No. 683,366. Patented Sept. 24, 1901.

F. WOERNER.

SELF ACTING BOILER FEED APPARATUS.

(Application filed June 28, 1900.)

(No Model.)

Fig. 1.

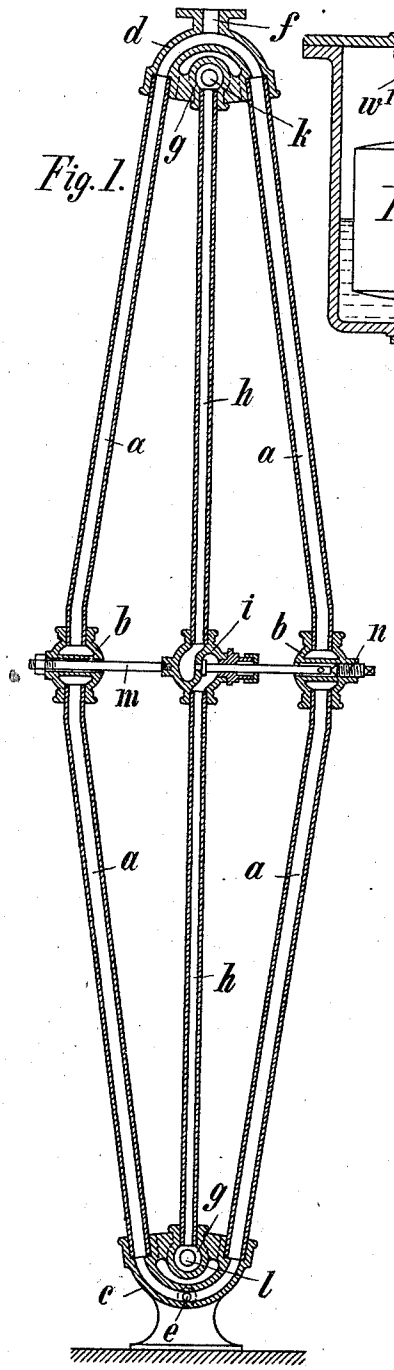


Fig. 2.

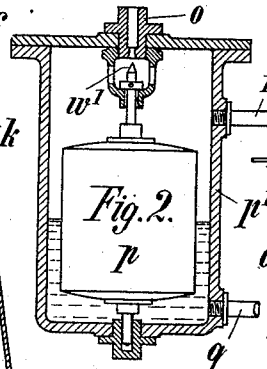
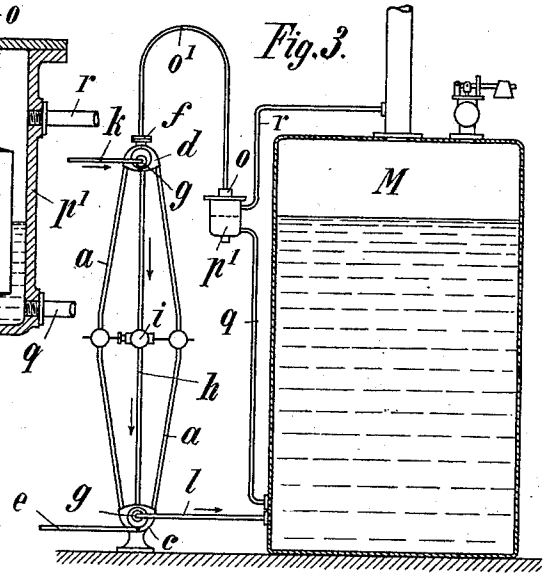


Fig. 3.



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SELF-ACTING BOILER FEED APPARATUS.

SPECIFICATION forming part of Letters Patent No. 683,366, dated September 24, 1901.

Application filed June 28, 1900. Serial No. 21,973. (No model.)

To all whom it may concern:

Be it known that I, FRITZ WOERNER, a subject of the German Emperor, and a resident of Hamburg, in the German Empire, have invented certain new and useful Improvements in Self-Acting Boiler Feed Apparatus, of which the following is a specification.

The present invention relates to that class of automatic feed-water apparatus which when used for feeding a steam-boiler give access of the steam at a given water-level to a suitable device, which device by means of its expansion operates a valve in the feed-water pipe until the requisite water level has been reached, when the flow of steam to the said expansion device is cut off and by the cooling and consequent contraction of the expansion devices closes the valve in the feed-water pipe leading to the boiler.

With this end in view my invention consists of certain novel features of construction and combinations of parts, as will be hereinafter described with reference to the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section of the apparatus which acts by expansion and contraction on the feed-valve. Fig. 2 shows the arrangement of a form of float-valve used in connection with my feed apparatus. Fig. 3 shows a steam-boiler fitted with my improved feed apparatus.

Similar letters refer to similar parts throughout the several views.

The feed apparatus shown in Fig. 1 acts similarly to that class of automatic steam-traps that act by the expansion and contraction of the pipes through which the steam and condensed water pass. The apparatus consists of two pairs of tubes *a a*, each pair forming a steam-leg of a substantially diamond-shaped frame. Each pair of tubes is connected in the middle by ball-shaped socket-joints *b*, and the outer extremities of the tubes are fixed in suitably-shaped unions *c* and *d*. The lower union *c* is provided with an outlet *e*, leading to a condensing-chamber, and the upper union *d* with a flanged steam-inlet *f*. The tubes *a* form a diamond or parallelogram, and the steam flowing into the same expands it in such a manner that the joints *b* move outward away from each other, provided that the two unions *c d* are immovably held. The unions *c d* are provided with elbow-joints *g*, the latter communicating with each other by a connecting-tube *h* and respectively with the boiler-feed pipe *l* and the water-supply pipe *k*. At about the middle of this tube, between the joints *b*, is situated a valve-chamber *i*, which is connected with one of the joints *b* by a screw rod or bolt *m*. The valve-spindle *m'* of the valve *i* proper is connected to the other joint *b*. The position of the valve-spindle—*i. e.*, the stroke of the valve—may be regulated as required by means of an adjusting-screw *n*.

The above-described feed apparatus is connected, by means of a float-valve device *p p'*, with the boiler M, which is to be fed in the manner shown in Fig. 3. The upper neck *o* of the valve-chamber *p'* is connected, by means of a tube *o'*, with the steam-inlet *f*. The valve-chamber *p'* is further in communication with the steam-space of the boiler by a pipe *r* and with the water-space of the boiler by a pipe *q*. The float-valve chamber *p'* is attached to the boiler at such a height that the level of the water in the former is sufficiently low when the water in the boiler is at its lowest level to cause the float *p* and the valve *w*, which is attached to it, to open the passage in neck *o* and to close it when the water-level in the boiler rises. In the latter case no steam can enter into the frame *a a* and the valve *i'* remains closed; but when the water-level in the boiler sinks so that the float *p* opens the outlet-neck *o* steam from the boiler will flow through the tube *r*, the valve-chamber *p'*, and the pipe *o'* into the tubes *a*. The latter expand in consequence of the heat and pressure of the steam sufficiently to open the cut-off valve in the tube *h*, thus allowing the feed-water to flow through the supply-pipe *k*, the tube *h* and the open valve therein, and through the pipe *l* into the boiler. As the valve-chamber *i* is attached to one side of the expanding tube-frame and valve *i'* to the other side of the said expanding tube-frame, the effect is that the expansion of the tube-frame causes the opposite tubes to spread apart—that is to say, the tube carrying the valve-spindle and valve in one direction and the tube carrying the chamber and the valve-seat in the opposite direction—from which arrangement it results that

the opening or closing stroke of the cut-off valve is twice as great as if the valve or its chamber were each moved alone. The feed continues uninterruptedly until the water-level in the boiler has risen sufficiently to cause the float-valve *p* to close the steam-outlet *o*, whereupon the tubes *a* cool and contract again, thereby reversing the action above described, closing the cut-off valve in the tube *h* and preventing further passage of water into the boiler.

Referring again to Fig. 1, it will be observed that the union from which the exhaust takes places, here shown as the lower one, *c*, contains a passage somewhat smaller than the diameter of the lateral steam-legs, while the exhaust-pipe *e* has quite a relatively small diameter. This construction will allow of a certain steam-pressure to be maintained in the frame, especially after the pipes *a* have been heated up to approximately steam temperature, when this steam-pressure will exert itself and tend to make the frame assume a circular form irrespective of the effect produced by expansion. Of course the amount of pressure will be regulated by the size of the passage in the union *c* or the outlet-pipe *e*.

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

1. In an automatic regulating device, a pair of steam-legs connected to an inlet-union at one end and an outlet-union at the other end, a valve connected to one of said legs and a valve-casing to the other, whereby both valve and valve-casing are caused to simultaneously move an equal extent, substantially as and for the purpose set forth.

2. In an automatic regulating device, a pair of steam-legs connected to a steam-inlet union at one end and a steam-outlet union at the other end, each of said legs connected to a movable element of a suitable controlling device, and means for producing steam-pressure in said legs to cause them to separate to actuate the controlling device, substantially as and for the purpose set forth.

3. In an automatic regulating device, a pair of steam-legs connected to a steam-inlet union at one end and a steam-outlet union at the other end provided with a contracted steam-outlet, each of said legs connected to an element of suitable controlling device, substantially as and for the purpose set forth.

4. In an automatic regulating device, a pair of steam-legs, a steam-inlet union at one end and an outlet-union at the other end, a feed-water pipe between the steam-legs, a cut-off valve intermediate the end of said pipe, the casing of said valve connected to one of the legs and the valve-stem to the other, substantially as and for the purpose set forth.

5. In combination, a boiler, a steam-pipe connected with the steam-space thereof, a cut-off valve controlled by variations in the level of the boiler-water and controlling the flow of steam through said pipe, an automatic feed-regulator comprising a pair of steam-legs, a feed-water pipe between said legs, a union connecting one end of the steam-legs and feed-water pipe with the aforesaid steam-pipe and with a water-supply pipe, respectively, a union connecting the opposite ends of said steam-legs and feed-water pipe, said union having a contracted steam-outlet port and a port in communication with the feed-water pipe and with the water-space of the boiler, and a cut-off device in said feed-water pipe comprising two coöperating members each connected with one of the steam-legs, whereby said members are moved in opposite directions by the contraction and expansion of the steam-legs, substantially as and for the purpose set forth.

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