T. SNOWDON.

STEAM BOILER FEED-WATER HEATER.

No. 188,201. Patented March 6, 1877.

Fig 1.

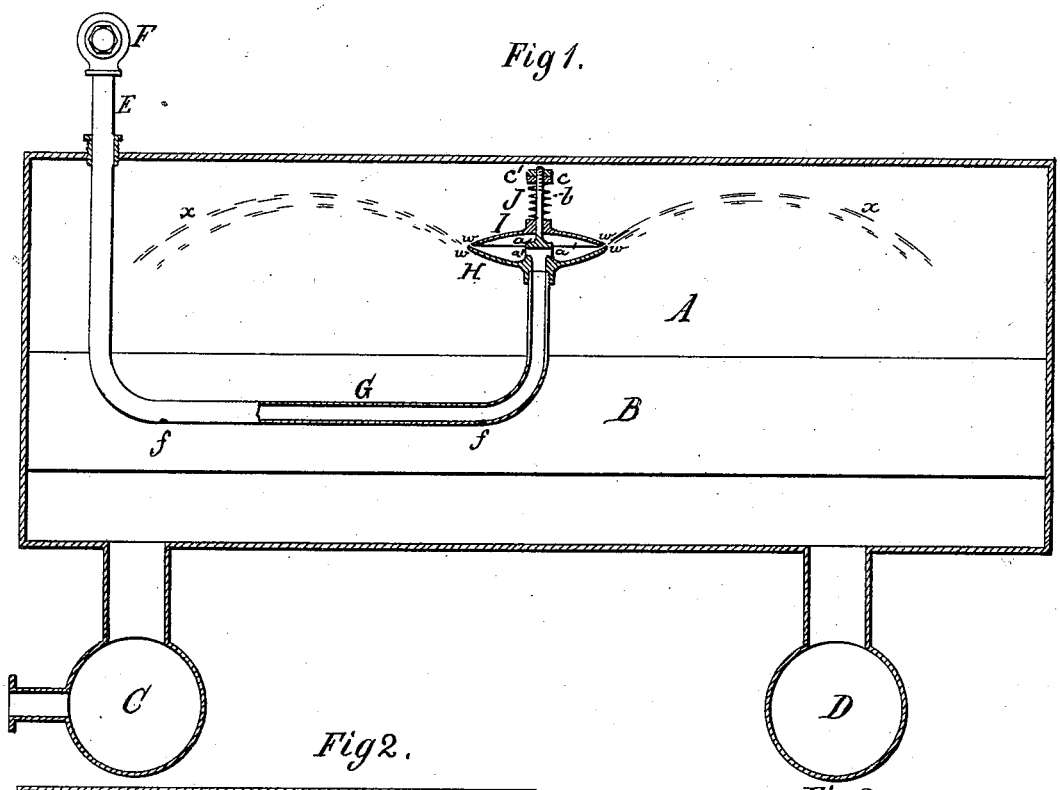


Fig 2.

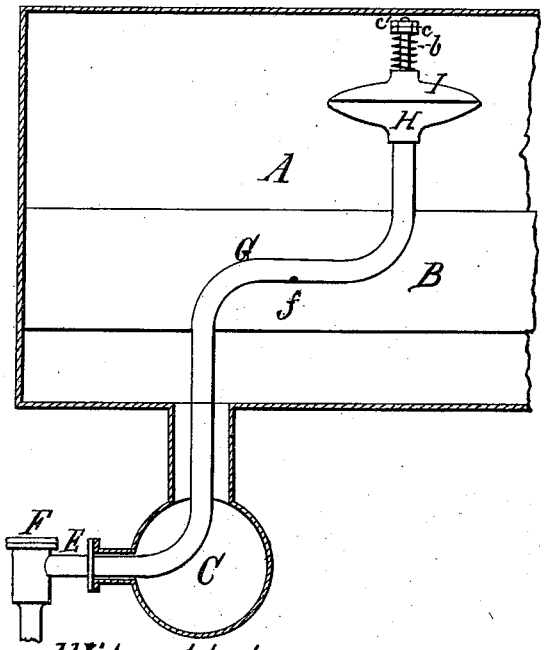


Fig 3.

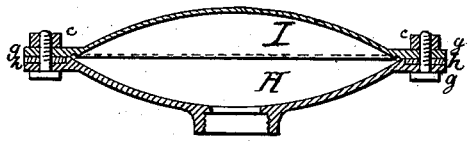


Fig 4.

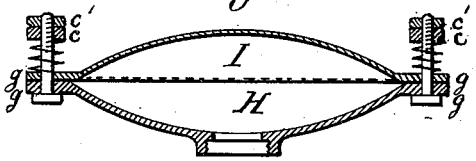
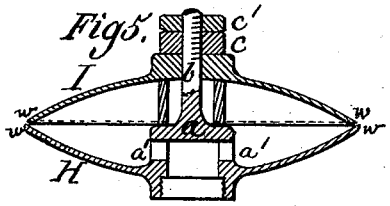


Fig 5.



Witnesses:
James Martin Jr
J. P. Theodore Lang.

Inventor:
Thomas Snowdon
by
Mason, Fenwick & Lawrence.

UNITED STATES PATENT OFFICE.

THOMAS SNOWDON, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN STEAM-BOILER FEED-WATER HEATERS.

Specification forming part of Letters Patent No. **188,201**, dated March 6, 1877; application filed February 14, 1877.

To all whom it may concern:

Be it known that I, THOMAS SNOWDON, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and Improved Feed-Water Supplying, Heating, and Distributing Apparatus for Steam-Boilers; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a vertical longitudinal section of my apparatus, as applied to a steam-boiler. Fig. 2 is a partial section of the steam-boiler, and an elevation of a modified form of my apparatus as applied to a steam-boiler. Figs. 3, 4, and 5 are vertical cross-sections of modifications of the distributer.

My invention relates to a feed-water heating, supplying, and distributing apparatus, adapted for use within a steam-boiler; and the nature of my invention consists, first, in a distributing-disk connected to a supply and heating pipe, which is within a steam-boiler, in combination with another distributing-disk placed over the discharge end of the pipe, and in such relation to the first-mentioned disk that the water supplied from the pump or "doctor" is discharged between the edges of the disks in a thin film or sheet into the boiler, and instantly heated to about the temperature of the water already in the boiler, or converted into steam before it has a chance to come in contact with the highly-heated flues or bottom of the boiler.

Second, my invention consists in a perforated supply and heating pipe, having a feed-water distributer attached to its discharging end, whereby the water within the boiler is allowed to enter the pipe through the perforation or perforations and rise therein to the water-level of the boiler, and thus prevent a vacuum being formed in the feed-pipe by evaporation or exhaustion when the supply from the pump or doctor is cut off, and consequently insuring a ready flow of the water from the doctor or pump the instant it is started.

Third, my invention consists in the combination, with the feed-water and heating-pipe and its attached distributing-disk, of a distributing-disk which is adjustable toward or from the disk of the pipe, whereby the thickness of the film or sheet of water discharged from between the disk is regulated accordingly as necessity may require, and thus more or less water supplied in a given time without greater labor or resistance to the pump.

My invention consists, fourth, in the combination, with the supply and heating pipe and its attached distributing-disk, of a distributing-disk which is automatically adjustable and yielding, whereby the escape space between the disks is allowed to become enlarged or smaller automatically, in accordance with the supply of water caused to flow through the pipe from the pump or doctor.

In the accompanying drawings, A represents an ordinary steam-boiler, having two horizontal flues, B, a stand-pipe, C, and a mud-drum, D. E, Fig. 1, is the supply-pipe leading from the pump or doctor to the boiler. This pipe is provided with the usual check-valve at F, and it leads into the top of the boiler, and connects with a supply heating-pipe, G, arranged inside the boiler. The said supply and heating pipe is of siphon or ⌊ shape, and extends down between the flues B some distance below the water-level of the boiler, and then runs along the flues a considerable distance, and finally rises through the water to a point above the water-level, or into the steam-space of the boiler. H is a disk, of concave or other suitable form, attached to the upper end of the pipe. This disk is constructed with a central tubular hub, *a*, which is perforated on all sides, as shown at *a'*. From the top of the hub a screw-threaded stem or pin, *b*, extends, and around this stem or pin a disk, I, of a form corresponding to the disk H, is placed, and allowed to seat itself upon the edge of the disk H. J is a spiral spring placed around the stem or pin *b*, and *c c'* are nuts screwed on the end of the pin *b*, and caused to press down upon the spring J, and through said spring upon the disk I, and thereby hold this disk with a yielding force to its place on the disk H. The meeting edges or faces *w* of the two disks are beveled, as represented in Figs. 1 and 5 of the drawings, in order that the direction of the sheet or film of water *x* discharged from below the disks shall be to-

ward the upper surfaces of the boiler-shell, as illustrated in Fig. 1.

The supply and heating pipe G is perforated at one or more points, as shown at *f*, below the water-level, and through these perforations a portion of the water which is already in the boiler flows into the pipe and rises therein to the water-level when the pump or doctor is not working, and thus the pipe cannot become exhausted by evaporation, and a vacuum be formed; but the pipe will always be free from the effects of such vacuum therein when the pump or doctor is started, and therefore the flowing of the water into the boiler will not be interfered with from such cause.

The perforation in the pipe may be provided with an ordinary vacuum-valve.

The supply heating-pipe and distributer described are so constructed and located, as will be seen from the drawings, that the water passed through them will be heated by the water in the boiler before it arrives in the distributer, and it will also be heated while in the distributer by the steam in the steam-space, and then almost instantaneously will be converted into steam while being distributed in a thin film amidst the very hot steam in the steam-space, and thus all injurious effects resulting from comparatively cooler water being introduced into the boiler are avoided.

In some cases the disks will be provided with lugs *g g*, and will be held together by bolts passed through the lugs, as represented in Figs. 3 and 4 of the drawings. The adjustment of the disks having lugs will, in some cases, be effected by washers *h* placed between the lugs, as illustrated in Fig. 3, or the bolts may have spiral springs placed on their ends, and nuts screwed down upon the springs, as represented in Fig. 4 of the drawings.

If washers are used the disks may be set the required distance apart, and held rigidly by the nuts, and if the washers are not used the upper disk may be allowed to move farther from the lower one after being set for a given thickness of sheet or film of water by providing the springs between the nuts and lugs of the disk. This latter mode of operation may be the case with the plan shown in Fig. 1, by applying a thimble on the pin or stem between the two disks, in the manner shown in Fig. 5.

In applying the invention the supply-pipe may be introduced at the stand-pipe, as shown in Fig. 2 of the drawings, and the heating-pipe pass up through the leg of the boiler and between the flues and into the steam-space, and have the distributer attached to its upper end, instead of being introduced at the top of the boiler.

The distributer described might be used to advantage below the surface of the water in the boiler, but in such use of it the provision made for preventing a vacuum may not be necessary, and the advantages resulting from heating the water directly by the steam in the steam-space will not be secured; but the advantage of distributing the water in a very thin film or sheet amidst the hot water at points above the flues will be retained, and the liability of clogging will be avoided. I prefer, however, to arrange the apparatus as represented in the drawings.

The operation of the distributer, when the upper disk is held down by spring-pressure is a little different from the operation when the upper disk is held rigidly in relief from the lower disk, inasmuch as the pressure of the water from the force pump causes the upper disk, when retained by spring-pressure, to open more or less according to the force exerted, and therefore the disk will adjust itself automatically to varying quantities of water flowing through the pipe, whereas when the disk is rigidly adjusted for a given quantity of water any considerable variation in the quantity supplied by the force-pump would necessitate a setting up of the disk by hand, so as to afford a broader discharging-space between the disks.

By employing a distributer formed of two separate disks, as described, the sediment and mud which may be mingled with the supply-water will have freedom to pass out with the film or sheet of water between the edges of the disks, and therefore clogging of the supply heating and distributing apparatus will be prevented.

What I claim as new, and desire to secure by Letters Patent, is—

1. A distributer formed of separate disks placed one opposite the other, and affording a discharging-space between their edges, in combination with a supplying and heating pipe, which is within the boiler, and is in communication with the supply-pipe of the doctor or pump, substantially as described.

2. A perforated feed-water supply and heating pipe, which is within the boiler, and has its perforated portion submerged, in combination with a feed-water distributer of a steam-boiler, substantially as described.

3. A feed-water supply and heating pipe, which has a distributing-disk attached to its inner end, in combination with an adjustable disk applied above the disk attached to the pipe, substantially as described.

4. A feed-water supply and heating pipe, which has a distributing-disk attached to its inner end, in combination with a disk applied opposite the disk attached to the pipe, and a spring or springs for pressing upon one of the disks, substantially as and for the purpose described.

Witness my hand in the matter of my application for a patent for an improved steam-boiler heater this 8th day of February, 1877.

THOMAS SNOWDON.

Witnesses:

J. P. THEODORE LANG,

JAMES MARTIN, Jr.