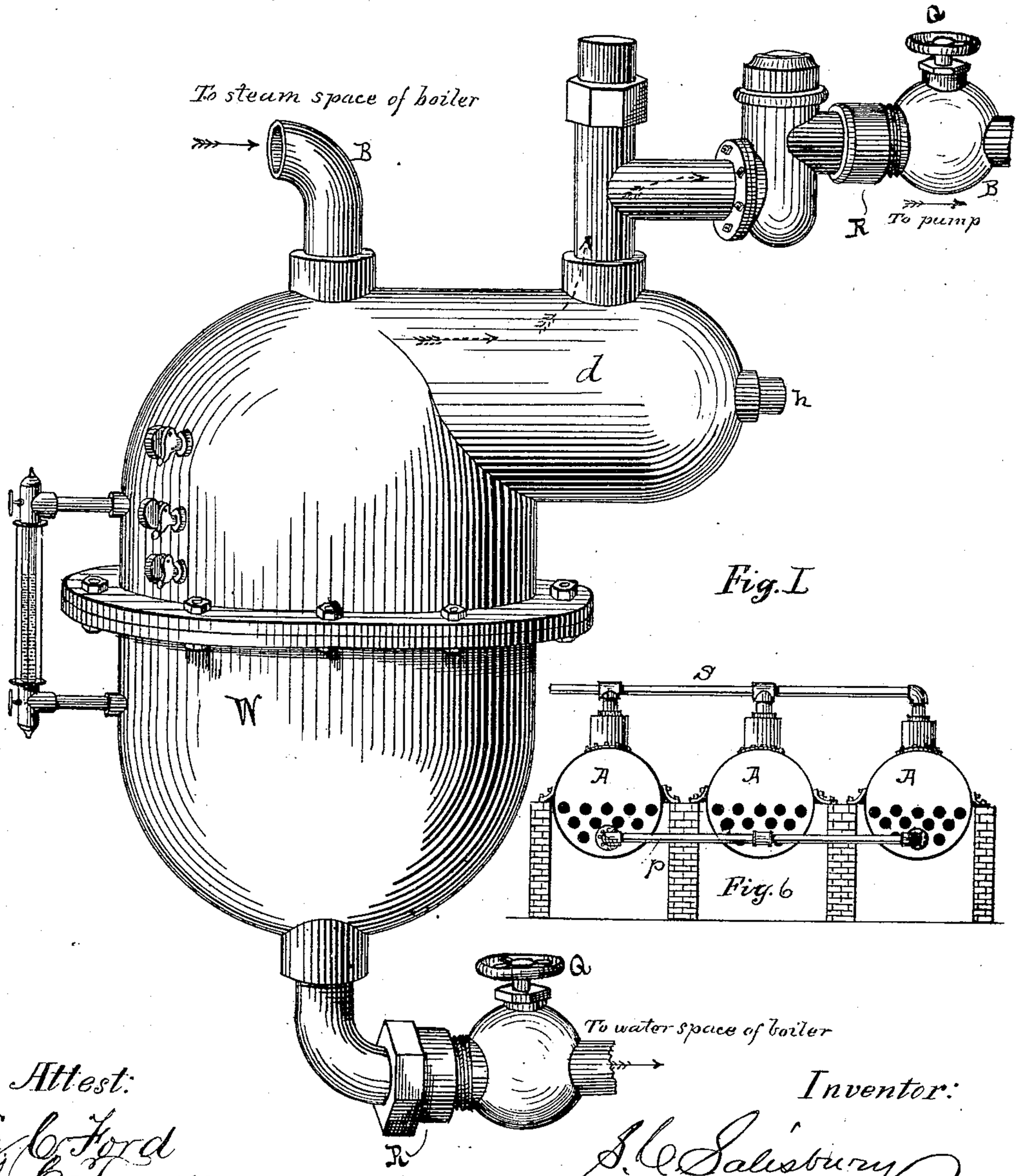
(No Model.) 3 Sheets—Sheet 1.

S. C. SALISBURY.

FEED WATER REGULATOR.

No. 265,542. Patented Oct. 3, 1882.



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E. C. Ford
J. C. Turner

Inventor:
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By his atty
A. D. Smith

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Fig. 2.

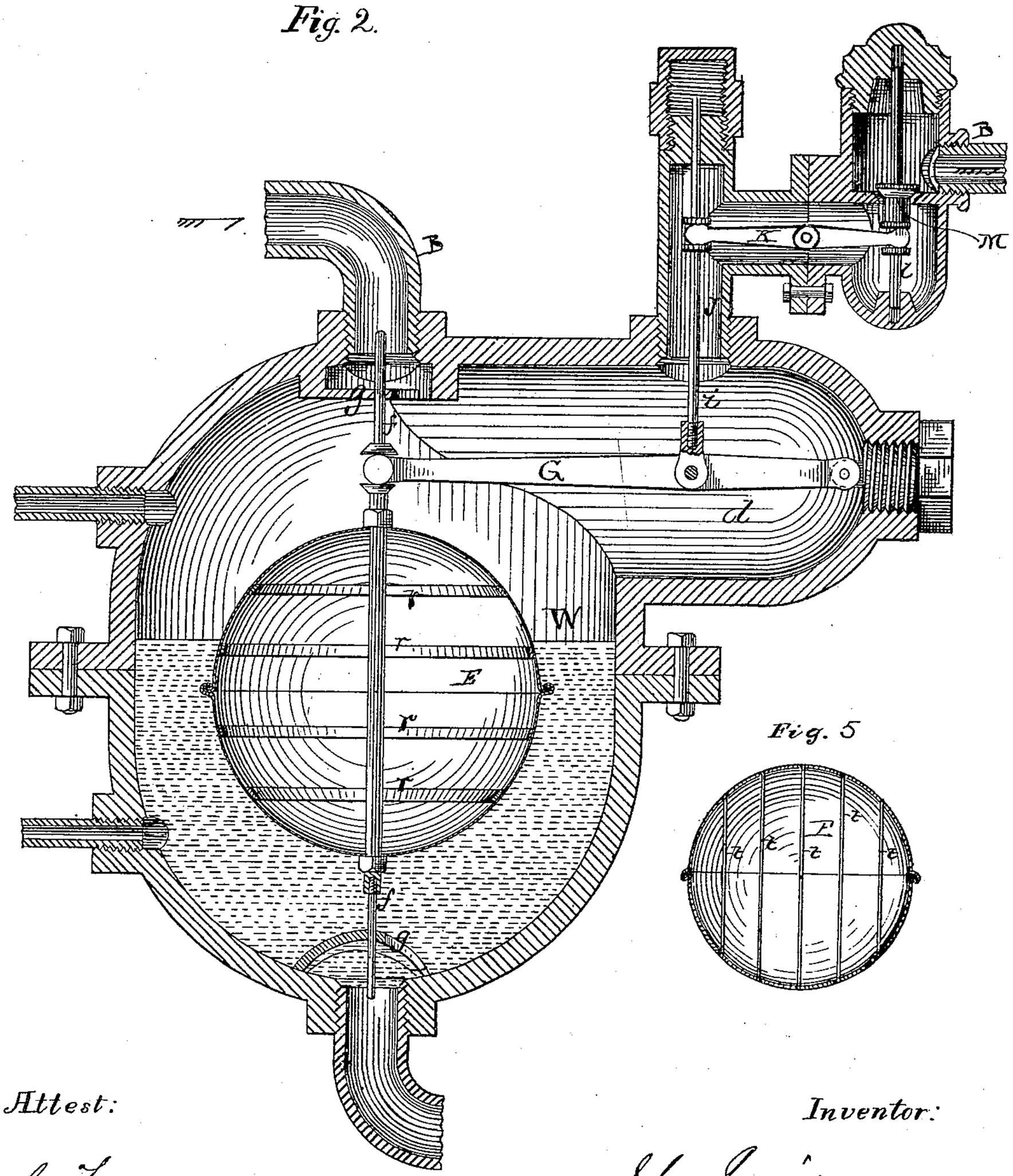

Fig. 5

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Fig. 3.

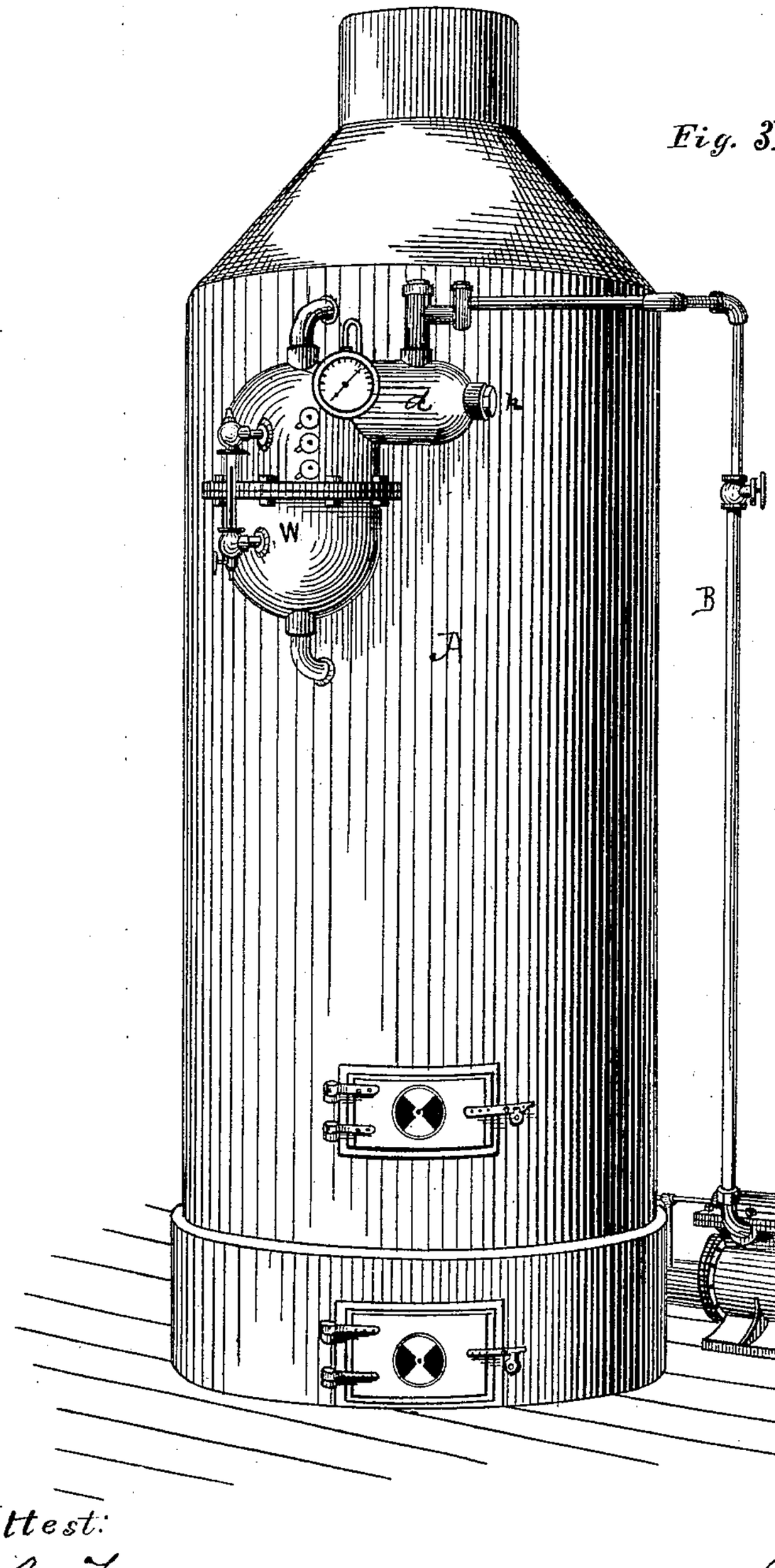
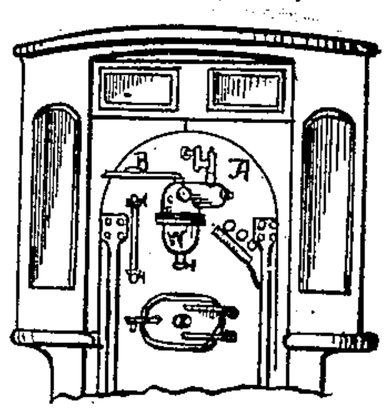


Fig. 4.



Attest:

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Inventor

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By his Atty

R. D. Smith

UNITED STATES PATENT OFFICE.

SILAS C. SALISBURY, OF NEW YORK, N. Y., ASSIGNOR TO THE AMERICAN NON EXPLOSIVE BOILER ATTACHMENT COMPANY, OF SAME PLACE.

FEED-WATER REGULATOR.

SPECIFICATION forming part of Letters Patent No. 265,542, dated October 3, 1882.

Application filed January 30, 1882. (No model.)

To all whom it may concern:

Be it known that I, SILAS COVEL SALISBURY, of the city, county, and State of New York, have invented a new and useful Improvement in Feed-Water Regulators for Steam-Generators; and I do hereby declare that the following is a full and accurate description of the same.

This invention relates to that class of feed-water regulators wherewith the feed-pump is supposed to be constantly running, but with speed in accordance with the evaporation going on in the boiler by means of an automatic control of the throttle-valve in the steam-pipe which conducts steam to the pump. For this method of controlling the supply of feed-water Letters Patent No. 246,215 were issued to me August 23, 1881. My present invention is therefore an improvement on said invention, to adapt it to certain locations. I therefore do not propose to claim in this patent the general structure and arrangement of controlling float and throttle-valve shown in said application, but only the structure and arrangement in addition thereto shown herein.

A particular object of this improvement is to adapt my invention to locomotive steam-generators, wherein the water within the generator may be liable to concussion and movements from side to side. Another object is to increase the sensitiveness of the throttle-valve. It is evident, however, that this improvement is equally well adapted to stationary generators of all kinds, especially sectional generators.

My improvement consists, first, in a float-chamber interposed in the line of the feed-pump steam-pipe, containing a float mounted upon a stem or rod which moves in guides to restrain the float from lateral movements, a throttle-and-lever movement within said steam-pipe, and a supplemental or auxiliary lever within the float-chamber, whereby the vertical movements of said float, but not its lateral movements, will be transmitted to the valve; second, also, in the structure of the float; third, in the arrangement, in connection with the valve-movement alluded to above, of a throttle-valve in the steam-pipe.

That others may fully understand my improvement, I will particularly describe it, having reference to the accompanying drawings, wherein—

Figure 1 is a perspective view, showing my improvement detached. Fig. 2 is a longitudinal vertical section of the same. Fig. 3 is a perspective showing the application to a stationary boiler. Fig. 4 is a rear elevation, showing the mode of applying to a locomotive-boiler. Fig. 5 is a section of the float, showing the tubular stays. Fig. 6 is an elevation showing the circulation-pipes of a bank of boilers.

A is the boiler, which may be locomotive or stationary, but for convenience a stationary boiler is shown; and B is the steam-pipe taking steam to the pump C.

In the line of the steam-pipe B there is interposed a float-chamber, W, which is connected at its bottom with the water-space in the boiler, so that the water will stand in said chamber at the same level as in the boiler.

The float E may be made in any approved way; but I prefer a manner which will be hereinafter described. The stem *f* of the float E is made sufficiently stiff to resist the lateral thrust of the float when the chamber oscillates from side to side during the movements of the locomotive, and said stem moves in guides *g* at top and bottom. Near the top of the stem *f* it engages with a lever, G, which at its opposite end is pivoted to some rigid support under the chamber most conveniently to a stud, *h*, which is screwed into the side of the chamber.

At a proper point between the fulcrum-pin and place of engagement with the stem *f* a rod, *i*, is mounted and joined to the lever G, and said rod *i* extends therefrom upward into the passage-way J and engages with the lever K, which at its opposite end engages with and controls the stem *l* of the throttle-valve M.

It is only desirable that the float-chamber shall be sufficiently large to accommodate the float, because the larger the body of water confined in said chamber with the float the greater will be the lateral thrust of said water against the float when the boiler sways from side to side in its movements. I therefore prefer to make the water-space of said chamber W but slightly larger in horizontal cross-section than the float which it is to contain; but near its

top I make a lateral enlargement or offset, *d*, to accommodate the lever G. The proper length of said lever and the dimensions of the offset *d* are, however, variable and dependent upon the dimensions and purposes of use of the relative parts. While the steam is escaping to an engine in action the water in a stationary boiler is in a constant state of oscillatory motion, due to the ebullition which is constantly going on. In locomotive-boilers this motion is greatly increased by the agitation of the boiler itself as it advances along the track. All such movements of the fluid in the boiler are communicated to the fluid in the float-chamber, and the float and valve, if not restrained, will partake of these movements, and the escape of steam to the feed-pump will be uneven. To obviate these objectionable effects I bring the steam in so that the steam-pressure tends to force the valve open, and thereby force the float deeper into the water. This action has a tendency to steady the float, especially as the oscillation of the water in ebullition is accompanied by a corresponding and coincident oscillation in steam-pressure, and these two forces are placed in opposition to neutralize each other. The float and valve are thereby rendered perfectly steady and capable of responding to the slightest variation in water-level, and the action of the pump is rendered correspondingly steady and capable of varying immediately and to the smallest variations of water-level.

It has been customary to construct similar floats of sheet-copper; but this method is costly, and I propose to make them of cast metal, preferably of brass or bronze, with strengthening-ribs *r* properly disposed, or with stays inserted, whereby the comparatively soft cast metal may be stiffened to resist any pressure or hard usage to which it may be subjected. A float so constructed is shown in Figs. 2 and 5. This float may be cast in one or two pieces, as most convenient, and the stays *t t* are inserted to enable it to resist external pressures more effectively than it would do if unprovided with such stays. These stays may be inserted as screw-bolts or otherwise; but I prefer to employ tubes, which are secured by expanding the ends in the ordinary way of securing tubes in boilers.

A valve which closes against the steam-pressure has always the pressure of steam upon the valve to oppose oscillations caused by the bodily or tremulous movements of the water, occasioned by the ebullition going on in the boiler. Such bodily movements will be greatly augmented by the motion of a locomotive-boiler. Every oscillatory motion of the float produces a similar motion of the valve and uneven action of the feed-pump.

The structure above described secures the utmost steadiness, delicacy, and freedom from oscillation, and therefore enables the float to control the throttle with reference to minute variations of the water-level.

When several boilers are set in bank, as shown in Fig. 6, I connect the water-spaces of the several boilers by a water-pipe, *p*, and also connect the steam spaces or domes by a steam-pipe, *s*. This equalizes the circulation perfectly and insures a uniform water-level and a uniform steam-pressure in the several boilers, notwithstanding the condition of the several fires may be different, and it obviates the necessity of more than one feed-water regulator for the whole bank.

It is desirable that the feed-water regulator may be detachable from the boiler without disabling the latter, and I therefore cut off valves Q Q in the steam and water pipes between the regulator and the boiler, and I also insert unions R R in said pipes between said valves Q and the regulator. The latter can then be cut off and detached at any time, whether the generator be detached or not.

Having described my invention, what I claim as new is—

1. A steam-pipe from the boiler to the feed-pump and interposed therein a float-chamber, D, having communication at the bottom with the water-space of said steam-generator, a float within said chamber, and a lever, G, fulcrumed at one end on the chamber-wall, and engaged at the other end with the stem of said float, combined with a throttle-valve in said steam-pipe and the lever K and rods *i l*, whereby said throttle is connected with and controlled by said lever G and float E.

2. A float, E, constructed of a hollow shell of cast or other metal, provided with tubular stays to strengthen said shell to resist compression from without, substantially as set forth.

3. A float, E, combined with a throttle-valve and its lever in the steam-pipe of the feed-pump and connecting mechanisms, whereby said valve may be controlled, the water and steam pressure opposing each other to repress oscillation of the valve and prevent uneven feed of steam to the steam-pump, so that the amount of steam which enters the steam-pipe may be exactly sufficient to cause the feed to be exactly equal to the amount evaporated.

4. A metal float made in two parts united by seaming without solder or brazing, and provided with internal stays to insure lightness, strength, and a perfect protection against collapse and leaks.

5. The float-chamber D, adapted to receive the float with the smallest possible surplus surrounding space and the lateral extension of offset *d*, whereby the oscillations of the confined water will have but little effect of disturbance on said float, and the lever G may be received within the chamber, substantially as set forth.

SILAS COVEL SALISBURY.

Witnesses:

HENRY K. THOMAE,

E. A. GARTHWAITE.