

No. 674,270.

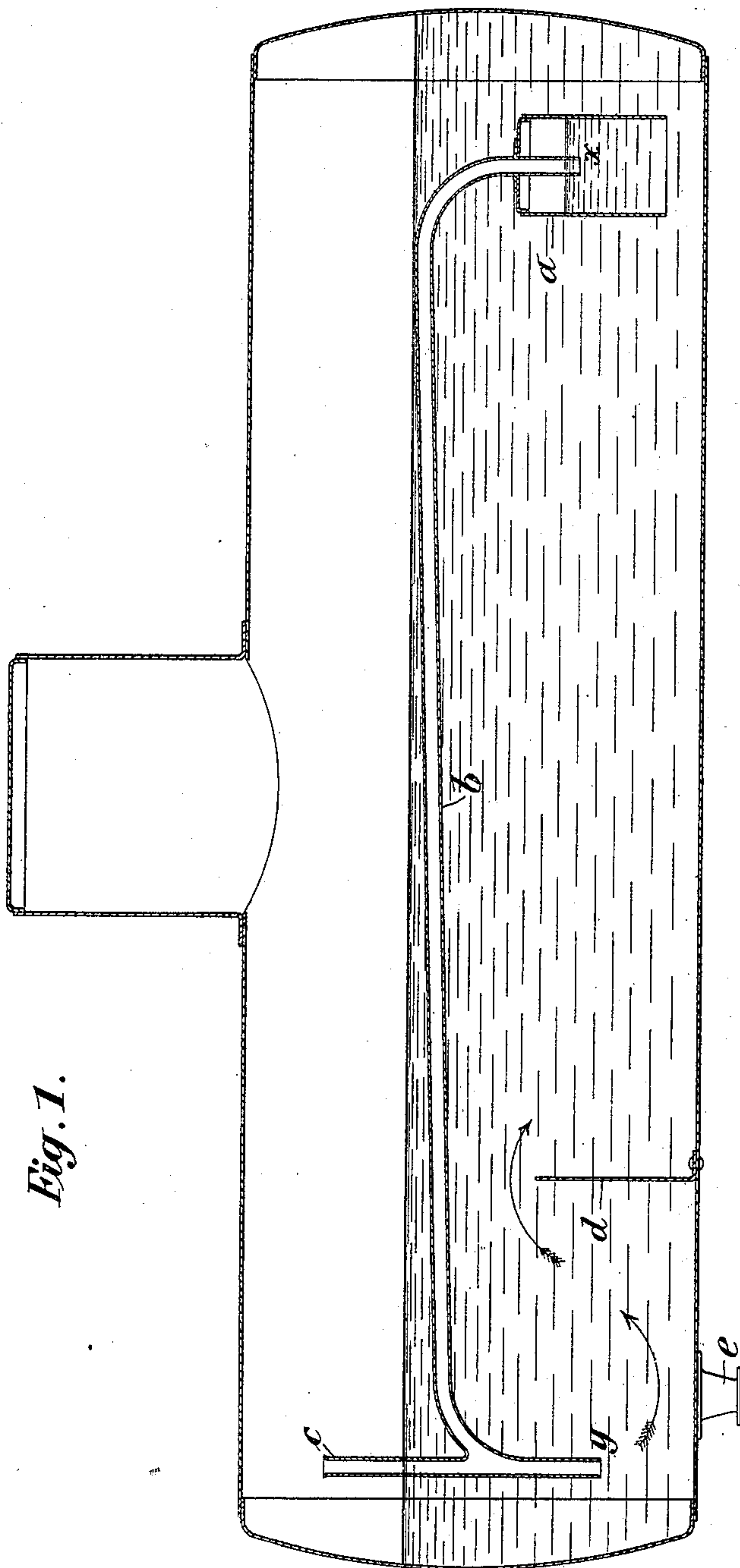
Patented May 14, 1901.

R. KNAPPICK.
BOILER CIRCULATION.

(Application filed Sept. 30, 1899.)

(No Model.)

2 Sheets—Sheet 1.



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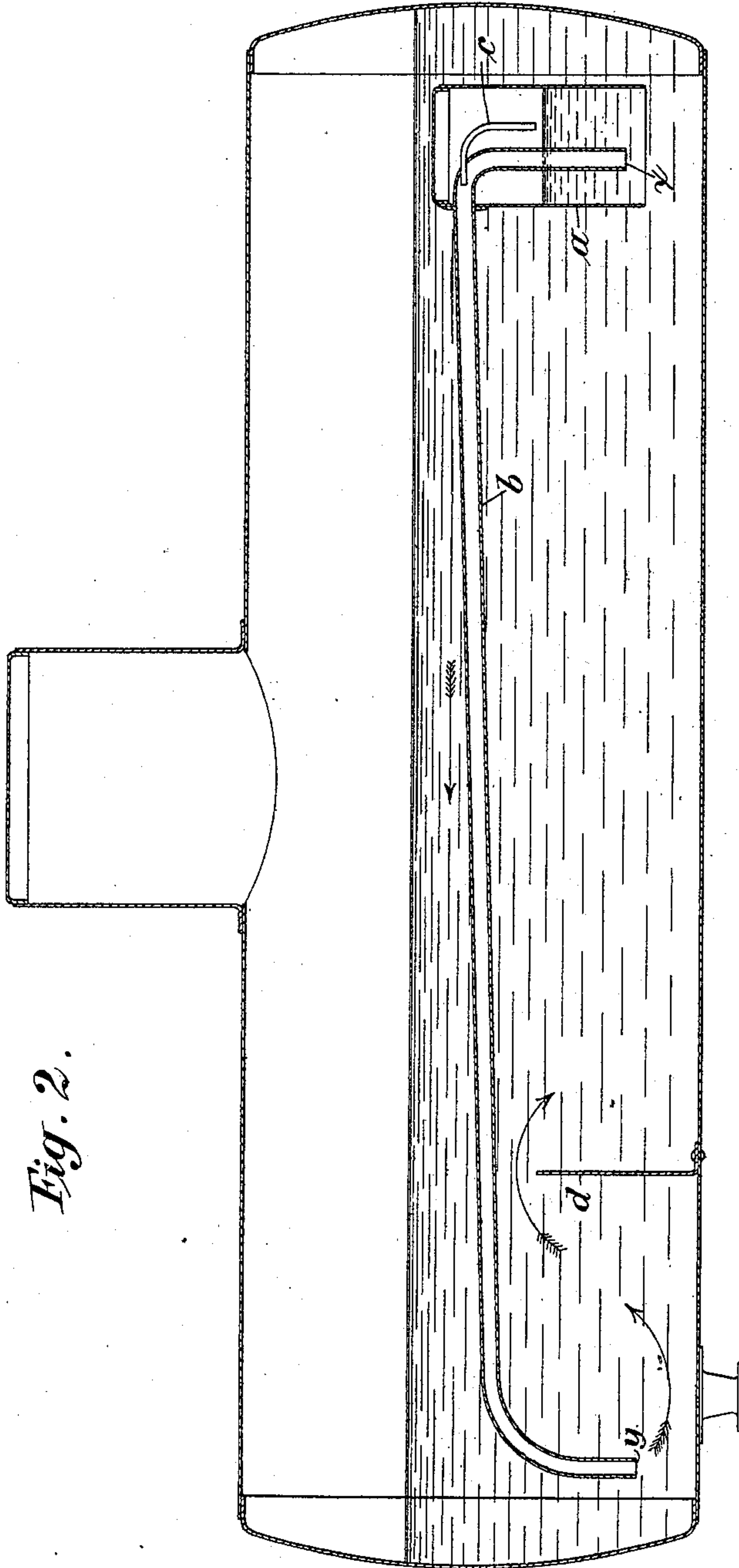


Fig. 2.

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UNITED STATES PATENT OFFICE.

ROBERT KNAPPICK, OF DABROVA-GORNICZA, RUSSIA.

BOILER CIRCULATION.

SPECIFICATION forming part of Letters Patent No. 674,270, dated May 14, 1901.

Application filed September 30, 1899. Serial No. 732,160. (No model.)

To all whom it may concern:

Be it known that I, ROBERT KNAPPICK, a citizen of Russia, residing at Dabrova-Gornicza, in the Province of Poland, Empire of Russia, have invented certain new and useful Improvements in Apparatus for Increasing the Circulation in Steam-Boilers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to a novel device for producing rapid circulation in boilers, the object being to provide a device which can be readily applied to old boilers and which will produce so rapid a circulation as to prevent to a large extent the settlement of mineral impurities upon the walls of the boiler; and it consists in the features of construction and combinations of parts hereinafter fully described and claimed.

In the accompanying drawings, illustrating my invention, Figure 1 is a vertical longitudinal section through a boiler containing a device constructed in accordance with my invention and showing the latter partially in section. Fig. 2 is a similar view showing a slight modification of my device.

In the water-chamber of the boiler and adjacent one end of same I mount a cylindrical vessel *a*, open at its lower end and closed at its upper end, the said open end being located sufficiently far above the bottom of the boiler to permit the free circulation of water into and out of said vessel *a*. A pipe *b* enters said vessel *a* and extends downwardly through the center of same, terminating in an end *x* above the open end of said vessel. Said pipe extends longitudinally through the middle portion of said boiler, below the water-line thereof and at a slight downward incline toward the other end, where it is bent to an arc of ninety degrees, so that its other end *y* also terminates at a point above the bottom of said boiler and on a higher level than the open end of the vessel *a* and lower than the end *x* of said pipe *b*. A branch *c* of said pipe *b*, forming practically a continuation of said end portion *y* thereof, extends vertically upward therefrom and terminates above the water-level. The operation of this

device is very simple and effective. Steam collects in the upper portion of said vessel *a*, thus forcing the water-level therein down until it is lower than the end *x* of said pipe *b*, whereupon the steam will rush into said pipe *b* until the water-level has again risen to a level higher than said end *x* of said pipe, and in the manner of an injector said steam passing through said pipe *b* will suck water after it, the steam escaping through said pipe *c* and the water passing downwardly through the end *y*. The steam in said vessel *a* is obviously under higher pressure than that in the steam-space of the boiler, being under the additional pressure of a water column equal to the difference between the water-level in the boiler and the water-level in said vessel *a*.

The operation above described is obviously repeated at short intervals and produces a very rapid circulation of the water from end to end of the boiler, thereby increasing its efficiency and likewise preventing the formation of boiler-stone on the walls of the boiler. Such rapid circulation tends to keep the mineral precipitation in suspension in the water, depositing it only where the circulation is less rapid. This enables me to fix a point of deposit and provide means for removing such precipitation either in the form of mud or small grains at such frequent intervals as to prevent its hardening. To this end I provide a transverse plate *d* adjacent one end of the boiler, (preferably that which is farthest from said vessel *a*,) which extends upwardly from the bottom a distance equal to about one-half the depth of the water, so that the water flowing toward said vessel *a* is forced to pass over said plate. I thereby form a sediment-chamber adjacent the end *y* of said pipe *b* and provide a blow-off *e* therefrom, through which said sediment is drawn off at intervals.

In the modification shown in Fig. 2 the end *x* of said pipe *b* extends to a point near the open lower end of the vessel *a* and passes out at the side of said vessel. A smaller pipe *c*, bent to an L shape, enters said pipe *b* at the bend, so as to be practically concentric with the horizontal portion of same, while its other arm extends downwardly through the vessel

a and terminates at a point considerably above the end x of said pipe b , so that when the water-level in vessel a falls below the said lower end of pipe c the steam will pass through said pipe into pipe b and in the manner of an injector produce a suction in the downwardly-extending portion of said pipe b , thereby creating a flow of water through said pipe b from the end x to the end y , both the steam and water being discharged from the end y of said pipe b . This latter device has the advantage that it produces a more steady circulation than is produced by the device illustrated in Fig. 1.

I claim as my invention—

1. A device for increasing the circulation in boilers, comprising an inverted cup mounted below the water-level of the boiler, a pipe leading from the upper end portion of said cup and extending longitudinally through said boiler, and having its end portion lying within said cup projecting downwardly through the latter and terminating at a point above the lower end of said cup, the other end of said pipe terminating at a point below the water-level of said boiler, substantially as described.

2. A device for increasing the circulation in boilers, comprising an inverted cup mounted below the water-level of the boiler, a pipe leading from the upper end portion of said cup and extending longitudinally through said boiler and having its end portion lying within said cup projecting downwardly through the latter and terminating at a point above the lower end of same, and having an

inlet to receive steam collecting within said cup, substantially as described.

3. A device for increasing the circulation in boilers, comprising an inverted cup mounted below the water-level of the boiler, a pipe leading from the upper end portion of said cup and extending longitudinally through said boiler, below the normal water-level of same, and having an outlet below the water-line of said boiler, and an outlet above the water-line thereof, the end portion of said pipe within said cup projecting downwardly through same and terminating at a point above the lower end thereof, substantially as described.

4. A device for increasing the circulation in boilers, comprising an inverted cup mounted below the water-level of the boiler, a pipe leading from the upper end portion of said cup and extending longitudinally through the same, and having an outlet below the water-line of said boiler, the end portion of said pipe within said cup projecting downwardly through the latter and having an inlet for steam above the lower end of said cup, a partition within the boiler adjacent the outlet end of said pipe to form a sediment-chamber, and a blow-off cock for discharging sediment collecting within said chamber, substantially as described.

In testimony whereof I have affixed my signature in presence of two witnesses.

ROBERT KNAPPICK. [L. S.]

Witnesses:

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MICCRYRDAU ROSCIELSKO.