

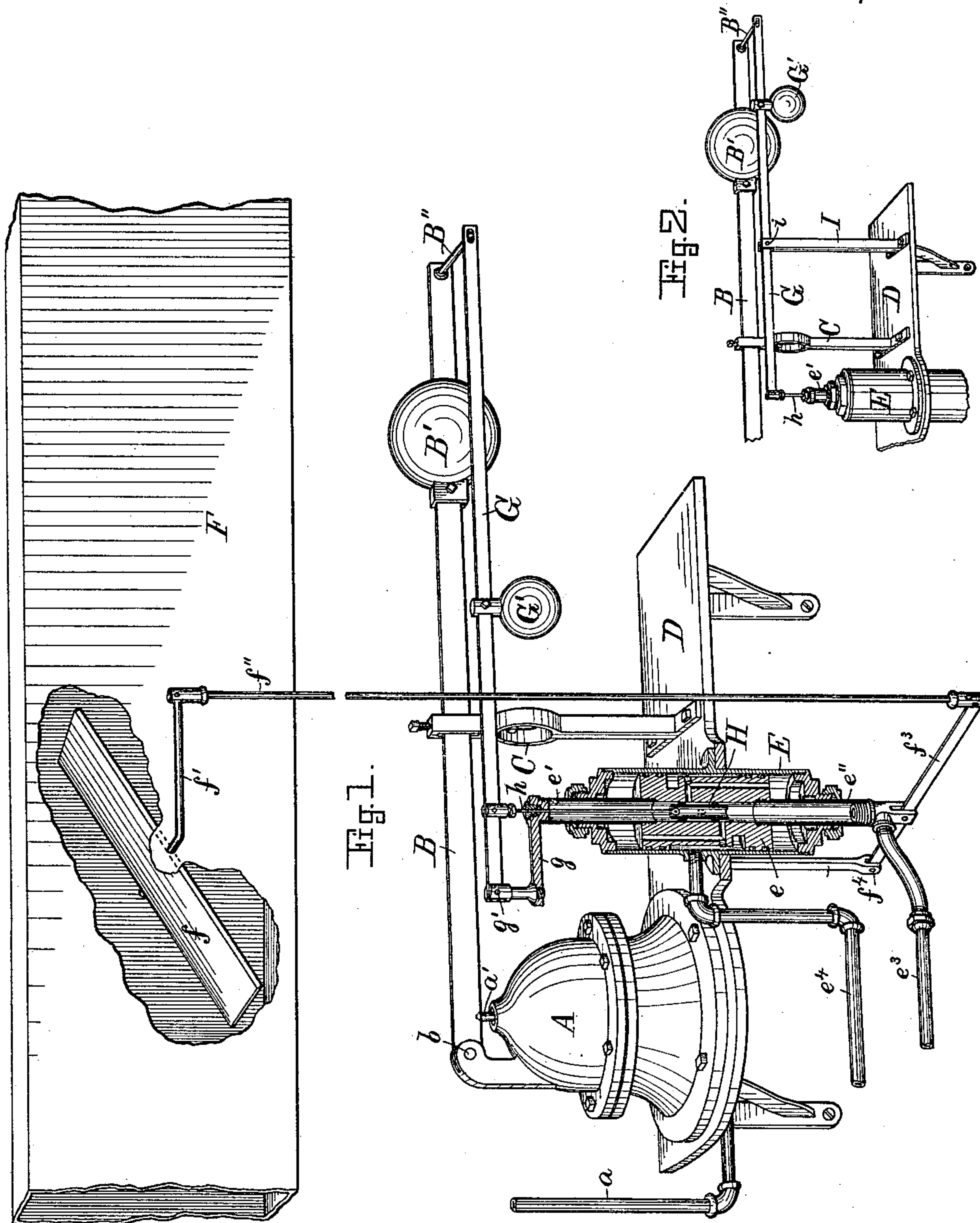
(No Model.)

J. E. SPENCER.

AUTOMATIC DAMPER REGULATOR.

No. 338,686.

Patented Mar. 23, 1886.



Witnesses  
Henry Chadbourne.  
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Inventor  
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by Alvan Andrus, his atty.



# UNITED STATES PATENT OFFICE.

JOHN E. SPENCER, OF SALEM, MASSACHUSETTS, ASSIGNOR OF ONE-HALF  
TO SMITH & SMART, OF SAME PLACE.

## AUTOMATIC DAMPER-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 338,686, dated March 23, 1886.

Application filed December 26, 1885. Serial No. 186,722. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN E. SPENCER, a citizen of the United States, residing at Salem, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Automatic Damper-Regulators; and I do hereby declare that the same are fully described in the following specification and illustrated in the accompanying drawings.

This invention relates to improvements in automatic damper-regulators for automatically regulating the damper within the flue or smoke-stack leading from a steam-generator, according to variations in the steam-pressure in the latter, so as to retain as near as possible a uniform or normal pressure therein.

United States Letters Patent No. 327,337 were duly issued to me September 29, 1885, for improvements in automatic damper-regulators, and in said patent I employ a stationary cylinder having its movable piston connected to the damper or its connections, and a valve, the stem of which is connected directly to the weighted lever of the steam-pressure device; but I have found that in practice such direct connection of the valve and lever causes the damper to close fully in one continuous motion as soon as the piston in the regulator-cylinder commences to move, and to open in the same continuous motion when the piston commences to move in the opposite direction. In damper-regulators of this class it is very essential that the damper should be gradually closed, or partly so, in proportion to the increase of pressure in the steam-generator, and that it should likewise be gradually opened, or partly so, as the pressure decreases, and such movements of the damper should be steady and gradual; and for this purpose I arrange in my present invention, between the regulator and the main lever of the pressure device, an intermediate or secondary lever, the outer end of which is suitably connected to the pressure-device lever, and the inner end of such intermediate lever being preferably hung on a fulcrum attached to the movable piston, and having connected to it, between its ends, one end of the valve-stem. As a modification of my

invention, the said intermediate lever may be hung on a stationary fulcrum, its outer end connected to the main lever of the pressure device and its inner end connected to the valve-stem of the regulator-valve, as will hereinafter be more fully shown and described, reference being had to the accompanying drawings, where—

Figure 1 represents a perspective view of the invention, showing in section the regulator-cylinder, its piston and valve. Fig. 2 represents the modification of the invention.

Similar letters refer to similar parts wherever they occur on the different parts of the drawings.

A is a suitable pressure device, having within it a diaphragm or other movable or yielding part, on which the steam from the boiler is acting, as usual. *a* is the pipe leading from the boiler to the under side of the pressure device A, in the usual manner.

B is the pressure-lever, as usual, hinged or pivoted at *b* to the pressure device A, and resting upon the spindle *a'*, extending from the diaphragm in the pressure device A, in the same manner as shown and described in my patent aforesaid.

B' is the adjustable weight on lever B, as usual, such weight being provided with a set-screw or suitable fastening device, by means of which it can be secured to lever B, after it has been adjusted thereon according to the pressure desired in the generator.

C is a stand or guide for the lever B, such guide being provided with suitable set-screws, as usual, to limit the swinging motion of said lever B.

D is a suitable shelf or bracket secured to the wall of the boiler-room, or in any other convenient place, such shelf serving as a support for the pressure device A, guide C, and the regulator-cylinder E, that is constructed in the same manner as shown and described in my patent above mentioned, such cylinder having within it the movable piston *e*, to the ends of which are secured or made in one piece, respectively, the hollow piston-rods *e'* and *e''*, that pass through stuffing-boxes at the upper and lower ends of the cylinder E, and



are closed in their extreme upper and lower ends.

$e^3$  is a pipe leading from the lower end of piston-rod  $e''$ , serving as an outlet for the exhaust from the regulator-cylinder, and  $e^4$  is the inlet-pipe, as usual, to the cylinder E, leading from the steam-generator or any other suitable source of pressure.

F is the flue or chimney leading from the boiler, and having located within it the oscillating damper  $f$ , the axis of which is provided with crank  $f'$ , to which is hinged the connecting-rod  $f''$ , the lower end of which is hinged to lever  $f^3$ , as shown in Fig. 1. The rear end of lever  $f^3$  is hinged to the stationary fulcrum  $f^4$ , and between it and the rod  $f''$  the lever  $f^3$  is hinged to the lower end of the piston-rod  $e''$ . According to circumstances and localities, other suitable and equivalent connecting mechanism may be employed between the end of piston-rod  $e''$  and the damper  $f$ .

So far as described, the invention is constructed in the same manner as shown and described in my above-mentioned patent.

To the upper end of the piston-rod  $e'$  is secured the arm or bracket  $g$ , having fulcrum-pin  $g'$ , to which is hinged the inner end of the intermediate lever, G, as shown in Fig. 1, the outer end of such lever being coupled to the outer end of the main pressure-lever B by means of pin  $B''$ , secured to lever B, and passing through a perforation in the outer end of lever G, or vice versa, or in any other suitable manner; or the end of one lever may be made to rest on the end of the other, or on a projection thereon, without departing from the essence of my invention.

$G'$  is an adjustable weight located on the intermediate lever, G, which, in connection with the weight  $B'$  on lever B, serves to regulate the desired pressure on the pressure device A, which is the one to be kept normal in the boiler.

H is the valve arranged within the piston  $e$ , as usual, and provided with the valve-stem  $h$ , passing through a stuffing-box at the upper end of the hollow piston-rod  $e'$ , and hinged or otherwise connected in its upper end to the intermediate lever, G, as shown in Fig. 1.

In the modification shown in Fig. 2 the lever G is connected to lever B and to valve-stem  $h$ , as in Fig. 1; but instead of being hung on a movable fulcrum on the piston-rod  $e'$  it is hung on a stationary fulcrum,  $i$ , located between the outer end of said intermediate lever, G, and the regulator-cylinder E, such fulcrum being preferably made in the upper end of a standard, I, secured to bracket D, or in any other stationary part of the device.

The operation of my invention is as follows: The regulator is set so that the damper  $f$  will be half open, or nearly so, at the pressure desired. Should the pressure in the steam-generator increase or diminish, the main lever B on the pressure device will gradually rise or fall, carrying the intermediate lever, G, with

it, which operates the valve of the automatic regulator, causing the damper  $f$  to close or open gradually as the pressure rises or falls. For example, should I desire to carry a pressure of, say, seventy pounds to the square inch in the steam-generator, the weight  $B'$  on the main lever B of the pressure device will be adjusted accordingly, to balance said pressure, or nearly so. Then by means of the weight  $G'$  on the intermediate lever, G, I adjust it so that the damper  $f$  will commence to close at a pressure slightly undersaid pressure, gradually closing as the pressure increases, arriving at half-closed, or nearly so, at seventy pounds pressure, thereby reducing the draft gradually, and consequently the heat in the furnace, which has a tendency to prevent the pressure from rising above the desired pressure. Should the pressure continue to rise above seventy pounds, the damper will continue to close gradually until, at a pressure slightly above seventy pounds, it will have fully closed. As the pressure gradually descends, the damper will gradually open, arriving at half-open, or nearly so, at seventy pounds pressure. Should the pressure still continue to fall below seventy pounds, the damper will continue to open, arriving at full-open, or nearly so, at a pressure slightly below seventy pounds. It will be plainly seen that a regulator operating a damper in this manner will hold the damper open just enough to keep the pressure normal, or nearly so, in the steam-generator.

It must be kept in mind that the normal condition of the automatic damper-regulator is to hold the damper half open, or nearly so, at the desired pressure, closing as the pressure increases and opening as the pressure decreases in the steam-generator.

By the employment of the said intermediate lever, G, it will be seen that I relieve the main lever B of the pressure device of most of its frictional resistance, and that such frictional resistance is reduced in proportion to the length of such lever G.

What I wish to secure by Letters Patent, and claim, is—

1. In an automatic damper-regulator, the intermediate lever, G, connected to the pressure-lever B and to the valve-stem  $h$  of the regulator-cylinder E, as and for the purpose set forth.

2. In an automatic damper-regulator, a pressure device with its lever B connected to the intermediate lever, G, the latter being suspended upon the movable piston-rod  $e'$  and connected to the valve-rod  $h$ , as and for the purpose set forth.

3. In an automatic damper-regulator, a pressure device and an adjustable damper, combined with a regulator having one end of its piston connected to the damper, the other end of said piston jointed to the intermediate lever, G, the latter being connected to the main lever B of the pressure device

and to the valve of the regulator, as and for the purpose set forth.

5 4. In an automatic damper-regulator, the intermediate lever, G, connected to the pressure-lever B and to the piston-rod *e'* and valve-stem *h* of the regulator-cylinder E, as and for the purpose set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

JOHN E. SPENCER.

Witnesses:

ALBAN ANDRÉN,  
FRED. C. CONVERSE.