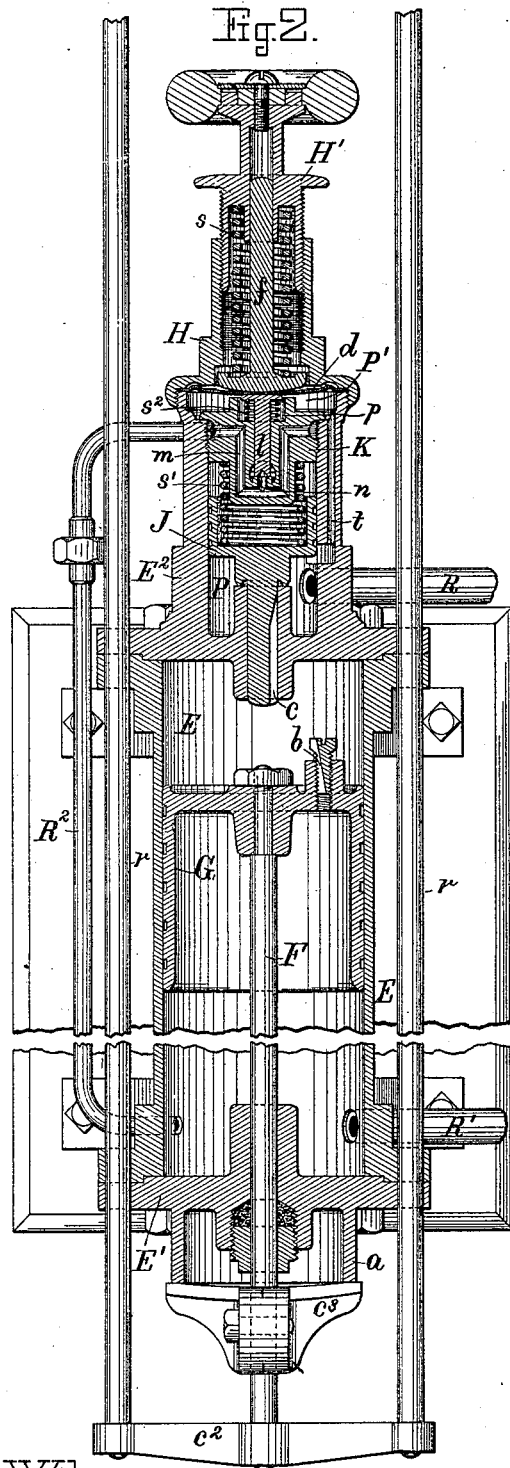


(No Model.)

N. CURTIS.  
DAMPER REGULATOR.

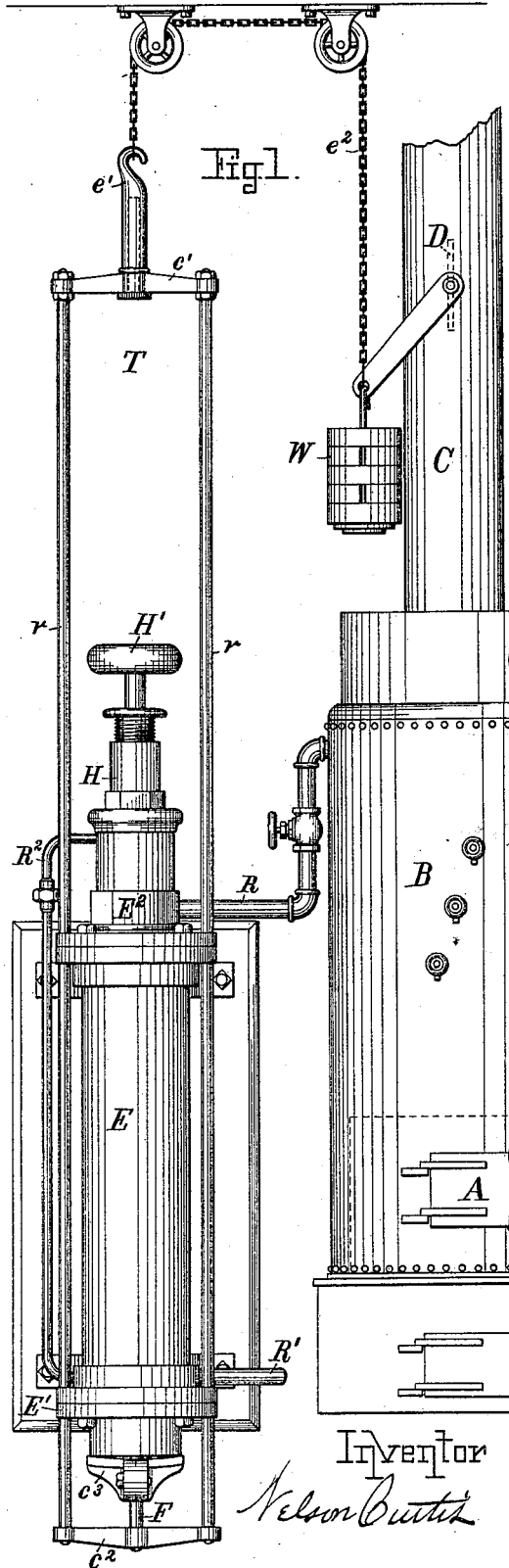
No. 346,898.

Patented Aug. 10, 1886.



Witnesses

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# UNITED STATES PATENT OFFICE.

NELSON CURTIS, OF BOSTON, MASSACHUSETTS.

## DAMPER-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 346,898, dated August 10, 1886.

Application filed May 13, 1886. Serial No. 202,031. (No model.)

*To all whom it may concern:*

Be it known that I, NELSON CURTIS, of Boston, Massachusetts, have invented an Improvement in Damper-Regulators, of which the following is a specification.

The invention relates to that class of damper-regulators in which steam from the boiler, whose fires it is desired to regulate, is employed for moving the damper in one direction, while a weight is employed for moving the damper in the other direction, no steam from the boiler being required except when it is desired to overcome the force of the weight.

The object of the invention is to provide an exceedingly-sensitive apparatus.

The damper is so balanced or weighted as to normally stand open. Its lever is connected by a chain passing over suitable pulleys with the piston of a steam-cylinder, so that when steam is admitted to the piston it will overcome the tendency of the damper to stand open and close it; but there is normally no steam-pressure upon the piston. Steam is admitted to the cylinder when required to operate the piston through a port controlled by a piston-valve that works in a steam-chamber always open to the boiler. Normally the steam-pressure in this steam-chamber above and below the piston of the piston-valve is equal; but above the piston is an exhaust-port which normally is closed by an auxiliary valve acting under the force of a weight or spring equal to the desired boiler-pressure. This auxiliary valve is in effect a diaphragm-valve whose diaphragm is always exposed to steam at boiler-pressure. When the steam-pressure upon the diaphragm overcomes the force of the said spring or weight, the auxiliary valve opens, thereby relieving the pressure above the main valve and causing the main valve to open and admit steam to the piston that is connected to the damper-lever.

The invention consists in the combination, with a steam-boiler, a furnace, a flue, an unbalanced damper in said flue, a steam-cylinder provided with a piston mechanically connected with said chamber, and a steam-passage connecting said boiler with said steam-cylinder, of further steam-connections and valve mechanism therein, in a manner hereinafter fully set forth.

It also consists in a detail of construction.

In the drawings, Figure 1 is an elevation of apparatus embodying my invention. Fig. 2 is a partial sectional elevation of the same upon an enlarged scale.

A is the furnace.

B is the boiler.

C is the flue.

D is the damper.

E is an upright steam-cylinder, firmly fixed, as shown, to the wall of the boiler-room. At its lower end it has a cylinder-head, E', through which a piston-rod, F, works, the said head being provided with a stuffing-box, and also with a circular projection, *a*.

G is a cup-shaped piston having a minute adjustable port, *b*, in its working-surface, as shown.

E<sup>2</sup> is the cylinder-head at the upper end of the cylinder, containing a port, *c*. This cylinder-head E<sup>2</sup> is hollow and contains a large portion of the main-valve mechanism of the apparatus. It is tightly closed at the upper end by a flexible metallic cap or diaphragm, *d*, which is held in place, as shown, by a casting, H, which is bored out to receive and hold apparatus, acting as a weight upon the said diaphragm, consisting of a follower, *f*, a screw-handle, H', and a spring, *s*.

J is a piston-valve for the port *c*. It is furnished with a spindle working through the port *c*, as shown, in order that the said port may be sufficiently small when open. The piston of the valve J is cup-shaped, and is provided with a spring, *s'*, that finds a resistance against a block, K, screwed into the casting H, below the diaphragm *d*. The block K is bored out to contain the greater part of a second or auxiliary valve mechanism, *l* being the valve, *m* being a passage-way through the block, and *n* being the valve-port, while *p* is a recess in the said block carrying a spring, *s''*, which presses against a flange upon the top of the valve to cause the valve to follow the movements of the diaphragm. A chamber (marked P) in the casting H, below the piston of the piston-valve J, is connected with a chamber, P', above the block K and below the diaphragm *d*, by a passage-way, *t*, bored in the casting H, as shown.

R is a pipe or passage-way connecting the chamber P with the boiler.

R' is a drain-pipe leading from the lower

end of the cylinder E, and R<sup>2</sup> is an exhaust-pipe for the auxiliary valve connecting the passage-way *m* with the lower end of the cylinder E.

5 T is a double yoke, the cross-bars *c'* *c''* of which are connected by two rods, *r r*, passing through holes in flanges of the cylinder-head, as shown. The lower cross-bar, *c''*, of the yoke is secured to the piston-rod F, while the upper bar, *c'*, carries a hook, *e'*, that is connected  
10 by a chain, *e''*, with the lever of the damper.

W is a weight attached to the lever of the damper to operate it in one direction.

The operation is as follows: We will assume,  
15 as is the case, that normally there is no steam in the cylinder E above the piston G. Accordingly the weight W opens the damper and draws up the yoke T, and with the yoke the piston G, to the upper limit of motion of the  
20 latter, which is determined by the cross-bar *c''* striking the boss-ring *a* upon the lower cylinder-head. There is constantly full boiler-pressure in the pipe R, and consequently there is always full boiler-pressure in the  
25 chamber P, and likewise in the chamber P', which is connected with chamber P by the ever-open passage-way *t*. Moreover, the piston of the valve J fits somewhat loosely in the chamber P, or there may be a pin-hole  
30 through it; and accordingly there is normally full boiler-pressure in the chamber P above as well as below the piston of the valve J. The valve J, therefore, under gravity or assisted by spring *s'*, falls and normally rests upon  
35 its seat to close the port *c*.

It is obvious that the exact construction shown is not of the essence of my invention, broadly considered. For instance, the cylinder E, with its piston G and yoke T, might be  
40 located near the flue, while the valve mechanism might be placed near the boiler at a distance from the flue, a suitable pipe connecting the port *c* of the chamber P with the cylinder. Again, the valve *l*, with spring *s''*, diaphragm *d*,  
45 and spring *s*, so far as my invention is concerned, is but the equivalent of a weighted valve working across an exhaust passage-way at the end of chamber P, above the piston of valve J. As before pointed out, the spring *s''* keeps the valve *l*  
50 in contact with the diaphragm *d*, whatever may be the position of the latter. In fact, the valve and diaphragm together are in effect a piston-valve pressed down toward the valve-seat to close the port *n* by whatever force may  
55 be given to spring *s* by turning the screw-handle H'. The lower surface of the diaphragm *d* closes the top of the chamber P', which, as before stated, is constantly full of steam at boiler-pressure. Accordingly the  
60 screw *s''* is adjusted to resist the exact boiler-pressure which it is desired to maintain. Any, the least, excess of boiler-pressure will overcome the force of the spring *s''* and open the valve-port *n*. This will allow the steam

which lies in chamber P above the piston of 65 the piston-valve J to escape through port *n*, passage-way *m*, and exhaust pipe R<sup>2</sup>. Accordingly, the valve J now rises, and steam passes through port *c* into the cylinder above the piston G and forces that piston down, and with it the yoke T, to overcome the weight W and close the damper. When the fires are sufficiently reduced and the steam-pressure falls below the pressure to which the valve *l* has been adjusted, the valve *l* will close, when, the 75 equilibrium of pressure above and below the piston of piston-valve J being restored, the latter valve will also close, and the piston G will rise under the force of the weight W, and the damper will open the steam in the 80 cylinder E above the piston G leaking through the minute port *b*. So, also, without departing from my invention, the chamber P' might take its steam directly from the boiler, instead of through chamber P and passage-way *t*. In 85 the construction shown, however, the chamber P may be regarded as a continuation of the main steam-passage, entering the cylinder-head C<sup>2</sup> from pipe R, and continuing through port *c*, and controlled by valve P, while a branch exhaust-passage, consisting of the passage by the piston of the valve P, owing to its loose fit, a hole (shown in dotted lines) in block K, port *n*, and passage *m*, is controlled by valve *h*. 95

I claim—

1. The combination, with a steam-boiler, a furnace, a flue, an unbalanced damper in said flue, a steam-cylinder provided with a piston mechanically connected with said damper, 100 and a steam-connection between said boiler and said steam-cylinder, of two steam-chambers, one of which, being an enlargement of said passage-way leading to said cylinder, is provided with a piston-valve normally closing said passage-way, and has an independent escape or exhaust passage, while the second chamber is provided with a weighted valve normally closing said independent exhaust-passage of the first chamber, and has a 105 steam communication opening into it from the boiler to oppose the weight of said weighted valve, substantially as described.

2. The combination, with the cylinder E, provided with piston G, piston-rod F, and perforated head E', of chambered cylinder-head E<sup>2</sup>, provided with port *c*, valve P, auxiliary valve *l*, a main steam passage-way leading to said port *c*, and a branch steam-exhaust passage leading from said main passage, the 115 said valve P being in the main passage and the said auxiliary valve *l* being in the exhaust-passage, substantially as described. 120

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Witnesses:

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