J. WERTHEIM.

Automatic Feed-Water Regulator.

No. 165,283. Patented July 6, 1875.

Fig: 1.

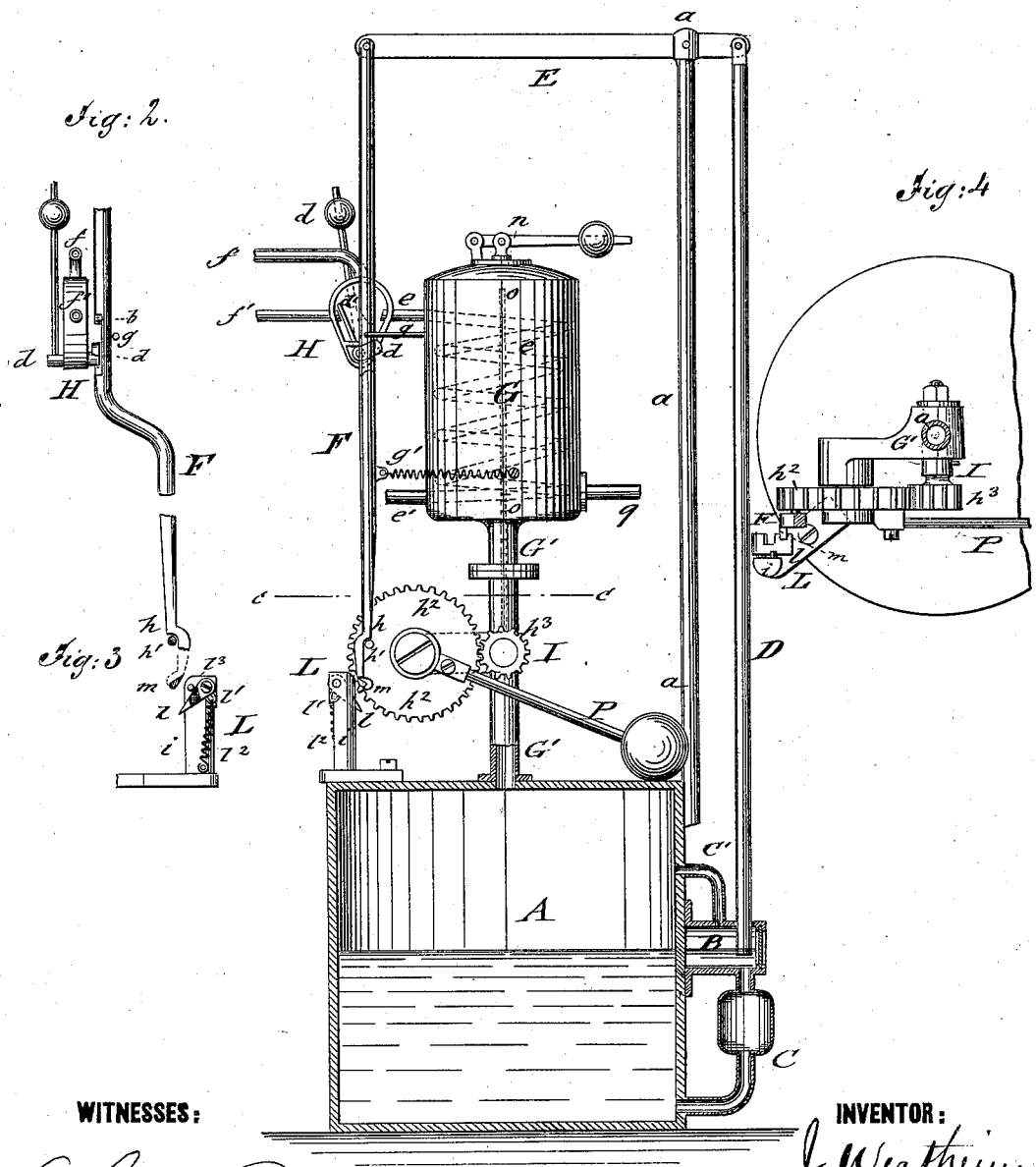

Fig: 2.

Fig: 3

Fig: 4

WITNESSES:

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JOSEPH WERTHEIM, OF FRANKFORT-ON-THE-MAIN, GERMANY.

IMPROVEMENT IN AUTOMATIC FEED-WATER REGULATORS.

Specification forming part of Letters Patent No. **165,283**, dated July 6, 1875; application filed June 5, 1875.

To all whom it may concern:

Be it known that I, JOSEPH WERTHEIM, of Frankfort-on-the-Main, Germany, have invented a new and Improved Automatic Feed-Water Regulator, of which the following is a specification:

In the accompanying drawing, Figure 1 represents a side elevation of my improved automatic feed-water regulator for steam-boilers, and Figs. 2, 3, and 4 are detail views of the steam-heating and water-regulating parts.

Similar letters of reference indicate corresponding parts.

The invention will first be described in connection with drawing, and then pointed out in the claims.

In the drawing, A represents a steam-boiler that is connected to a separate side receptacle, B, by pipes C and C′, which connect the water and steam sections of the boiler with the receptacle so that the water in the same is always at the same level with that in the boiler. A tube, D, extends vertically from receptacle B to suitable height above the same, the lower open end being at the point of lowest water-level, so that the pressure of the steam fills the tube entirely with water as long as the water is above the lowest point. Whenever the water is below the same the steam enters the tube D and causes the expansion of the same. This expansion of tube D is transferred to a lever, E, that is pivoted to tube D and fulcrumed to a supporting-rod, *a*, near the same. The longer arm of lever E is pivoted to a downward-extending rod, F, to which, on account of the considerable leverage of arm E, even the slightest changes in the length of tube D are transferred. Rod F passes sidewise along a valve, H, that regulates the admission of waste steam from the cylinder to the coiled heating-pipe of the water-reservoir G, supported above the boiler and connected therewith by a pipe, G′, with stop-cock I. Rod F engages, by a recess, *b*, or projecting parts, the arm of an elbow-shaped valve-lever, *d*, which is pivoted to the lower part of valve-casing H, and accelerated in its motion by a weighted arm attached thereto. The valve *d′* at the inner end of the lever *d* in the casing swings from one side to the other of the same, according to the motion of rod F, shutting, on the descent of the same, the pipe *e*, which extends, in the shape of a coil, through the reservoir G, and opening, on its ascending motion, the heating-pipe, so that the waste steam may enter from the waste-pipe *f* to the coil, heating up the feed-water and passing out through the lower end *e′*. When the heating-pipe is closed the steam is conveyed to the outside through the exit-pipe *f′* of valve H. The governing-rod F is guided in its motion along valve H by an arm, *g*, extending from the water-reservoir G, and is further acted upon by a spiral spring, *g′*, for being retained in proper position on the stop-cock controlling mechanism. The lower end of rod F is provided with a shoulder, *h*, that rests on a pin, h^1, of a cog-wheel, h^2, turning on a shaft secured to an arm of the feed-pipe G′. Cog-wheel h^2 intermeshes with a pinion, h^3, of the stop-cock and produces thereby, on the downward motion of the rod F, the opening of the same and the discharge of water to the boiler. A weighted lever, P, is keyed to cog-wheel h^2, causing the instant closing of the stop-cock on the release of rod F from pin h^1.

For the purpose of making the action of the rod more sensitive to the movements of tube D, a mechanism, L, is provided, which interrupts the discharge of water into the boiler before the tube has been allowed to cool off to that extent, and which renders the apparatus capable of responding to very small changes in the tube D. The mechanism L is constructed of a post, *i*, that carries at its upper end a pivoted wedge-shaped catch, *l*, which is provided with a short elbow-arm, l^1, acted upon by a spiral spring, l^2, so that the catch is carried against its stop-pin l^3 and into inclined position. The catch is recessed at the side, as shown in Fig. 3, in such a manner that a small wedge-shaped lugs *m*, projecting at the lowermost end of rod F, may pass up through the same. The lug *m* slides, by the downward motion of rod F, over the spring-acted face of catch *l* and presses it into nearly vertical position until the lug gets below the same, when catch *l* is thrown up against its stop-pin l^3 and compels thereby the lug to pass up along the under side of the catch. The

rigid position of catch *l* releases at the same time the rod F from the pin h^1 and causes, by the action of the weighted lever, the closing of the stop-cock before the rod returns to its position thereon. By the gradual contraction of the tube the rod returns to its position on the pin of the cog-wheel by the action of spring *f'*, the lug *m* passing up through the recess of the catch *l*. The water-reservoir G is provided with a safety-valve, *n*, at the top, for allowing the exit of any water or air expanded by the heat. A small pipe, *o*, leads up from stop-cock I to a point below the top of the reservoir and serves to conduct, on the opening of the cock, steam from the boiler to the surface of the water, by which the discharge of the same to the boiler is accelerated. The gradual discharge of the water and the cooling off of the reservoir produces, by the condensation of the steam, a partial vacuum, and fills thereby the reservoir with water from the suction-pipe *g*.

The feed-water regulator may also be employed without the use of a reservoir by connecting it directly with the feed-pumps in such a manner that it opens and shuts the stop-cock of the suction-pipe of the pump.

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

1. The combination, with rod F, having lug *m*, of the recessed spring-catch *l*, having spring-arm l^1, the pin l^3, and the wheel having pin h^1, as and for the purpose specified.

2. The combination of governing-rod F with waste-steam valve and feed-water reservoir, producing the alternating warming and cooling of the same, for heating up the water and creating the suction-vacuum, for the purpose specified.

3. The governing-rod F, having shoulder *h*, in combination with projecting-pin h^1, of weighted cog-wheel h^2, and stop-cock pinion for opening and closing the stop-cock on expansion of tube D at low-water level, substantially as set forth.

4. The combination of spring-acted governing-rod F, having projecting-lug *m* at lowermost end, with recessed and spring-acted elbow-catch *l*, and the weighted stop-cock gear to respond to small variations of the main tube, substantially as and for the purpose set forth.

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Witnesses:
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