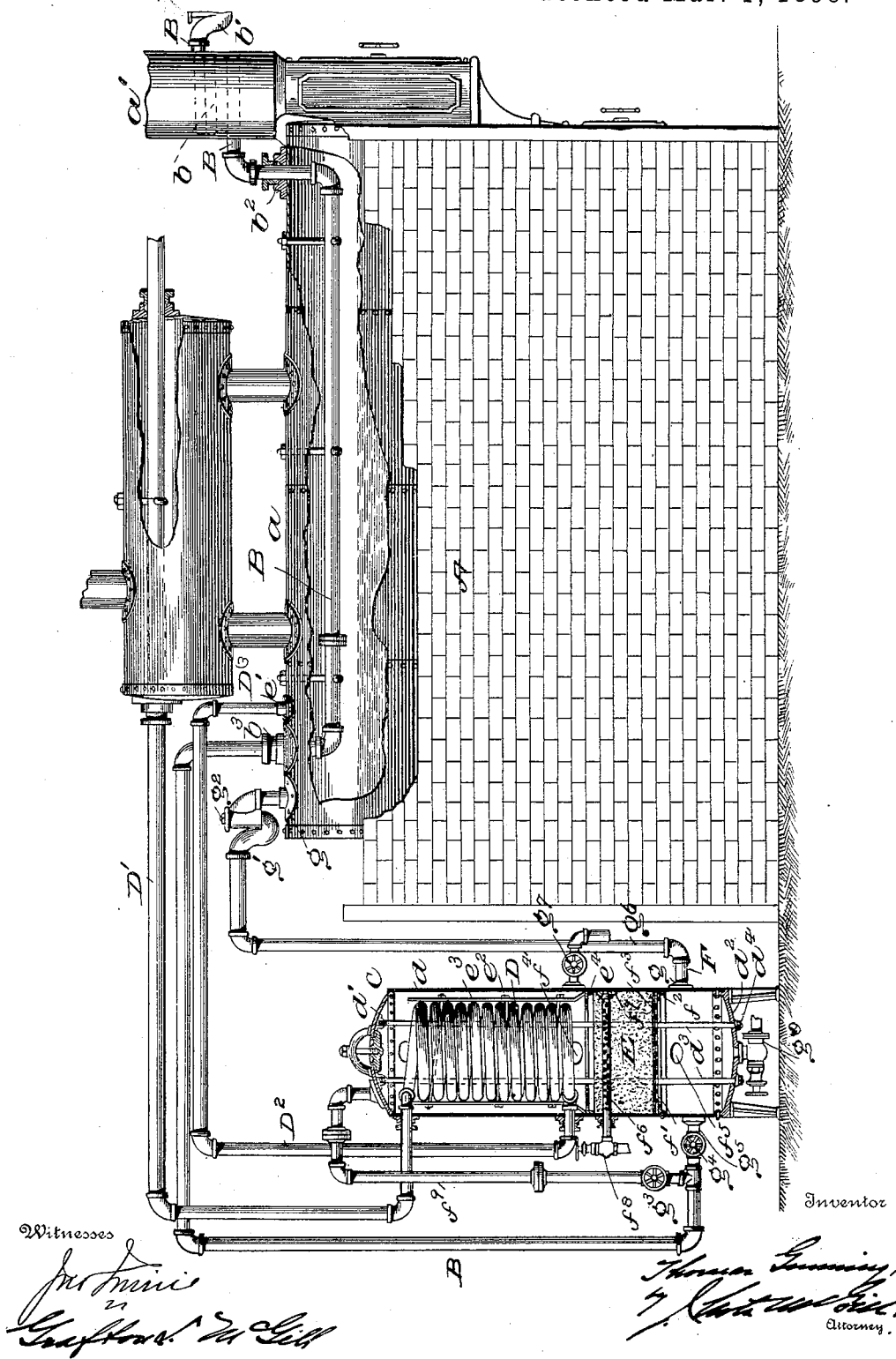


(No Model.)

T. GUNNING.
FEED WATER HEATER AND PURIFIER.

No. 599,983.

Patented Mar. 1, 1898.



UNITED STATES PATENT OFFICE.

THOMAS GUNNING, OF PITTSBURG, PENNSYLVANIA.

FEED-WATER HEATER AND PURIFIER.

SPECIFICATION forming part of Letters Patent No. 599,983, dated March 1, 1898.

Application filed June 25, 1897. Serial No. 642,324. (No model.)

To all whom it may concern:

Be it known that I, THOMAS GUNNING, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain
5 new and useful Improvements in Feed-Water Heaters and Purifiers; 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
10 appertains to make and use the same.

This invention contemplates certain new and useful improvements in feed-water heaters and purifiers for steam-boilers.

The object of the invention is to provide
15 simple and inexpensive means for heating feed-water up to a high degree of temperature, so as to precipitate all scale-forming particles and then removing the latter from the water before it enters the boiler, the water when
20 entering the latter being at boiler temperature, thus effecting a great saving in fuel not only by avoiding any reduction in the boiler temperature by the inflow of water, but by reason of the fact that scale or incrustation
25 cannot form on the boiler-shell.

The invention will be hereinafter fully set forth, and particularly pointed out in the claims.

In the accompanying drawing the figure is
30 a view in side elevation showing but a portion of the boiler-furnace, the boiler proper being shown broken away and the filter in vertical longitudinal section.

Referring to the drawing, A designates a
35 furnace of any preferred form, (only a portion thereof being shown,) *a* the boiler-shell, and *a'* the stack leading from the furnace.

B is the feed-water pipe, which leads from a pump. (Not shown.) Within the stack *a'*
40 it is formed into a coil *b* to obtain the benefit of the heat of the gases passing from the furnace. Outside of the stack the pipe B has a check-valve *b'* to prevent back pressure on the pump. From the coil *b* the pipe B is extended
45 outward and thence through a stuffing-box *b*² down into the steam-space of boiler-shell *a*. This pipe is then extended longitudinally within the latter to near the full length thereof and thence out through a second stuffing-box
50 *b*³. The pipe B is then extended and opens into a filter C. By thus passing the pipe B

longitudinally through the steam-space of the boiler and coiling it within the stack the feed-water is heated to a high degree of temperature. It is well known that water must be
55 heated up to 280° in order to precipitate scale-making particles, and some ingredients cannot be separated at less than about 320° of heat; but by arranging the pipe in the manner stated the water is so heated that all foreign particles—that is, all that will tend to
60 form a scale or incrustation on the boiler-shell—are precipitated. The next step in my present invention is to separate these precipitated particles from the water and thus prevent them from entering the boiler.

The filter C comprises a cylindrical casing *d*, having upper and lower heads *d'* *d*², which are riveted to the casing and strengthened by two rods *d*³, pivoted to the under side of the
70 upper head *d'*, their lower ends being extended through openings in the lower head *d*² and provided with nuts *d*⁴. Within the upper portion of casing *d* is the coiled steam-pipe D, which leads by a branch D' from the
75 steam-dome *e* of the boiler and returns to the latter above the water-line by a branch D². The extreme end D³ of the steam-pipe branch D² is held to the boiler-shell by a flanged plate *e'*. Live steam is constantly circulating
80 through the coil and the branches D' D² and is returned direct to the boiler. This coil is held in place by cross-rods *e*², secured to uprights *e*³, resting at their lower ends on an angle-iron *e*⁴, riveted to the interior of the
85 casing *d*.

E is the filtering-bed, preferably composed of pulverized or ground granite. It rests upon a header *f*, which consists of a perforated plate *f'*, having an angle-iron *f*², riveted to the casing *d*. On this perforated
90 plate is a series of wire screens *f*², which are held by any suitable means. The filtering material is introduced through a hand-hole *f*⁴ in the casing immediately above the angle-iron *e*³. A second hand-hole *f*⁵ in the lower
95 portion of the casing permits the lower head being cleaned by brushing or scraping. A perforated spray-pipe *f*⁶ is extended transversely into the casing through the filtering-bed, being supported at its inner end by a
100 plate *f*⁷. By opening a valve *f*⁸ water may

be admitted through this pipe f^6 to effect agitation in the filtering-bed.

The feed-water pipe B has a branch f^9 , which opens into the top of casing d , so that the water will pass down the space within the coil of steam-pipe, through the filtering-bed, into the lower portion of casing d , and thence out through a pipe F, which leads to the boiler-shell, opening into the steam-space thereof, said pipe being secured to the shell by a flanged plate g . In this pipe, adjoining the shell, is an elbow g' , wherein is a small check-valve g^2 to prevent back pressure.

It will be seen that not only is the heat of the feed-water maintained as it passes into the filter, but all the precipitated scale-forming particles are removed therefrom before it passes to the boiler. To effect the cleansing of the boiler, the operator closes a valve g^3 in pipe-branch f^9 and opens a valve g^4 in the lower branch g^5 of pipe B, which opens direct into the lower end of casing d . The water will then rise through the filtering-bed and pass out through a waste-pipe g^6 , the valve g^7 thereof being opened. The operator then closes valve g^4 and opens valve g^3 , allowing the water to pass down through the filter and out through a valved pipe g^8 , opening into the lower head d^2 . In this way every now and then the filter is freed of the accumulated precipitated scale-forming particles.

The advantages of my invention are apparent to those skilled in the art. In the first place it results in a great saving of fuel, since the temperature of the boiler is not reduced when the water enters therein, as it has been previously heated to boiler heat; secondly, no scale or incrustation being possible of forming on the boiler-shell extra fuel for maintaining the necessary temperature is not required.

Another advantage lies in the fact that explosion of the boiler is rendered absolutely impossible. This is not so when cold or even cool water is supplied to the boiler, and crystallization and contraction are avoided.

I claim as my invention—

1. The combination with a boiler-shell, of a single continuous feed-water pipe extended longitudinally through the steam-space thereof for heating the feed-water to boiler temperature and precipitating scale-forming particles, a filter with which said pipe connects, a pipe leading from said filter to the steam-space of said boiler-shell, and a steam-pipe within said filter leading from and returning

to the steam-space of said boiler-shell, substantially as set forth.

2. The combination with a furnace having a stack, and a boiler-shell, of a single continuous feed-water pipe coiled in said stack and extended longitudinally through the steam-space of said boiler-shell for heating the feed-water to boiler temperature and precipitating scale-forming particles, a filter with which said pipe connects, a pipe leading from said filter to the steam-space of said boiler-shell, and a steam-pipe within said filter leading from and returning to the steam-space of said boiler-shell, substantially as set forth.

3. In a feed-water heater and purifier, a casing having upper and lower end heads and an inner header provided with a perforated plate, a filtering-bed resting on said header, a perforated spray-pipe extended transversely into said casing through said filtering-bed, a valved water-pipe opening into the upper and lower ends of said casing, outlet-pipes, a steam-pipe within said casing above said filtering-bed, and securing-rods pivoted to said upper end head and projected through said lower end head, substantially as set forth.

4. The filter herein described comprising the casing, upper and lower heads, rods connecting the latter, a coil of steam-pipe located within said casing, uprights having cross-rods supporting said coil, an angle-iron on which said uprights rest, a header having a perforated plate, screens on the latter, and a series of valved outlet-pipes, hand-holes being formed in said casing, substantially as set forth.

5. The combination with a boiler-shell, of a single continuous feed-water pipe extended longitudinally through the steam-space thereof, a casing into which said pipe opens, a steam-pipe leading from and returning to the steam-space of said boiler-shell and coiled within said casing, the other end of said steam-pipe opening into the steam-space of said boiler-shell, a filtering-bed within said casing, a pipe leading from said casing and opening into the steam-space of said boiler-shell, and a check-valve in said pipe adjacent to the boiler-shell, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS GUNNING.

Witnesses:

CHAS. SCHLEGEL,
JAS. H. PAGE.