ROBERT BERRYMAN & R. N. PRATT.

Improvement in Automatic Boiler-Feeders.

No. 114,255. Patented May 2, 1871.

Fig. 3.

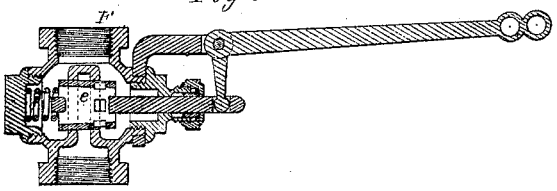


Fig. 1.

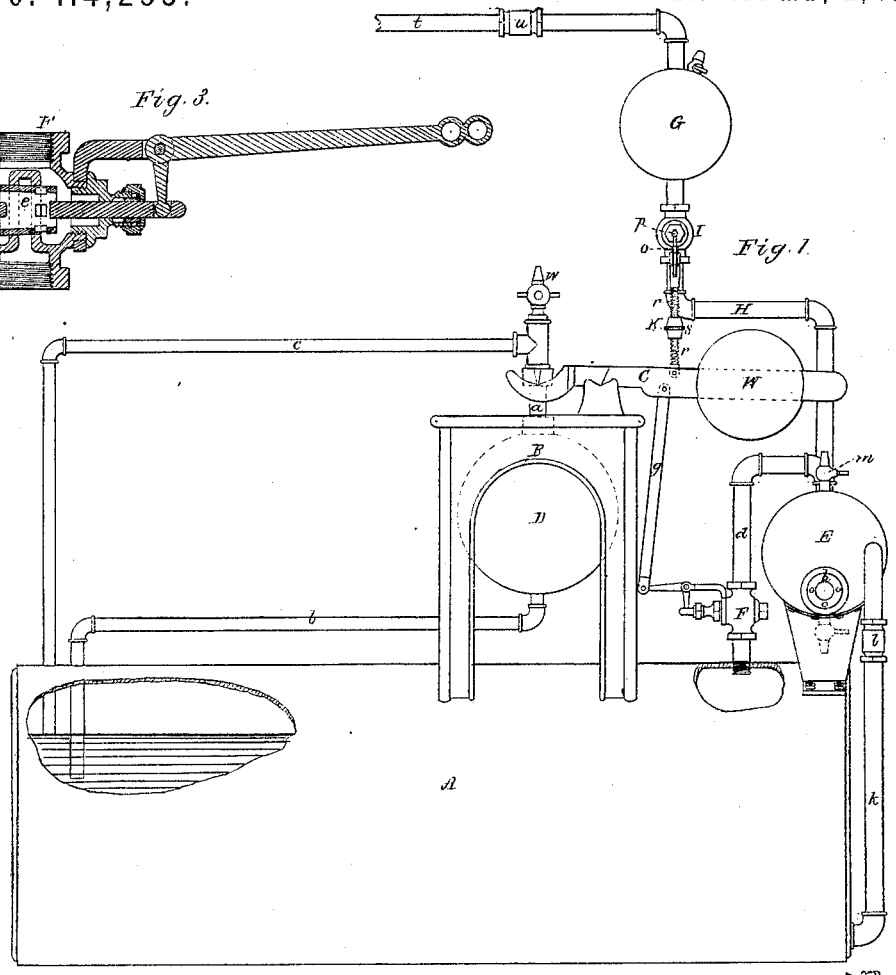


Fig. 2.

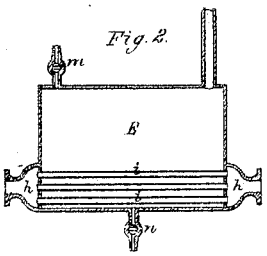


Fig. 5.

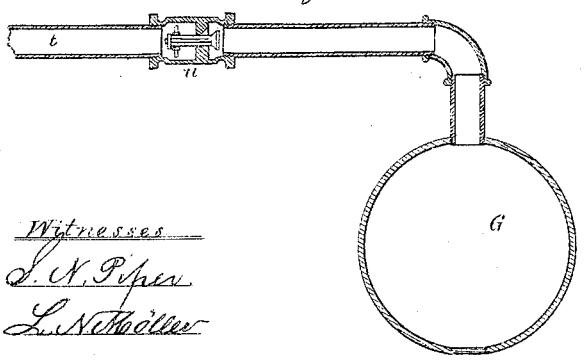
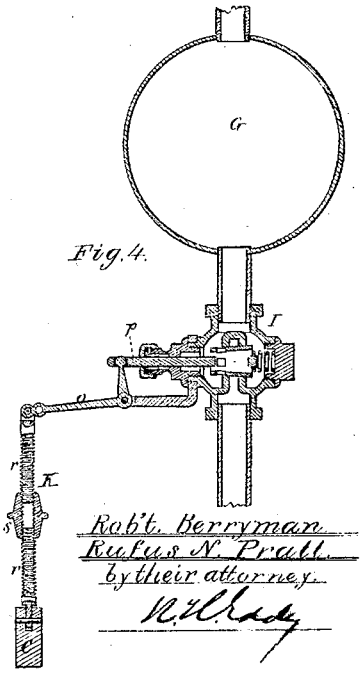


Fig. 4.



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UNITED STATES PATENT OFFICE.

ROBERT BERRYMAN, OF HARTFORD, CONNECTICUT, AND RUFUS N. PRATT, OF PHILADELPHIA; PENNSYLVANIA.

IMPROVEMENT IN AUTOMATIC BOILER-FEEDERS.

Specification forming part of Letters Patent No. **114,255**, dated May 2, 1871.

To all whom it may concern:

Be it known that we, ROBERT BERRYMAN, of Hartford, of the county of Hartford and State of Connecticut, and RUFUS NUTTING PRATT, of Philadelphia, of the State of Pennsylvania, have invented a new and useful Apparatus for Automatically Feeding a Steam-Boiler with Water; and we do hereby declare the same to be fully described in the following specification and represented in the accompanying drawings, of which—

Figure 1 denotes a front elevation of the apparatus as applied to a boiler. Fig. 2 is a vertical and longitudinal section of the water-supply vessel or "tank," as it is sometimes termed.

In the drawings, A denotes the boiler, having erected on it a frame, B, to support the pivots of a lever, C, from whose shorter arm is suspended a hollow globe or vessel, D. Opening into the said globe B and its stem *a* are two flexible pipes, *b c*, which respectively lead down into the boiler, the upper pipe terminating therein at the level at which it may be desirable for the water to stand in the boiler, the other pipe extending somewhat below such level. On the longer arm of the lever is an adjustable counterbalance or weight, W.

E is a hollow drum or vessel, usually termed "the tank." It is provided with a pipe, *d*, which leads out of the top of the boiler and into that of such vessel E, such pipe being furnished with a steam-cock, F, a vertical section of which is shown in Fig. 3. The plug *e* of this cock is moved in one direction by a spring, *f*, and in the other by an angular lever, arranged as shown. The longer arm of the said angular lever is connected with that of the lever C by a connection-rod, *g*, pivoted to both levers.

On the outside of each head of the vessel E is a chamber, *h*, the two chambers being connected by a series of pipes, *iii*, leading through the vessel E from one chamber *h* to the other. It is intended that the waste or exhaust steam from the engine shall be passed into one chamber, and from thence be caused to pass through the stack of pipes to and through the other chamber, the object being to heat the water that may be in the vessel E by means of the heat absorbed by the stack of pipes from the exhaust-steam. By so exhausting such water before it may be received into the boiler an advantage will be gained, as can readily be seen.

A pipe, *k*, leading out of the vessel E at a level above the stack of pipes leading through such vessel, extends down and opens into the boiler at or near its bottom. Within the pipe *k* is a check-valve, *l*, to open downward. There is also a blow-cock, *m*, leading out of the top and another such cock, *n*, leading out of the bottom of the vessel E. Furthermore, arranged above the said vessel E is another hollow vessel or globe, G, from whose lower part a pipe or conduit, H, leads to and opens into the upper part of the vessel E. Within the pipe H is a cock, I, like the cock F hereinbefore, described, the longer arm of the angular lever *o* of the stem *p* of the said valve being conjoined with the longer arm of the lever C by a connection-rod K, composed of two screws, *r r*, united by a nut, *s*.

Fig. 4 is a vertical section of the cock I, the lever *o*, the screws *r r*, the nut *s*, and the globe G. A pipe, *t*, leading from a water-supply cistern, opens into the top of the globe G, there being in such pipe *t* a check-valve, *u*, a section of the pipe check-valve and globe being shown in Fig. 5,

There is applied to the top of the globe D a blow-cock, *w*, for effecting the discharge of air from such globe and the pipes leading into it.

In the operation of the above-described apparatus gravity is brought into action upon the counterpoised hollow globe D, whose weight, together with that of its contents, which may be water and steam or steam alone, is employed to effect oscillation or movement of the lever C. If air contained in the pipes *b c* and the globe D be suffered to escape through the blow-cock *w*, and the boiler be charged with water to its proper level, it will be evident that when steam is made in the boiler water will be forced by the pressure thereof into the suspended globe D until it will be filled thereby. The weight of the water will cause the globe to descend and move the lever, whereby the cock F will be closed by its spring, so as to cut off communication between the steam-space of the boiler and that of the vessel or tank E. At the same time the cock I will be opened. Now,

if we suppose the water to fall to a level below that of the lower end of the upper of the two pipes *b c* it will be evident that steam will pass up such pipe into the hollow globe D and will displace the water therein, which will, by gravity, run through the other pipe into the boiler. The globe D on being relieved of water will admit of the weight W depressing the longer arm of the lever C, in consequence of which the cock F will be opened and the cock I will be closed. If, now, we suppose water to stand in the tank E above the level of the discharge-pipe leading therefrom to the water-space of the boiler, the steam which will flow from the steam-space in the boiler into the tank will admit of the water from the tank flowing down through the discharge-pipe *k* into the boiler. On the water in the boiler rising to the proper level, or while rising to such, the steam in the globe D and pipes *b c* will be condensed, and water from the boiler will take its place, thereby causing the globe to descend, the cock I to be opened, and the cock F to be closed. On the cock I being opened water from the condenser or auxiliary globe G will flow down the pipe H into the tank or vessel E, and will condense the steam therein, thus creating a vacuum in the steam-space of such vessel, whereby water will be drawn from the globe and its inlet-pipe until the tank may be filled.

The object of the condenser or vessel G′ and its cock I, combined with the tank and its induction-pipe, is to effect sudden condensation of the steam in the tank or vessel E and supply the latter with water; also to enable the water in the vessel E to be heated by the exhaust-steam, all of which could not be performed with the dispatch required without the said condenser. The condenser renders the water-supply apparatus of the boiler very sensitive in action, and is productive of other important and useful results.

The purpose of arranging the feed-pipe so as to open out of the vessel or tank E at a level above the stack of pipes of such tank or vessel E, is not only to keep the stack constantly covered with water, and thereby prevent sudden contractions and expansions of the stack, tending to rupture or otherwise injure the pipes thereof or their joints, but also to prevent the sediment which may fall in the water in the tank from being forced into the boiler. Such sediment may be discharged through the blow-cock of the bottom of the vessel E. That portion of the tank E which is above the tube-stack should be so large that the boiler will always be properly supplied before the water in the tank descends low enough to uncover any of the tubes. The opening of the feed-pipe *k* out of the tank may be located high enough to leave a space below in the bottom of the tank for sediment, but must be so low that it will never be uncovered by the descent of water while the boiler may be in operation.

The check-valve *l* in the feed-pipe *k* is to prevent the pressure of steam in the boiler from forcing the water of the tank up into the condenser, and the check-valve *u* of the pipe *t* is to prevent water from being blown out of the condenser through its supply-pipe. For the apparatus to operate to good advantage the bore of the pipe *d* should be about one-third larger in diameter than that of the pipe *k*. Furthermore, it is better to have the supply-pipe *t* enter or open into the condenser G at or near its bottom rather than at or near its top, as shown in the drawings. Furthermore, instead of slotting, we prefer to fork at their outer ends the stems of the valves of the two cocks I and F, their operative bent levers having their shorter arms extended into the openings of the forks, the object being to have one valve surely closed while the other is open.

The pipe H may be extended into the tank E, and there be provided with a nose or foraminous end to discharge the water in fine streams or jets in various directions.

We claim—

1. The combination of the condenser G and the cocks I with weighted lever C and globe D, combined with the boiler by pipes *b c*, as described, and with the tank or vessel E, its water induction and eduction conduits *b* H *k* and the pipe *d* and its cock F all being applied together and with the boiler, substantially in manner and to operate as described.

2. In combination therewith, means of heating the tank E by the exhaust-steam, such means, as represented and described, consisting of the two chambers *h h* and the stack of pipes *i*.

3. The combination and arrangement of the chambers *h h* and the stack of pipes *i* with the vessel E.

4. The combination of check-valves *u l*, arranged in the pipes *t* and *k*, with the condenser G, the tank E, the vessel D, and lever C, all arranged and combined together in manner substantially as described, and with or for use with a boiler, as set forth.

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