described. From the globe E extends a pipe, H, communicating with an inclined pipe, I, extending through the front of the said fire-box, and terminating at the back of the same, where it connects with a pipe, K, inclined in the opposite direction, and extending through the front of the fire-box or furnace. The front end of said pipe is connected to a pipe, L, extending through the front of the boiler to near its water-level, as shown. The pipes I K at their junction are connected to the back of the furnace by means of a button or bolt fitted loosely in a bracket, P, attached to the rear wall of the fire-box or furnace. This is only for the purpose of supporting the pipes in position. The end of the pipe C is provided with an induction attachment, M, consisting of an inverted trough of peculiar construction, as shown in detail in Figs. 5 and 6. The said pipe opens into the larger end of said trough, and the trough is provided with a series of transverse curved partitions, N N, the object of which is to prevent the water in the boiler from too rapidly entering the pipe C and being distributed too suddenly to the other pipes of the series. The end of the pipe L, extending into the upper part of the boiler, terminates in an eduction attachment, O, consisting of a trough similar to the trough at the end of the pipe C, but not inverted, having the open side uppermost. Said trough is provided with the curved transverse partitions, which, in this case, prevent the water from being thrown in too great a volume or too suddenly into the boiler.

The operation of my apparatus is as follows: Water is pumped into the boiler through the feed-pipe F, and by means of the injector starts a circulation of the water from the lower part of the boiler through the pipe C into pipe H, and from thence into pipes I and K. Here the water is converted into steam, which expands and forces the water into pipe L, and out of the end of the same through the eduction attach-

ments O. When the feed-pump is stopped, the water in the lower part of the boiler enters the pipe C through the induction attachment M, to supply the place of that forced out of the pipes I and K by the steam, thus keeping up a continuous circulation of water through the boiler during the entire process of generating the steam.

As above stated, the induction and eduction attachments M and O prevent the water from being taken too rapidly in or ejected from the pipes, rendering the circulation of the same through the series of pipes and the boiler uniform and safe.

Instead of employing the form of trough shown in Figs. 5 and 6 for preventing the rapid entrance of water into the circulating-pipe or the discharge from the same at the top of the boiler, I propose to use the attachment or inverted conical head or nozzle M, (shown in Figs. 7 and 8,) which is provided with an elongated inlet or discharge aperture, O, made comparatively narrow in width, for the object specified.

In Figs. 9 and 10 I have represented a similar form of attachment, the same being pro-

vided in this instance with partition or division plates, which extend to the edges of the discharge or inlet aperture, for causing several distinct jets of water to enter into or issue from the attachment.

The double attachment shown in Figs. 11 and 12 is formed by combining two distinct cone-shaped nozzles, P, having contracted apertures, with a single water-conducting neck or short tube.

What I claim is—

The combination of the induction-pipe C and its attachment, and the eduction-pipe L and its attachment, as herein shown, with the pipes I K, feed-pipe F, globes E and G, and check-valve inclosed in globe G', all constructed and relatively arranged to operate substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand.

NORMAN WIARD.

Witnesses:

ALBERT H. NORRIS,
JAMES L. NORRIS.