2 Sheets—Sheet 1.

A. C. NORCROSS.

AUTOMATIC DRAFT REGULATORS FOR STEAM BOILERS, &c.

No. 190,354. Patented May 1, 1877.

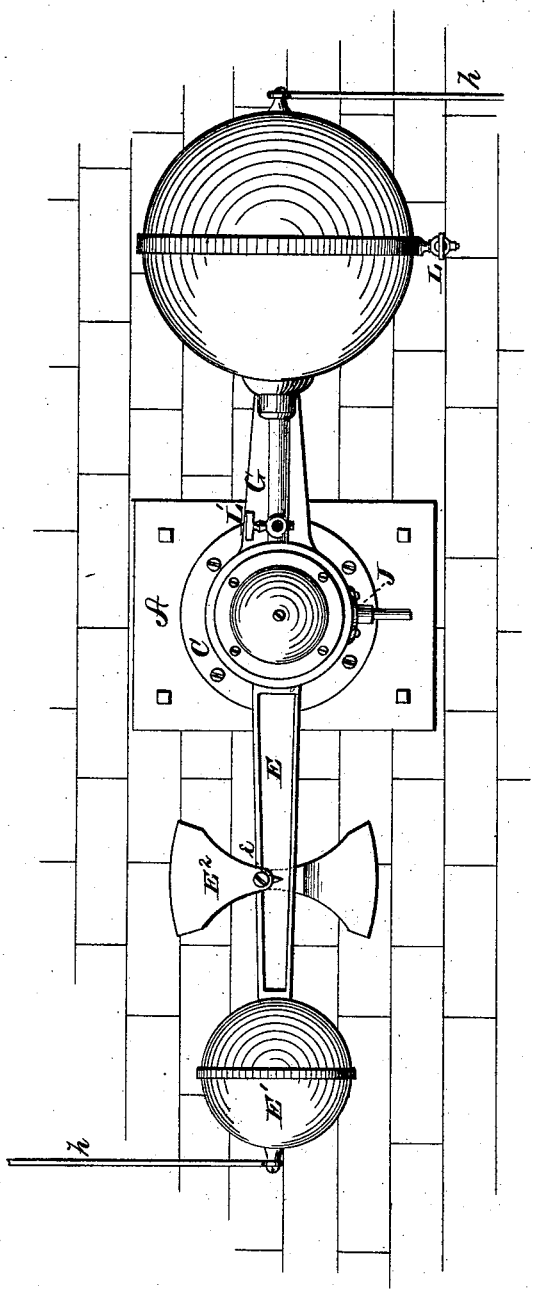


Fig. 1.

WITNESSES

Frank L. Qurand

John C. Schroeder

INVENTOR

A. C. Norcross.

Munn & Munson.

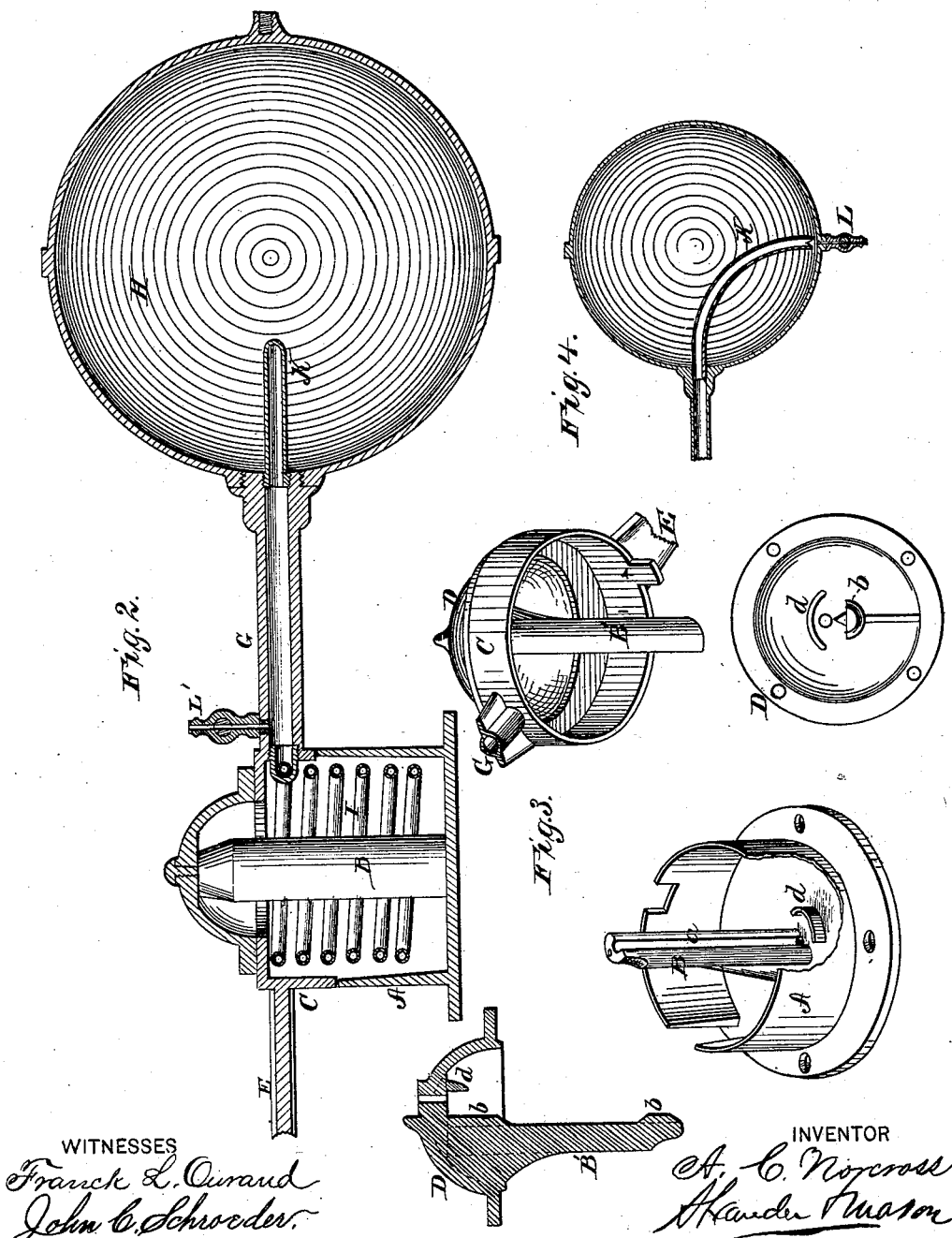
ATTORNEYS.

2 Sheets—Sheet 2.

A. C. NORCROSS.

AUTOMATIC DRAFT REGULATORS FOR STEAM BOILERS, &c.

No. 190,354. Patented May 1, 1877.



WITNESSES

Franck L. Durand

John C. Schroeder.

INVENTOR

A. C. Norcross

Alexander Mason

ATTORNEYS

UNITED STATES PATENT OFFICE.

ALVIN C. NORCROSS, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN AUTOMATIC DRAFT-REGULATORS FOR STEAM-BOILERS, &c.

Specification forming part of Letters Patent No. **190,354**, dated May 1, 1877; application filed April 14, 1877.

To all whom it may concern:

Be it known that I, ALVIN C. NORCROSS, of Boston, in the county of Suffolk, and in the State of Massachusetts, have invented certain new and useful Improvements in Automatic Draft-Regulators for Steam-Boilers, &c.; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

The nature of my invention consists in an automatic pressure regulator or governor, operated by water from the boiler, as will be hereinafter more fully set forth.

In order to enable others skilled in the art to which my invention appertains to make and use the same, I will now proceed to describe its construction and operation, referring to the annexed drawings, in which—

Figure 1 is a front view of my invention. Fig. 2 is a longitudinal section of a part thereof; and Figs. 3 and 4 are detailed views, showing detached parts of the same.

A represents a cylindrical casing of any suitable dimensions, which is to be made fast to a wall or other suitable support. In the center of this casing projects a horizontal arm, B, having a longitudinal groove or bearing, *a*, in its upper side, as shown.

On the front end of the casing A is placed a rim, C, provided with an annular flange, corresponding with, and loosely resting against, the edge of said case, to allow for the lateral motion caused by the oscillation of the working-beam, and to which is fastened the cap D; and this cap has a stem or arm, B′, projecting inward from its center, forming the support or bearing of the beam and its attachments. On the under side of the stem or arm B′ are formed knife-edges *b b*, which rest in the groove or bearings *a* on the arm B, and on which the rim C can thus tilt from side to side. In the back of the casing A, and in the cap D, are formed segmental projections *d d*, which overlap the ends of the arms or stems B B′, by which they are held in position.

From one side of the rim C projects a beam, E, which may be graduated or not, as desired, and on the end of this beam is formed or attached a weight, E^1, preferably in ball form. E^2 represents a movable poise on the beam E, to be placed at any point desired, according to the pressure to be maintained, and fastened at such point by a set-screw, *e*, or otherwise.

From the opposite side of the rim C, and in the opposite direction from the beam, extends a hollow arm, G, having an air-chamber, H, attached on its outer end, and which nearly or quite balances the weights on the beam end.

In the inner end of the arm G is screwed or otherwise connected one end of a pipe, I, which is coiled within the casing A, performing in a small degree the function of a volute spring, and the other end of said pipe is attached by a connection, J, to the casing A. This connection J is to be connected by a suitable pipe with the water-space of the boiler.

In the outer end of the hollow arm G is screwed or otherwise connected a curved pipe, K, which lies within the air-chamber H, and extends nearly to the bottom thereof, as shown in Fig. 4.

The air-chamber H is full of air, and should be made perfectly air and water tight.

The governor or regulator thus constructed being connected by means of the coil and hollow arm G with the water-space of the boiler, as described, the operation is as follows: When the pressure in the boiler increases the water is forced by the steam into the coil I, through the same, and through the hollow arm G and pipe K into the air-chamber H, compressing the air therein in the top of the chamber. As the pressure of the steam in the boiler decreases the water is forced back into the boiler from the air-chamber by the expansive force of the air previously compressed.

This is the principle upon which my regulator or governor operates:

The weight E^2 on the beam E being set at a certain pressure, the air-chamber H will remain up until the pressure in the boiler exceeds such amount; but at that time sufficient quantity of water has been forced from the boiler into said chamber to overbalance the weights on the opposite end of the beam, and hence the whole rim C tilts on its knife-edges, the air-chamber H dropping down the desired distance. The air-chamber H and weight E^1 being, by rods *h h*, connected with the dampers, of course such movement oper-

ates said dampers to decrease the heat in the furnace, and hence also the pressure in the boiler.

Then, as the pressure decreases, the air-chamber H becomes lighter by the expansive force of the compressed air forcing back the water, and then the apparatus tilts again to its former position, reversing the dampers again, shutting or opening them, as the case may be.

This device may be applied in any way to regulate the steam-pressure, whether in the boiler itself, or in any apparatus connected with the boiler by connecting one or both arms of the apparatus with the necessary valves or cocks.

If from any cause the air should be exhausted from the chamber H, it can readily be resupplied by opening a stop-cock, L, in the bottom of the chamber, and another stop-cock, L′, at the inner end of the arm G, and closing a cock in the water-supply pipe. The water in the air-chamber will then pass out and air rush in to fill it.

It may also be applied for gas-pressure, in which case a water-chamber will be provided, and the water from said chamber forced into the air-chamber, this water-chamber then taking the place of the boiler.

The pipe I, being coiled in the casing A, forms a flexible oscillating conduit-joint, allowing the apparatus to work or vibrate easily without friction.

In some cases I may attach the air-chamber to an arm pivoted independent of the rim, and by attaching said pivoted arm to a stationary arm by a spiral spring, or its equivalent, and by rack and pinion attach the movable arm to an indicator or pointer on a dial made fast to the stationary arm. By means of this device I am able to indicate correctly on the dial the changes in the weight of the air-chamber, which shows correctly the pressure in the boiler.

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

1. An automatic draft-regulator, operated by water forced from the boiler into an air-chamber, and returned by the expansive force of the compressed air, constructed substantially as herein set forth.

2. The coil I, arranged within the casing A, and forming a flexible oscillating conduit-joint, substantially as set forth.

3. The combination of the casing A, with grooved arm B, rim C, cap D, with arm B′, having knife-edges *b b*, and the overlapping projections or flanges *d d*, substantially as and for the purposes herein set forth.

4. The curved pipe K, extending from the arm G to the bottom of the air-chamber H, in combination with the said chamber, arm, and the coil I, substantially as set forth.

5. The combination of the tilting rim C, beam E, with weights, flexible-joint conduit-pipe I, hollow arm G, and air-chamber H, substantially as and for the purposes herein set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 13th day of April, 1877.

ALVIN C. NORCROSS.

Witnesses:

FRANK GALT,

J. M. MASON.