

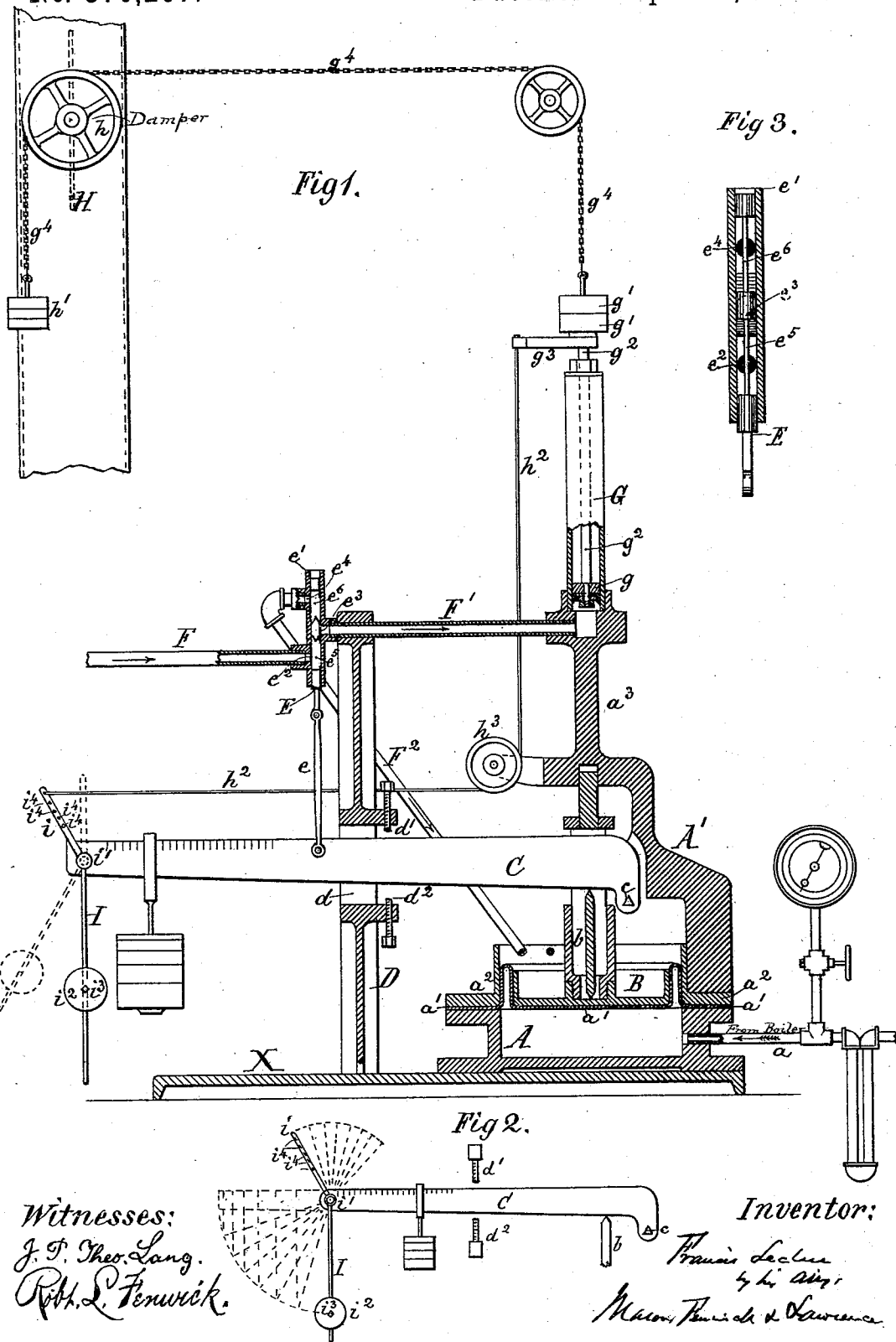
(No Model.)

F. LECLÈRE.

DAMPER REGULATOR.

No. 370,267.

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UNITED STATES PATENT OFFICE.

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DAMPER-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 370,267, dated September 20, 1887.

Application filed March 18, 1887. Serial No. 231,474. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS LECLÈRE, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Damper-Regulators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to damper-regulators; and it consists in a device whereby the sensitiveness of the damper to slight changes of steam-pressure is prevented from causing the position of the damper to be changed, and thus a more uniform supply of steam is produced accompanied by a great saving of fuel.

My invention, as will be seen, is applicable to all regulators in which a loaded diaphragm or piston is used for indicating the varying pressure of steam and for causing the motion of the damper; but it is especially well adapted for steam-generators and sectional boilers—such as are known as the ‘Babcock & Wilcox’—and other boilers which have very little steam-room, and therefore are subject to sudden changes of steam-pressure, such sudden changes having the effect of keeping the damper constantly in motion, and thus irritating the draft and fire under the boiler to such a degree that an excessive amount of fuel is required to produce the necessary amount of steam at a nearly uniform pressure.

With my invention steam of almost uniform pressure at a fair saving of fuel is produced; and I will now proceed to give a full description of its construction and operation with the aid of the accompanying drawings, in which—

Figure 1 is a front view of mechanism of a well-known damper-regulator, partly in section and partly in outline, and of my invention. Fig. 2 is a diagram of the loaded diaphragm-lever and the pendulum-weight of my invention, the inclinations of the latter being indicated and their perpendicular projections marked upon the extended line of the diaphragm-lever. Fig. 3 is a vertical section of a water-valve used in the said damper-regula-

tor, said section being taken at a right angle to the section shown in Fig. 1.

The letter A in the drawings represents a steam-vessel closed at the bottom and open on top, steam being supplied by a pipe, *a*, from the boiler. The top of the vessel is closed by a flexible diaphragm, *a'*, which is suitably secured thereto by a flanged ring, *a''*. A cap, B, suitably guided, as usual, is placed upon the diaphragm *a'*, and a knife-edge prop, *b*, resting upon said cap and supporting a loaded diaphragm-lever, C, from below, forms the connecting-link between the reciprocating diaphragm and lever. The knife-edge fulcrum *c* of the diaphragm-lever C is suitably hung in an ordinary superstructure, A', and the lever itself is guided in the slotted portion *d* of an upright stand, D, fastened to the foundation-plate X of the vessel A.

Two set-screws, *d'* *d''*, in the stand D, one at the lower and one at the upper termination of the slotted portion *d*, serve as adjustable abutments of the diaphragm-lever C. A connecting-rod, *e*, transmits the motion of the lever C to a piston-valve, E, which moves in a closely-fitting cylinder, *e'*, provided with ports *e''* *e'''*. Said ports are connected with pipes F F', respectively, the pipe F in the port *e''* conveying supply-water under pressure, the pipe F' in the port *e'''* conveying water to and from cylinder *e'* and a cylinder, G, (hereinafter referred to,) and the pipe F'' in port *e''* conveying waste water to the diaphragm *a'*.

The piston-valve E is a solid cylinder provided with flat depressions or reductions *e''* *e'''*, so arranged in relation to the ports *e''* *e'''* that when at its middle elevation, as illustrated, it holds the port *e''* closed; when at its highest elevation it, by means of its depression *e''*, furnishes communication between the ports *e''* *e'''*, and when at its lowest elevation it, by means of its depression *e'''*, furnishes communication between the ports *e''* *e''*. In the first case the supply is cut off from pipe F'; in the second case the supply-water in pipe F flows into pipe F', and in the third case the water is drawn from pipe F' and discharged through pipe F''. The pipe F connects the port *e''* of the cylinder *e'* with the foot portion of the cylinder G, which cylinder is provided with a

piston, g , loaded with weights g' . The piston-rod g'' of said piston is provided with an arm, g^3 , and a chain, g^4 , the latter operating the damper H by means of a pulley, h , or other

5 suitable device.

A weight, h' , is attached to the end of the chain g^4 , for the purpose of keeping it taut and enabling it to move the damper both ways. A cord, h^2 , is tied to the arm g^3 , passed around
10 a pulley, h^3 , suitably fastened to a stand, a^3 , which forms the top portion of the super-structure A' and supports the cylinder G. The cord h^2 extends horizontally to an arm, i , of a pendulum, I, pivoted at i' to the lever C.
15 This pendulum is provided with an adjustable weight, i^2 , fastened to it by means of a set-screw, i^3 , at any desirable elevation. The arm i extends upward at a suitable angle—say from thirty to forty-five degrees from a vertical
20 line—and it is provided with holes i^4 , in any one of which the cord h^2 may in turn be fastened, as circumstances may require. When steam is at an average pressure in the boiler, the lever C is balanced between the adjusting-
25 screws d' d^2 , as shown, and the damper H is at rest, the valve E being in its middle position and holding the port e^3 closed.

The position of the damper H may be either that shown in the drawings or it may be more
30 or less inclined. If it stands vertically in the chimney, as shown in the drawings, the draft of the boiler-furnace is the most powerful, and is apt to create sooner or later a surplus of steam, which will cause the lever C to rise.
35 In consequence of this rising of the lever C the valve E is moved to its highest position, thereby opening communication between the ports e^3 e^4 , so that the supply-water enters the cylinder G and raises the piston g , thereby
40 turning the damper into an inclined position and diminishing the draft area. While this is going on my invention prevents a sudden rise of the diaphragm and the complete cutting off the draft by a steady increase of weight
45 on the lever C, which is caused by the rising piston g and arm g^3 pulling the cord h^2 and moving the weighted pendulum I in an inclined position, and the higher the piston g is forced up the more inclined will be the pendulum and the greater the increase of weight
50 on the lever C. As long as the weight thus added to the lever C does not exceed a given limit—say from one to five pounds, or whatever may be desirable—the lever C will be so
55 balanced between the adjustable abutting screws d' d^2 that the position of the valve E is not materially changed and the damper H is not moved; but when the aforesaid limit is exceeded by the still-increasing pressure of
60 steam the lever C will be raised to its highest position, as above stated.

The sensitiveness of the described device may be suitably increased by fastening the cord h^2 in a hole i^4 nearer the fulcrum i .

65 With the draft area reduced in the described manner the steam-pressure in the boiler gradually diminishes and the lever C descends un-

til the position of the valve E is reversed, whereupon the piston g will descend, thus causing the cord h^2 to allow the pendulum I to
70 gradually assume a more perpendicular position and diminish the weight upon the lever C. By this operation the lever C is prevented from going altogether down upon the abutting screw
75 d^2 , unless the above-given limit of low pressure should be exceeded, and the damper H will remain stationary until the steam-pressure falls below the said limit, when the valve E will be sufficiently lowered to open communication between the ports e^3 e^4 . The water is
80 now emptied from the cylinder G through the waste-pipe F², as before stated, and the damper H is moved so as to increase the draft-area and the steam-generating power of the boiler.

It is easily seen that by changing the posi-
85 tion of the weight i^2 on the pendulum I, or by changing the connection of the cord h^2 from one hole i^4 to another, or by making both of said changes at once, the limitation of deviation from average pressure and the sensitive-
90 ness of the lever C to the changes in the steam-pressure may be adjusted to a greater or less extent, or accordingly as desired.

This device has been found to be especially
95 well adapted for use with sectional boilers, with which it has been found to work remarkably well and with great saving of fuel. The great inconvenience experienced with other
100 damper-regulators, arising from the improper motions of the damper and the consequent disturbed and interrupted combustion of fuel and generation of steam, is avoided.

I will state that the fastening of the cord h^2 to an arm, g^3 , is not an essential feature of my invention, since said cord may be attached di-
105 rectly to the piston-rod of the piston g , or to the chain g^4 , or to the pulley h , in order to work in conjunction with piston g ; neither is it necessary for the arm i to form an angle with the pendulum I, as in some cases it may
110 be more advantageous to form it in line with the pendulum.

Previous to my invention the best-known damper-regulator consisted of the steam-diaphragm, diaphragm-lever, and damper-motor.
115 It is evident that in this construction the diaphragm-lever once raised will move up until it is arrested by the abutting screw d' , or when beginning to drop will continue so until arrested by the abutting screw d^2 . Thus the
120 slightest change of boiler-pressure effects either a full opening or closing of the damper, when really a slight change of position of the damper would be the thing required to produce the desired steam-pressure, and thus the
125 damper-regulator gives at each change either too much or not enough draft, and the boiler-pressure is unnecessarily changed from high to low, simply by the action of the regulator
130 alone, or nearly so, to the detriment of boiler and machinery.

By gradually increasing the resistance to the rising diaphragm-lever, with the aid of the moving piston g , the said lever C may become

balanced and temporarily stationary at any elevation between the abutting screws d' d'' , and a slight change in steam-pressure will not affect the damper-motor and damper; hence, 5 unlike the operation of the old damper-regulators, the operation of a damper-regulator having my invention attached to it is not simultaneous with trifling changes of steam-pressure, and the motions of the damper are 10 not so frequent and radical, giving a more uniform draft, a more regular steam development, and less anxiety to the engineer.

What I claim as my invention is—

1. In a damper-regulator, the combination, 15 with a loaded diaphragm-lever, and a damper-motor having a valve operated by the diaphragm-lever, of a weighted pendulum fulcrumed to the diaphragm-lever and operated by the damper-motor, substantially as and for 20 the purpose described.

2. In a damper-regulator, the combination, with a diaphragm-lever, of a weighted pendu-

lum attached to the end portion of said lever, and a piston of a damper-motor connected with said pendulum, substantially as and for 25 the purpose described.

3. A weighted pendulum fulcrumed to the diaphragm-lever of a damper-regulator and operated by the motion of the damper-motor, substantially as and for the purpose described. 30

4. The combination, with a diaphragm-lever in a damper-regulator, of a pendulum, I, having an adjustable weight, i' , substantially as and for the purpose described.

5. The combination, with a diaphragm-lever 35 in a damper-regulator, of a loaded pendulum, I, having change-holes i'' , substantially as and for the purpose described.

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

FRANCIS LECLÈRE.

Witnesses:

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