

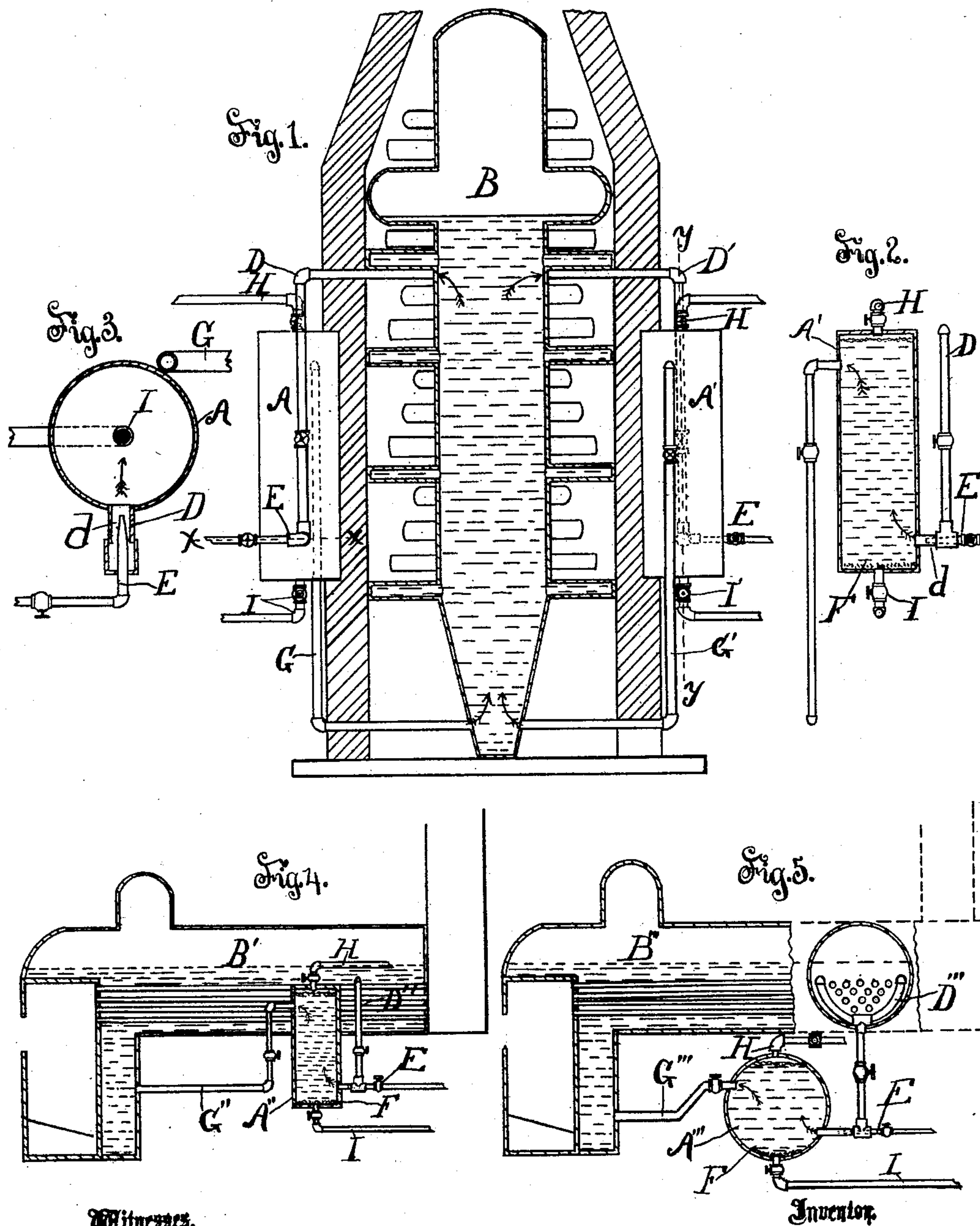
(No Model.)

J. MACDONALD.

WATER CIRCULATOR AND PURIFIER FOR STEAM BOILERS.

No. 482,183.

Patented Sept. 6, 1892.



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UNITED STATES PATENT OFFICE.

JAMES MACDONALD, OF LOS ANGELES, CALIFORNIA, ASSIGNOR OF ONE-HALF
TO MARY MACDONALD, OF SAME PLACE.

WATER CIRCULATOR AND PURIFIER FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 482,183, dated September 6, 1892.

Application filed July 7, 1891. Serial No. 398,650. (No model.)

To all whom it may concern:

Be it known that I, JAMES MACDONALD, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Improvement in Water Circulators and Purifiers for Steam-Boilers, of which the following is a specification.

The object of my invention is to provide cheaper, more efficient, and convenient means for purifying water designed to be used in the production of steam.

My invention relates to that class of devices which employ an external purifying tank or chamber through which the water is passed on its way to the boiler and in which it is common to cause a circulation of water from the boiler to the tank and from the tank to the boiler, so that the water passes in a circuit through the boiler and purifier for the purpose of depositing the impurities in the tank.

It is well known that water loses its impurities more readily at a change of temperature than under other conditions, and my invention is especially designed to take advantage of this fact.

My invention is characterized by its principle of operation, which I will now state, to wit: The hot and cold water are brought into intimate contact with each other and thoroughly mingled in such a situation as to allow the impurities which are released from suspension and solution by the change of temperature to fall out of the current of water to a point where suitable provision is made for their removal from the tank.

My improved purifier comprises the combination of a suitable boiler, an unobstructed tank provided at its base with a suitable blow-off, a hot-water pipe leading from the boiler below the water-line to the lower part of the tank at such a point above the bottom thereof as to allow a settling-chamber therebeneath, a feed-water injector arranged with its discharge-orifice coaxial with the hot-water pipe and close to the mouth thereof, (that is to say, within three or four inches thereof,) so that the injected cold water is caused to enter the

purifier-tank incased in a sheath of hot water and the impurities released at the instant of change of temperature will fall into the settling chamber or basin, and a purified-water pipe leading from the tank at a point near the top thereof opposite the mouth of the hot-water pipe to the boiler at or near the bottom thereof, the whole being so arranged that there are no obstructions which will impede the passage of the water or retain any deposit of impurities within the tank between the inlet at the bottom and the outlet at the top, whereby the water is instantly and uniformly changed in temperature and the current immediately flows in an upward oblique direction through the purifier, thus giving perfect freedom for the impurities to fall out of the current and deposit at a point from which they can be readily removed.

The accompanying drawings show the combination of a steam-boiler, a tank located outside of the boiler devoid of impurity, retaining-diaphragms between its ingress and egress pipes, a hot-water pipe leading from the intermediate part of the boiler near but below the water-line and arranged horizontally at its lower part to open into the lower part of such tank at a point sufficiently elevated above the bottom thereof to allow room for the undisturbed deposits of sediment below the discharge-mouth of such pipe, a feed-water-injecting pipe arranged at the bottom of such hot-water pipe to inject cold feed-water horizontally into such tank through the lower portion of such hot-water pipe, and a purified-water pipe leading from the upper part of the tank below the water-line and sufficiently below it to allow space thereabove for the accumulation of the lighter impurities above the opening into such pipe and opening into the boiler near the bottom thereof, such pipe having its receiving end or mouth arranged in the side wall of the tank, near the top of the tank, on the side thereof opposite the ingress or discharge orifice of the hot and cold water pipe.

Figure 1 is a vertical mid-section of a porcupine or radial-tube boiler provided with my invention. The purifiers and circulators are

shown intact. Fig. 2 is a vertical mid-section of the purifier-tank transverse to the line of section in Fig. 1. Fig. 3 is a horizontal section on line *xx*, Fig. 1. Fig. 4 shows my improvement applied to a stationary boiler. Fig. 5 shows it applied to a locomotive.

A A' are the purifier-tanks shown in Fig. 1.

A'' and A''' are respectively the purifier-tanks shown in Figs. 4 and 5.

B is the steam-boiler shown in Fig. 1, and B' B'' are respectively the stationary and locomotive boilers shown in Figs. 4 and 5.

D D' are the hot-water pipes shown in Fig. 1, leading from the boiler near the water-line and each arranged horizontally at its lower part *d* to open into the lower part of its purifier-tank.

D'' D''' designate the hot-water pipes in Figs. 4 and 5.

E represents the feed-water injector in the several views.

F represents the sediment-trap in the tank, below the mouth of the hot-water pipe.

G G' indicate the purified-water pipes, leading from the top of the purifier-tanks and opening into the bottom of the boiler.

G'' G''' indicate such pipes in Figs. 4 and 5.

Each tank is provided with the top and bottom blow-off cock H I, whereby the foam can be blown from the top of the tank and the sediment from the bottom of the tank, thus to readily, thoroughly, and conveniently cleanse the tanks from all impurities.

In operation the feed-water is injected into the horizontal portion of the hot-water pipe through the injector E, and the stream of feed-water thus injected causes the hot water in pipe D to flow down into the tank, thus causing a constant stream of hot water to flow from the upper part of the boiler into the lower part of the tank. The hot water thus drawn from the boiler is of a very high temperature—300° or 400° Fahrenheit—and immediately it comes into contact with the cold feed-water a separation of the impurities by precipitation occurs and the impurities immediately settle into the trap at the bottom of the tank, while the purified mingled hot water and feed-water ascend to the mouth of the purified-water pipe and passes through such pipe into the lower part of the boiler, whence it rises to be converted into steam or to again pass through the hot-water pipe, a constant circulation being thus maintained.

When it is desired to remove the impurities from the tank, the blow-off cocks I and H are opened, and the sediment from the trap portion F is blown off from the bottom, while the foam or froth and light impurities are blown off from the top of the water in the tank.

I am aware that mingled hot and cold water has heretofore been injected into the bottom of a purifier-tank having its outlet at the top, but having a series of sediment-receiving diaphragms or partitions interposed between the

inlet and outlet, and also that a purifier has heretofore been constructed in which the tank was practically without obstructions or sediment-collecting devices between the inlet and outlet, and I do not broadly claim either of these features as my invention.

In practice the blow-off valves are opened at intervals and the accumulated impurities are removed. Owing to the fact that the impurities are collected immediately at the point of discharge of the blow-off only a small amount of water need be discharged at any time.

The frequency with which the blow-off should be opened depends upon the character of the water and can be determined by experiment in each instance.

No claim is made herein to the process of purifying the water by means of the apparatus herein described for the reason that said process is the subject-matter of a claim in my application for Letters Patent filed in the United States Patent Office December 17, 1891, Serial No. 415,329.

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

1. The water-purifier set forth, comprising the combination of the boiler, a purifier-tank devoid of impurity-retaining diaphragms between its ingress and egress pipes, the hot-water pipe leading from the boiler and arranged to discharge horizontally into the lower part of the purifier-tank at one side and above the bottom thereof, the cold-water injector arranged coaxial with the horizontal discharge member of the hot-water pipe, with its discharge-orifice immediately outside of the tank, as set forth, and the purified-water pipe leading from the tank to the boiler and having its mouth arranged in the side wall of the tank, near the top of the tank, on the side thereof opposite the ingress or discharge orifice of the hot and cold water pipe.

2. The combination of a suitable boiler, an unobstructed tank provided at its base with a suitable blow-off, a hot-water pipe leading from the boiler below the water-line to the lower part of the tank at such a point above the bottom thereof as to allow a settling-chamber therebeneath, a feed-water injector arranged with its discharge-orifice coaxial with the hot-water pipe and close to the mouth thereof, (that is to say, within three or four inches thereof,) so that the injected cold water is caused to enter the purifier-tank incased in a sheath of hot water and the impurities released at the instant of change of temperature will fall into the settling chamber or basin, and a purified-water pipe leading from the tank at a point near the top thereof opposite the mouth of the hot-water pipe to the boiler at or near the bottom thereof, the whole being so arranged that there are no obstructions which will impede the pas-

sage of the water or retain any deposit or im-
purities within the tank between the inlet at
the bottom and the outlet at the top, whereby
the water is instantly and uniformly changed
5 in temperature and the current immediately
flows in an upward oblique direction through
the purifier, thus giving perfect freedom for

the impurities to fall out of the current and
deposit at a point from which they can readily
be removed.

JAMES MACDONALD.

Witnesses:

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