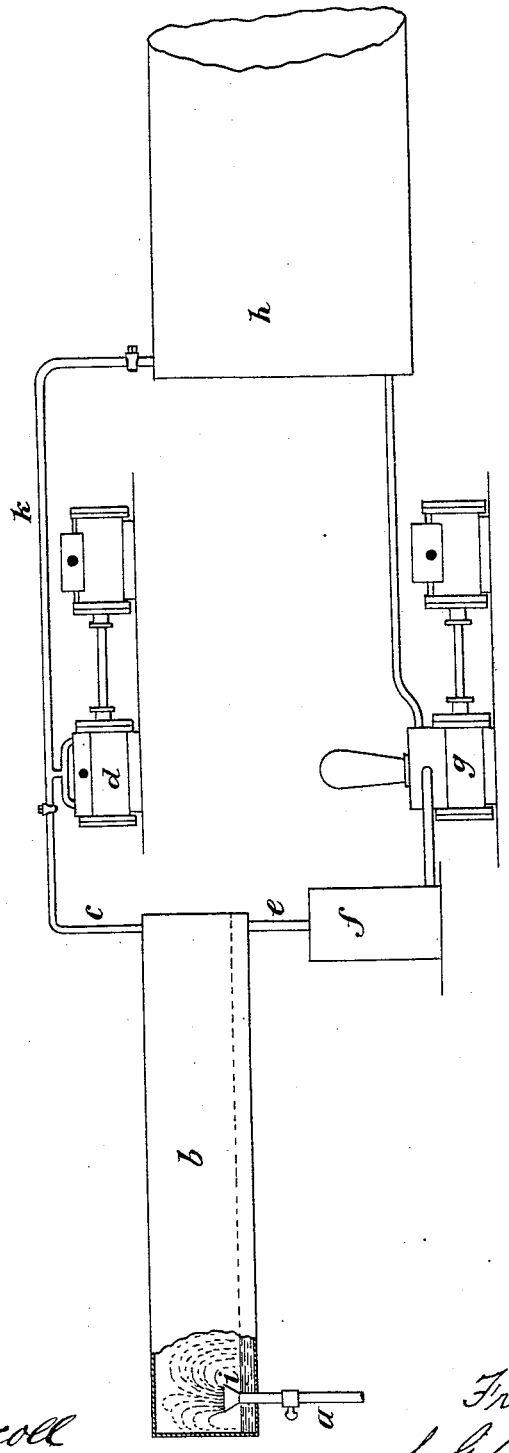
(No Model.)

F. G. FOWLER.

PREPARING FEED WATER FOR STEAM BOILERS.

No. 346,198. Patented July 27, 1886.



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FRANK G. FOWLER, OF BRIDGEPORT, CONNECTICUT.

PREPARING FEED-WATER FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 346,198, dated July 27, 1886.

Application filed November 27, 1885. Serial No. 184,064. (No model.)

To all whom it may concern:

Be it known that I, FRANK G. FOWLER, residing at Bridgeport, Connecticut, and a citizen of said State, have invented a new and useful Improvement in Preparing Feed-Water for Steam-Boilers, of which the following is a specification.

The primary object of my invention is to prevent the explosion and corrosion of steam-boilers, either or both. It is particularly useful in connection with boilers for non-condensing engines and with boilers for bleaching, rendering, &c.

My invention is founded on a discovery. I will first proceed to explain the nature of this discovery, and then will describe a form of apparatus by which it may be applied to use; but it should be understood that I do not limit myself to the form or arrangement of apparatus described, since I believe my invention to be much broader than any form of apparatus, and to be capable of embodiment in a great variety of forms.

Water ordinarily holds in solution a large quantity of gases, such as oxygen, carbonic acid, and air. If, as an experiment, a closed vessel (say three inches in diameter and eighteen inches in height) provided with a steam-gage be filled about one-third full with water having such gases in solution and be heated so as to produce a steam-pressure, (say twenty pounds or upward,) and then be shaken energetically, so as to agitate the steam and water together, there will be an instantaneous rise of pressure, which will be indicated on the gage, and may amount to one hundred per cent., (more or less.) If, before heating the vessel, the gases contained in the water be nearly pumped out with an air-pump, then, no matter how violently the contents are shaken, the gage will indicate comparatively no increased pressure. In other words, the explosive tendency results largely from the presence of such gases with the water, and it is substantially overcome by separating them from the water before it is heated.

The above experiment illustrates clearly how explosions have been produced and how they may be obviated by my invention. The water with which boilers are fed is charged with gases. If anything occurs to agitate the water and steam contained in the boiler together, (either the sudden raising of the throttle or safety valve or any other cause,) an instantaneous and greatly-increased pressure is produced, and perhaps an explosion; but if the gases be pumped or removed from the water with which the boiler is filled before it is used for steam, then agitation produces no such disastrous results. I have also discovered that the corroding of the boilers is largely produced by the presence of the gases in the water and steam. If these gases are present, the interior of the boiler is corroded; but if they are removed from the water before it is used no such corrosion occurs.

My invention is founded on the discoveries above outlined; and it consists in substantially removing the gases from the water before it is used to produce steam in the boiler.

In the accompanying drawing I have shown by diagram a general arrangement of apparatus by which my invention may be practiced.

a is a pipe from the water-supply. *b* is a vessel in which the water and its gases are separated. The gases are drawn off through the pipe *c* by the air-pump *d*. The water runs off through the pipe *e* into a supply-tank, *f*. Thence it is forced by the feed-pump *g* into the boiler *h*, arriving there substantially free from any gases. This boiler may be one in which the water is used alone simply for the production of steam, as in a non-condensing engine, or it may be one in which the water is mingled with other substances which are to be rendered or bleached, &c.; but in the case where the boiler is to be used for boiling the water, together with other substances, the air-pump may preferably be connected directly with the boiler and operated as soon as the boiler is charged, or while the charge is being admitted. In any case it is desirable, for the more efficient separation of the gases from the water, that the liquid should be admitted into the vessel where the separation is accomplished in the form of a spray. This may be accomplished by attaching a distributer to the end of the water-supply pipe, as shown at *i* in the drawing.

In getting up steam for the first time after the boiler has been filled, it may be more convenient to connect the suction of the air pump directly with the boiler, in order to remove the gases from the water therein contained, and thereafter, when the steam is allowed to go

down, all apertures leading into the boiler may be effectually closed, so that the water cannot be recharged by the admission of air into the boiler. To accomplish this I prefer to employ the pipe *k*, (shown in the drawing,) which is provided with suitable cocks. Likewise the pipe *c* will be provided with suitable cocks, so that the suction of the air-pump may be taken from either the boiler or the vessel *b*, as required. It is furthermore desirable that provision should be made for operating the air-pump by hand, or other means independent of the steam in the boiler, so that the air and gases may be exhausted from the boilers before steam is generated therein.

Agitating the contents of a boiler so as to intermingle the steam and water together, as has been described, is not the only means by which the water may be caused to yield up the gases with which it is charged, and thereby induce a greatly-augmented pressure. Any means by which the configuration of the water contained in the boiler is altered may accomplish the same result. If an upright vessel containing a considerable depth of water which is heated, and from which the gases have not been removed, is laid down horizontally, so that the water becomes very shallow, the contained gases will be yielded up and a greatly-increased pressure will ensue, though the water and steam may not have been agitated or intermingled in the least.

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

The process for obviating the explosion or corrosion of boilers, which consists in removing the gases from the water before it is used to produce steam, substantially as described.

FRANK G. FOWLER.

Witnesses:

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