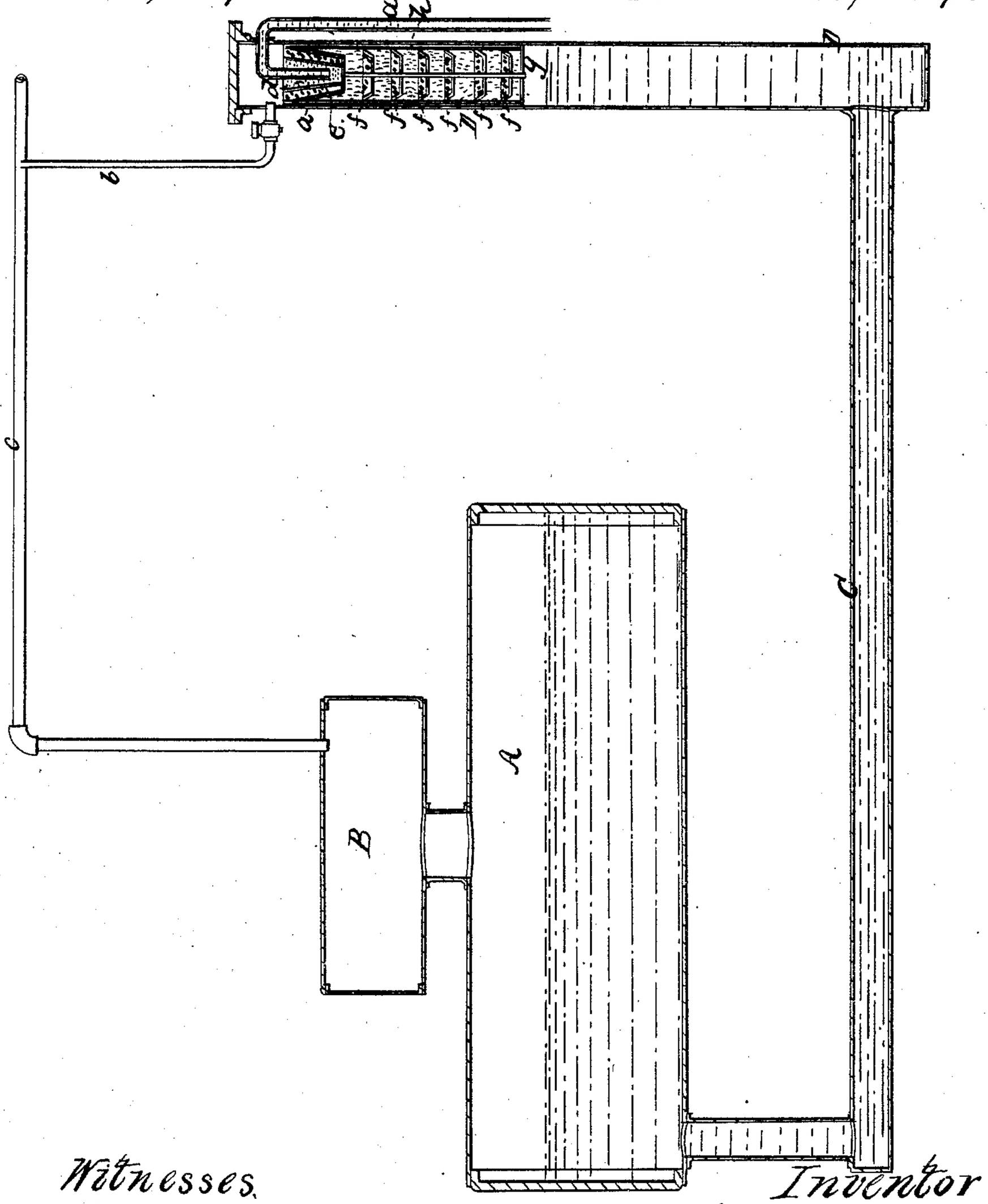
A. M. Granger,

Steam-Boiler Condenser

No. 41,374. Patented Jan. 26, 1864.



Witnesses.

J. W. Coombs

Geo. Reed

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UNITED STATES PATENT OFFICE.

A. M. GRANGER, OF ST. LOUIS, MISSOURI.

IMPROVEMENT IN FEED-WATER HEATERS FOR STEAM-BOILERS.

Specification forming part of Letters Patent No. **41,374**, dated January 26, 1864.

To all whom it may concern:

Be it known that I, A. M. GRANGER, of the city of St. Louis, in the county of St. Louis and State of Missouri, have invented a new and Improved Apparatus for Heating and Purifying Water for Supplying 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 drawing, forming part of this specification, said drawing representing a longitudinal vertical section of a boiler having my apparatus applied.

This invention relates to the heating of the feed-water on its way from the feed-pump or other feeding apparatus to the mud-well or lower part of the boiler by exposing it in the form of drops or spray in direct contact with steam taken from the boiler, thereby causing a more speedy and perfect separation of the mineral matters and other impurities than is obtained by means at present in use.

It consists in certain devices for effecting the distribution of water in the best practical manner within the heating-vessel.

To enable others skilled in the art to make and use my invention, I will proceed to describe it

A is the boiler; B, the steam-drum, and C the mud-well, constructed in the manner common to those boilers which use the water of the Mississippi river, for which my invention is more especially designed.

D is the vessel in which the heating of the water is effected on its way to the mud-well. This vessel is made of upright cylindrical form, perfectly tight, and capable of bearing the same pressure as the boiler. It is connected at or near its bottom with the mud-well, and it is of such height that its upper part reaches considerably above the proper level of the water in the boiler. The feed-pipe *a* enters the said vessel at or very near the top, and is turned downward within it. The pipe *b*, which admits steam to the said vessel, may be connected with it at any point above the highest level of the water in the boiler, and the said pipe be connected to receive steam either directly from the boiler or from the main steam-pipe *c*, which supplies the engine, as represented.

d is a basin arranged within the upper part of the vessel D for the reception of the mouth of the feed-pipe, which enters the said basin at the top and dips nearly to the bottom. This basin *d* is surrounded by another basin, *e*, which is perforated, and below the basins *c* and *d* there are arranged a number of perforated basins, *f f*, one above another, the several basins being arranged as nearly as practicable in the center or at equal distances from all sides of the vessel D, and the whole being either supported upon a bearer, *g*, arranged across the vessel D, or suspended from the top of the said vessel. The lowest of the basins *f f* should be a short distance above the proper level of the water in the boiler.

h is a casing surrounding the basins within the vessel B to protect the interior of the vessel from any overflow of water from the basins *e f f*, which might injure it by sudden cooling and contraction. This casing should have a space between it and the interior of the casing all around and suitable openings in its sides for the circulation of the steam.

The operation of the apparatus is as follows: The water is delivered from the immersed mouth of the feed-pipe *a* into the basin *d*, from which it overflows gently into *e*, falling from the perforations in the latter and through the steam in a fine shower, and being received in the uppermost basin *f*, from whose perforations it drops in another shower through the steam into the next basin *f* below, and so on through the whole series of basins, and from the lower basin into the body of water in the vessel D, in which the water is always at the same level as in the boiler. Some condensation of steam, of course, takes place, and the water of condensation falls with the incoming water. By the time the water has fallen from the lowest basin it is heated to such a degree that its mineral and other impurities will separate from it, and these impurities will be deposited in the lower part of the vessel D and in the mud-well, the water being supplied to the boiler in a heated state from the vessel D through the mud-well.

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

1. The basin *d*, in combination with the im-

mersed mouth of the feed-pipe *a* and the heating-vessel D, substantially as herein specified.

2. The perforated basins *e* and *f f*, arranged within the heating-vessel D to deliver the water in the form of a shower or spray, substantially as herein described.

3. The protecting-casing *h*, applied in combination with the basins *d e f f*, substantially as and for the purpose herein set forth.

A. M. GRANGER.

Witnesses:

JOHN C. H. CUNNINGHAM,

JAMES C. ADAMS.