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Fig. 2.

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BOILER-FEEDER.

934,845.

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To all whom it may concern:

Be it known that I, JOHN F. SENTER, a citizen of the United States of America, and a resident of Chattanooga, in the county of Hamilton and State of Tennessee, have invented certain new and useful Improvements in Boiler-Feeders, of which the following is a full and clear specification, reference being had to the accompanying drawing, in which—

Figure 1 is a vertical sectional view of an apparatus embodying my invention, and Fig. 2 a detail horizontal sectional view of a portion of the casing showing the manner of pivoting the float lever.

The object of this invention is to provide a simple, reliable, and durable apparatus for attachment to any steam generator to automatically maintain any predetermined level of water therein, and it is especially adapted for high-pressure or superheating boilers in which the water in the boiler is maintained at such a high temperature and pressure that its specific gravity is lowered by the presence of vapor in it, as more fully hereinafter set forth.

The housing of my apparatus consists of a horizontal cylindrical portion *a* having at one end a depending cylindrical portion or well *b* and at its other end an upstanding portion or dome *c*. Entering through the top of the dome is a pipe *d* which is provided with a cock *e* and enters the boiler to the normal water-level thereof. Another pipe *f* connects the casing to the boiler at a point below the normal or desired level of water therein, this pipe being provided with a cut-off valve *g*. This pipe *f* enters the housing at the end opposite the well *b* near the top of the horizontal casing *a* and extends across the bottom of the dome, terminating near the opposite side of the dome and the upper part of the casing *a*.

Pivoted on suitable horizontal pivots in the casing *a* at a point near the well *b* is a horizontal lever *h*, the shorter arm of which is provided with a depending weight *i* working vertically in the well *b*, and the longer arm of which is pivotally connected to an upstanding rod *j* which carries at its upper end a cup or tank *k* which works vertically in the dome *c*. This dome is preferably covered over at its top by a cover *l* in which is a central opening, and depending through the top of the dome and working loosely

through this opening is a stationary blow-off pipe *m* provided exteriorly with a suitable blow-off valve *n*.

Mounted on top of the casing *a* is the feed valve *o* whose stem *p* depends through a hole in the bottom of the valve casing and is swivelly connected to an extension *p'* pivotally connected to the lever *h* between its pivotal point and the weight *i*. The feed valve is practically balanced, it being of the two-disk type and the upper disk being but slightly larger in diameter than the lower disk so that the valve will be normally held to its seat by a slight preponderance of pressure on the upper disk. In the top of the valve casing is a removable screw-plug *q* provided with a removable oil-plug *r*. The oil-plug *r* enables the valve to be oiled without dismantling the apparatus and the removable plug *q* enables the valves to be ground to their seats from time to time as they become worn, by simply inserting a suitable tool and rotating them. The upper side of the upper valve is provided with means whereby a suitable tool may be engaged therewith to rotate it, a screw-driver notch being shown for this purpose. The swivel connection between the parts *p* and *p'* of the valve-stem enables the upper part of the valve-stem to be freely rotated.

When the lower end of pipe *d* is sealed the pressure in the boiler will force the water up through pipe *f* and completely fill the housing, in a well-known manner, and also fill the cup-weight *k*. The weight *k* when filled with the water and the housing is empty is heavier than the weight *i* and will thus descend and open the feed valve, but as the housing re-fills with water and the cup-weight is immersed the solid closed weight *i* exerts the greater gravitational force and thus causes the lever *h* to rock on its pivots and close the feed valve. It will be thus observed that the housing will be repeatedly automatically filled and emptied as the water in the boiler rises and falls, thus maintaining accurately a predetermined level of water in the boiler. It will be observed that it is essential that the cup-weight shall be larger in displacing capacity than the solid weight.

It will be observed that the blow-off pipe *m* serves to guide the hollow weight or cup in its vertical movements, and also that this blow-off pipe is of sufficient length to reach to a point near the bottom of the cup when

the cup is at the upper limit of its movement so that when the cup is elevated any sediment that may have collected therein may be readily blown out by opening valve *n*, thus avoiding dismantling the apparatus for cleaning out this cup.

It will be observed that, by connecting the water-pipe *f* to the main casing *a* near its top, the casing *a* and the well *b* will at all times be filled with water up to the bottom of pipe *f*. In this way the gravitational force of the solid weight will always remain the same, thus avoiding the inaccuracy that would result from having this weight working partly in water and partly in steam space.

Another advantage from connecting pipe *f* with the housing at the point shown and extending it across the bottom of the dome is that the incoming hot water from the boiler will be projected across the top of the trapped water toward the other end of the casing. This will cause a circulation of the trapped water, forcing it in the opposite direction toward the dome. This backward current of the trapped water will force the same up into the dome as the casing becomes filled, whereby the trapped water will immerse the cup-weight and cause the feed valve to close. The advantage in this is that the trapped water is cooler and has condensed all the steam that came with it from the water and is thus of normal density, whereby the inaccuracy that would result from operating the cup-weight by immersion in steam-charged water is entirely avoided.

A further result of extending the pipe *f* into the housing at a point near its top and extending it across the lower opening of the dome is that the incoming gushing water will be projected toward the opposite end of the housing so that the water which rises in the dome will not only be cooler than the incoming water, as stated, but will be subjected to a minimum of agitation, whereby accuracy in the operation of the cup-float will be secured to a greater degree than if the water from the boiler were injected into the housing in such manner that the in-rush of water would strike directly against or adjacent to the float. The main advantage however is, as stated, that

the cooler water trapped into the housing will be forced up into the dome before it is mixed with the steam-charged water that comes over from the boiler.

A further advantage of this arrangement is that in emptying the housing the water in the dome will pass down through the pipe *f* first, thereby avoiding the disturbance of the cooler water in the main body of the housing, the water in the dome having been highly heated by the steam that came up through the pipe *d* from the steam space of the boiler. In this way a body of cooler water is always maintained in the main trunk of the housing in a position to be forced up into the dome with each re-filling of the housing, whereby, as stated, water of normal density is always available for operating the immersion weight.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is:—

1. A boiler feeder comprising a housing and piping connecting the same to the boiler, automatic feed-valve-operating means in the housing embodying a vertically movable water-cup weight adapted to be filled with each operation of the apparatus and provided with a cover having a central guide opening, and a clean-out pipe depending into said cup-weight through said guide opening and provided exteriorly of the casing with a blow-off valve, for the purpose set forth.

2. A boiler feeder comprising a housing and piping connecting the same to the boiler, automatic feed-valve-operating means in the housing embodying a vertically movable water-cup weight adapted to be filled with each operation of the apparatus, and a clean-out pipe depending into said cup-weight and provided exteriorly of the casing with a blow-off valve, for the purpose set forth.

In testimony whereof I hereunto affix my signature in the presence of two witnesses this 7 day of Oct. 1908.

JOHN F. SENTER.

Witnesses:

H. G. WATSON,
O. P. STEWART.