

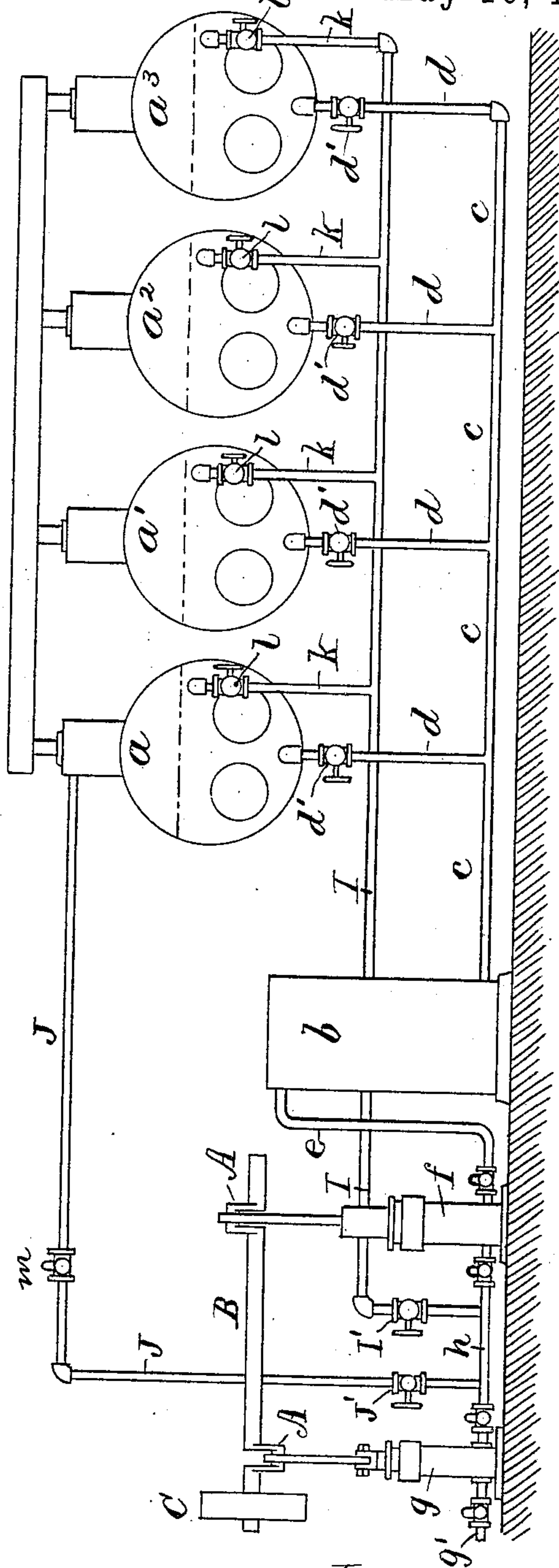
(No Model.)

J. W. HYATT.

## BOILER FEEDER AND PURIFIER.

No. 362,840.

Patented May 10, 1887.



Attest;

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# UNITED STATES PATENT OFFICE.

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## BOILER FEEDER AND PURIFIER.

SPECIFICATION forming part of Letters Patent No. 362,840, dated May 10, 1887.

Application filed November 29, 1886. Serial No. 220,112. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN W. HYATT, a citizen of the United States, residing at Newark, Essex county, New Jersey, have invented certain new and useful Improvements in Boiler-Feeders and Purifiers, fully described and represented in the following specification and the accompanying drawing, forming a part of the same.

10 The purpose of this invention is to effect the precipitation and the removal of mineral impurities from the boiler feed-water to prevent incrustation within the boiler; and my object in the present invention is partly to furnish a  
15 means of heating the feed-water of a boiler to a high temperature and filtering the same before its introduction to the boiler, partly to circulate the boiler-fluid through the filter in conjunction with the feed-water, and partly to apply these improvements to a battery or gang  
20 of boilers by a special arrangement of the water-pipes.

My invention is adapted particularly for steam-engine boilers operating under considerable pressure, and contemplates the introduction of the live steam from the boiler into the feed-water before its filtration, for the purpose of raising the water to a temperature considerably above 212° Fahrenheit to precipitate  
30 the mineral impurities in the most effective manner.

Various obstacles have heretofore prevented the raising of the water to the same temperature as the steam—as, for instance, it is well  
35 known that neither an injector nor force-pump can be advantageously operated if the suction-water has a temperature above 212° Fahrenheit, and the heat required to elevate the feed-water above such temperature must therefore  
40 be applied to the water on its passage from the feed-pump to the boiler. As the water-pressure produced by such feed-pump is ordinarily equal to that existing in the boiler, in order to deliver the water therein it is obvious that a  
45 supply of steam from the boiler would not enter such feed-pipe to heat the water in the desired manner.

My invention involves the use of two pressure-pumps, one operating to draw the feed-  
50 water from any source of supply, and the other operating with a larger delivery, and not only

taking the water supplied from the steam-pump, but also taking into its suction a volume of steam from the boiler, and when desired a volume of the boiler-fluid, to be circulated through the filter with the feed-water. 55

The function of the steam-pump is to deliver a regulated volume of feed-water to the second pump, and as the capacity of the latter requires more fluid to supply it than is furnished  
60 by the first pump, the difference may be positively drawn from either the steam-space or the water space in the boiler, for the purposes just named.

The steam and water pipes from the boiler  
65 may be furnished with stop-valves, by which the proportion of hot water or steam delivered to the second pump with the feed-water would be regulated, and the temperature of the water may thus be elevated very closely to the boiler  
70 temperature before the water is subjected to filtration; and, owing to such high temperature, a greater precipitate would be induced, and the impurities in the water may be thus most effectually removed from it. 75

With a boiler-pressure of sixty pounds the temperature of the water may thus be raised without difficulty to 300° Fahrenheit, and a much greater precipitation be effected than by the use of the ordinary heaters, which produce  
80 a temperature seldom above 212°.

My improvements are shown in the annexed drawing as applied to a battery of boilers; but it will be obvious from the following description that the invention is equally appli-  
85 cable to a single boiler, as all the others in the battery might be disconnected without affecting the operation of my improvements.

*a a' a" a"* represent an end view of four flue-boilers. 90

*b* represents a filter having an outlet-pipe, *c*, connected by branches *d* and cocks *d'* with the water-spaces in the said boilers.

*e* is the supply-pipe to the filter, connected with the delivery of a pump, *f*. The suction  
95 of this pump is connected with the delivery of another pump, *g*, by a pipe, *h*, and the suction of the pump *g* is connected with a water-supply by pipe *g'*.

The pumps may be of any desired construction, but are shown herein as plunger-pumps,  
100 actuated by cranks A upon a shaft, B, driven



by a pulley C, the pump *f* having a larger bore but the same stroke as the pump *g*. By this construction the pump *g* for each stroke draws a given volume of feed-water from the pipe *g'* and delivers through the pipe *h* to the pump *f*, which in turn forces it through the filter *b* into one or more of the boilers by pipe *c* and branch *d*. A pipe, I, connects the water-space in the boiler with the pipe *h*, and a pipe, J, connects the steam-space in the boiler with the pipe *h*, cocks I' and J' serving to regulate the delivery of steam and water through these pipes to the suction of the pump *f*. As by its construction the delivery of the pump *f* is greater than that of the pump *g*, a partial vacuum is produced in a pipe, *h*, and steam admitted thereto into contact with the feed-water would be more or less condensed and mixed with the feed-water in the pump *f*, and be forced by the same through the filter to the boiler.

By closing either the cock I or J the vacuum in the pipe *h* would be supplied exclusively with either steam or hot water from the boiler-space within the boiler, while a partial opening of both cocks would permit the pump *f* to draw a mingled supply of steam and hot water with the feed-water delivered by the pump *g*.

As the hot water and steam in the boiler would be of substantially the same temperature corresponding to the pressure therein, it is obvious that the temperature of the feed-water could be elevated very nearly to that of the boiler before its passage through the filter. The condensation of steam with such feed-water would serve to increase its temperature much faster than its volume would be augmented, while the deficiency in volume required to supply the capacity of the pump *f* could be made up by drawing hot water from the boiler to the desired degree.

As the filtration of the feed-water alone is not sufficient to prevent the further precipitation of the impurities when the water is evaporated in the boiler, it is obvious that a circulation of the boiler-fluid through the filter is very desirable to keep the boiler perfectly clean, and my construction thus affords the means of precipitating and removing by filtration the greatest possible proportion of impurities from the water before it is admitted to the boiler, while it also furnishes the means of removing from the boiler-fluid any precipitate caused by evaporation.

In drawing the water from a number of boilers it is important to avoid such construction that an excess of fluid might be drawn from one of the boilers, and, thus lower its water-level to an injurious degree, and I therefore apply my invention to a battery of boilers in such manner that the boiler-fluid in each may be circulated through the filter with substantial uniformity. To effect this result, I tap each boiler a little below the water-line and insert a pipe, *k*, provided with a cock, *l*, and unite it to the pipe I, leading into the pipe *h*, and also provided with the cock I'. By this

construction the water drawn into the pipe *h* from any of the boilers can never reduce the water-level in such boiler materially below the normal water-line, and although the pipe I would exert a greater suction upon the boiler nearest the pipe *h*, the cock *l*, connecting the pipe *k* with such boiler, can be nearly closed, to extend the suction to the other boilers, and the draft of fluid from each of the other boilers can be regulated in like manner.

The draft of fluid from each boiler may be further regulated by separately governing the filtered liquid from each boiler. For this purpose the delivery-pipe *c*, leading the water from the filter *b* to the boilers, is connected with each boiler separately by a branch, *d*, having cock *d'*. These cocks provide a means similar to the cocks *l* for regulating the delivery of the filtered fluid to the different boilers, and thus regulating the volume which it is desired to withdraw through the pipes *k*.

From the above description it will be seen that my invention may operate either as a boiler feeder or purifier, for when the two pumps are actuated in connection with the steam-pipe J alone the mechanism will operate simply to mingle live steam with the feed-water, and thus heat the latter to a high temperature, and produce a precipitate which would be filtered from the water before its delivery to the boiler. In like manner the device would be used when no feed-water is supplied to the boiler or boilers to draw hot water only through the pipe I, and to thus circulate the boiler-fluid through the filter to purify it continuously with the boiler or boilers in operation. By partially opening the cocks in both the pipes I and J both these operations may be performed simultaneously.

It might be supposed that a supply of water through a pipe under pressure would be an equivalent in my construction for the force-pump *g*; but it will be seen that the function of such a supply-pipe would not be the same as that of the pump, because it would supply an unregulated volume of water to the pipe *h* and pump *f*, and thereby prevent the adjustment of the pump and the steam or hot-water pipe, which is connected therewith, in the required manner. The pump *g* in my construction not only serves to deliver a regulated amount of fluid to the pipe *h*, but at the same time to prevent the access of water or air to the pipe when a vacuum is produced therein by the pump *f*.

Plunger-pumps, both connected to cranks upon the shaft B, are shown in the drawings; but it is obviously immaterial what kind of pumps are used or how they are driven, provided the deliveries are respectively proportioned in the required manner. Thus, if the pump *g* represents a feed-pump previously in use to supply a boiler or boilers with water, my invention may be combined with the same by inserting a direct-acting steam-pump or a belt-pump in the position of the pump *f* in the drawing and connecting it with the pump *g*



and with a filter in the manner described, and providing the other pipes needed to carry out the system.

5 A check-valve, *m*, is shown in the drawing to prevent the passage of fluid from the pipe *h* through the pipe *J*; but such check-valve is not necessary if the cock *J'* be properly regulated, nor are the cocks shown at *d'*, *l*, *I'*, and *J'* necessary to the working of my invention if the  
10 respective pipes are suitably proportioned to deliver the volume of fluid desired.

From the above description it will be seen that any form of pump or filter may be used to carry out my invention, and it is therefore  
15 obvious that the method of arranging the same in connection with the boilers and the means of conducting the fluids from one station to another may be varied to suit the circumstances of each particular case. Thus two  
20 pumps may be constructed upon a single frame and formed of the same bore with different strokes, and the pipe *h* may be replaced by a passage in the frame communicating between the outlet of the pump *g* and the inlet of the  
25 pump *f*. Such passage would be plainly an equivalent of the pipe *h*, and I do not therefore limit myself to a pipe or passage of any particular construction for connecting the pumps.

30 Having thus set forth the nature of my invention, what I claim herein is—

1. The combination, with a steam-boiler, a filter, and a force-pump arranged to deliver the feed-water through the filter to the boiler,  
35 of a feed-pump connected with the feed-water

supply and delivering the feed-water to the force-pump through an intermediate pipe, as *h*, and a steam-pipe conducting steam from the boiler into the intermediate pipe to heat the feed-water before filtration, as and for the purpose set forth. 40

2. The combination, with a steam-boiler, a filter, and a force-pump arranged to deliver the feed-water through the filter to the boiler, of a feed-pump of smaller capacity than the  
45 force-pump and connected with the water-supply, and delivering the feed-water to the force-pump by an intermediate pipe, and separate pipes connecting the steam and water spaces, respectively, in the boiler with the said intermediate pipe, the whole arranged and operated as and for the purpose set forth. 50

3. The combination, with a battery or series of boilers, of a filter and a force-pump connected therewith and arranged to deliver the  
55 water through the filter to the boilers, a feed-pump supplying water to the force-pump, and the pipes *I'* and *c*, arranged substantially as described, the pipe *I* having branches *k* inserted into each of the said boilers just below  
60 the water-line, and the pipe *c* being connected with the boilers by the branches *l*, all substantially as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses. 65

JOHN W. HYATT.

Witnesses:

THOS. S. CRANE,  
HENRY J. MILLER.