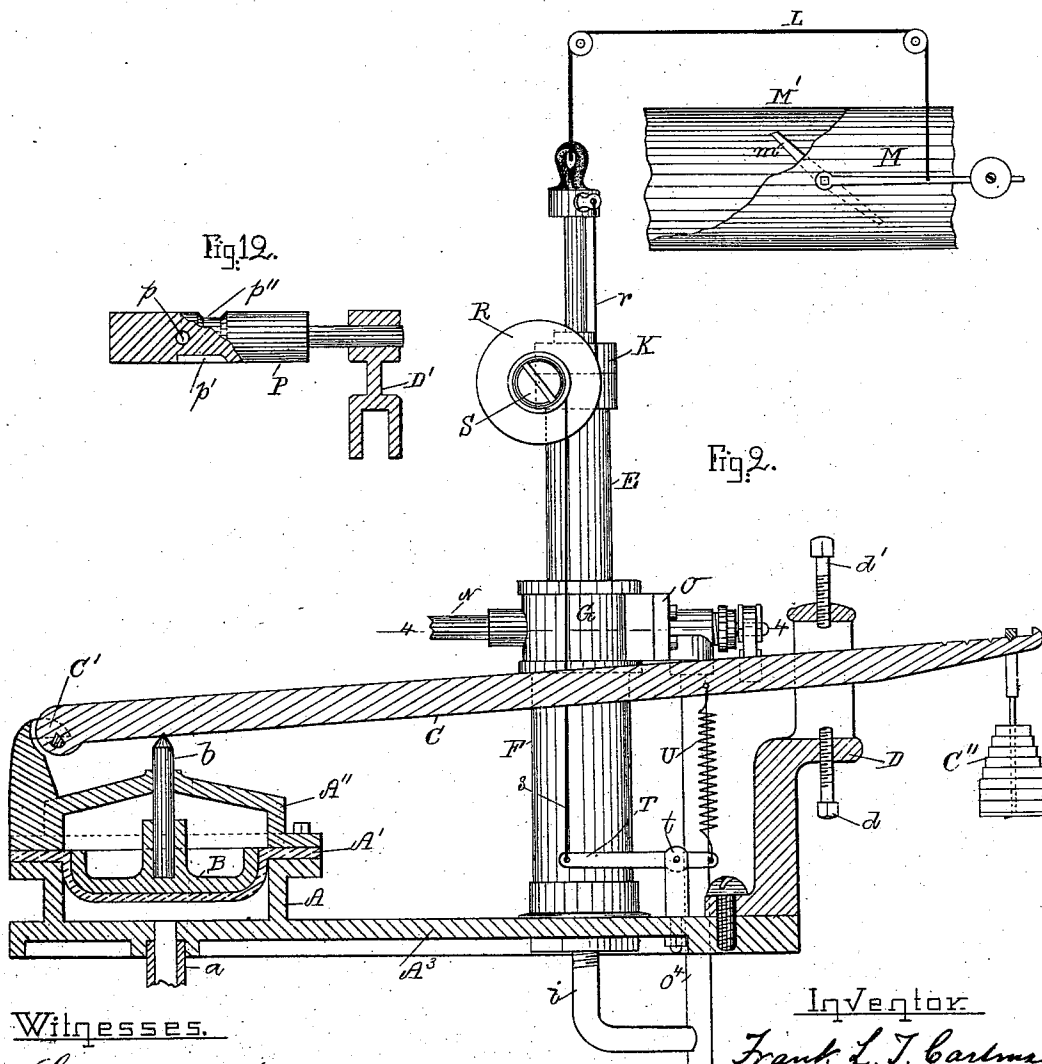
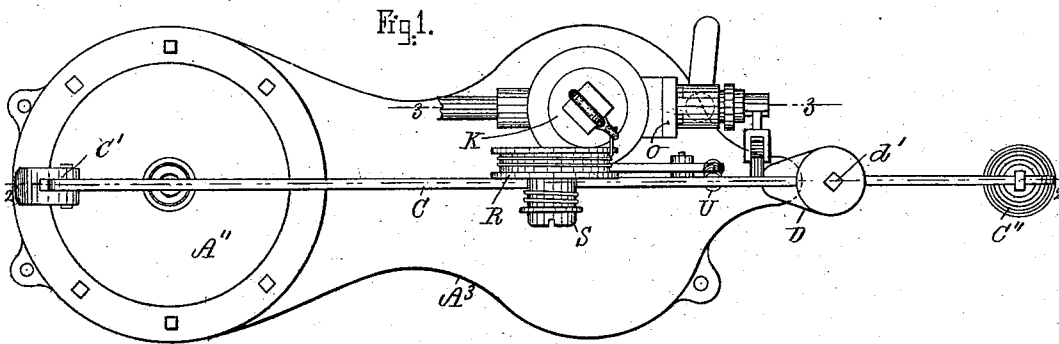


3 Sheets—Sheet 1.

No. 537.273.

Patented Apr. 9, 1895.



Witnesses.

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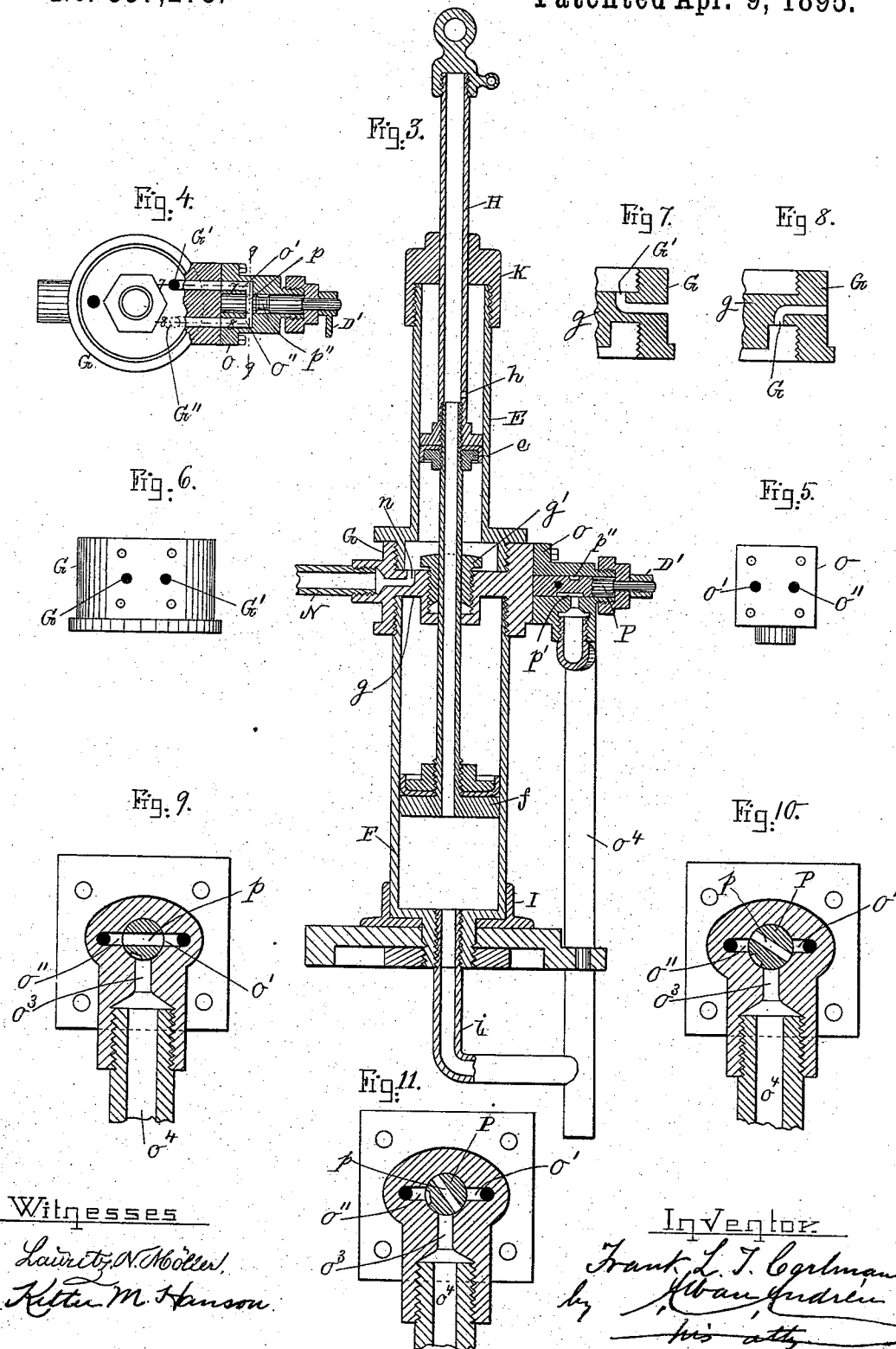
(No Model.)

3 Sheets—Sheet 2.

F. L. T. CARLMAN.  
DAMPER REGULATOR.

No. 537,273.

Patented Apr. 9, 1895.



Witnesses

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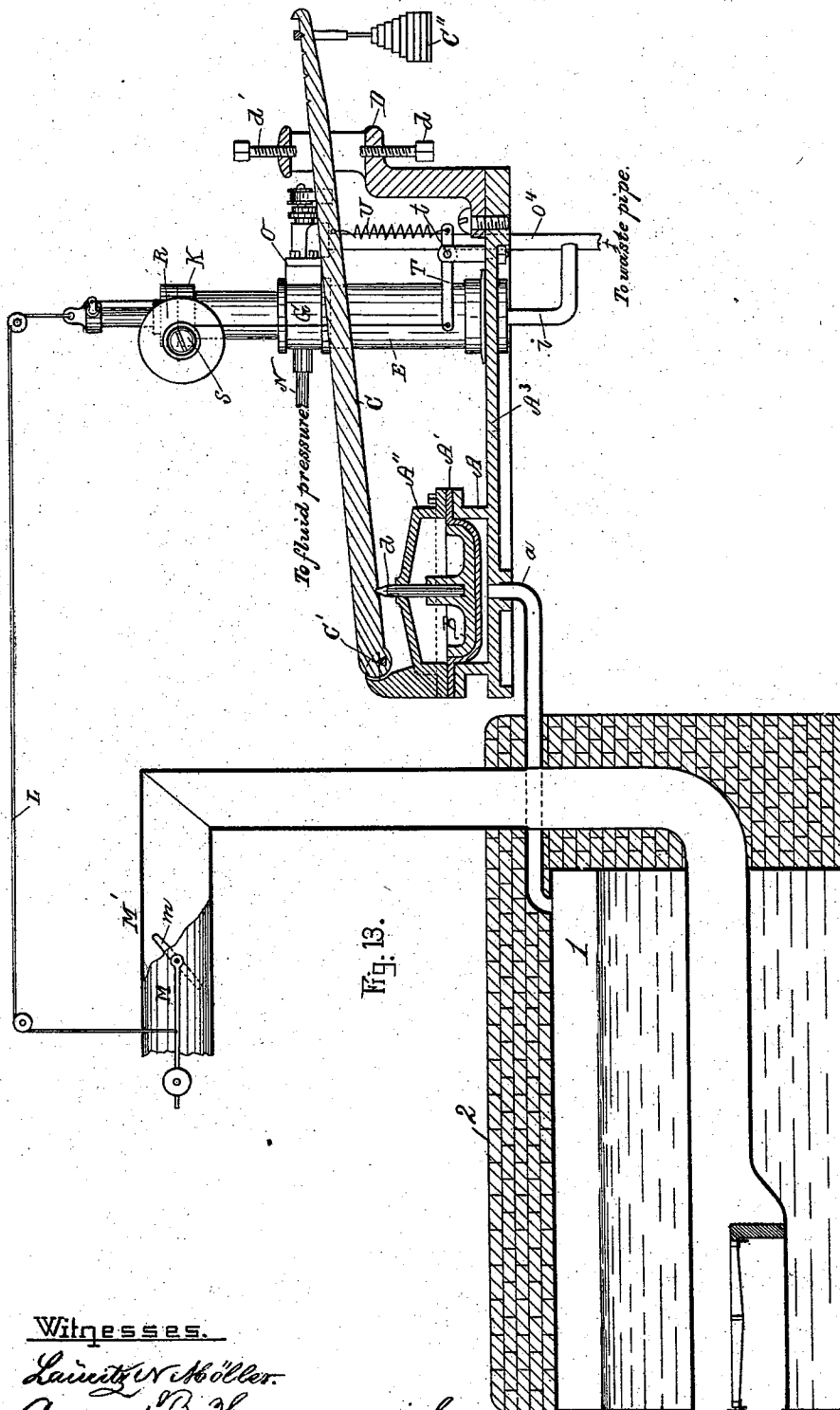
(No Model.)

3 Sheets—Sheet 3.

F. L. T. CARLMAN.  
DAMPER REGULATOR.

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Patented Apr. 9, 1895.



Witnesses.

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# UNITED STATES PATENT OFFICE.

FRANK L. T. CARLMAN, OF SALEM, MASSACHUSETTS.

## DAMPER-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 537,273, dated April 9, 1895.

Application filed December 21, 1893. Serial No. 494,365. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK L. T. CARLMAN, a subject of the King of Sweden and Norway, and a resident of Salem, in the county of Essex and State of Massachusetts, have invented new and useful Improvements in Damper-Regulators, of which the following, taken in connection with the accompanying drawings, is a specification.

10 This invention relates to improvements on the patent granted to me March 7, 1893, No. 493,149, for automatic damper regulators for the purpose of automatically adjusting the position of the damper in the smoke flue or chimney according to variations of steam pressure in the steam generator so as to maintain a desired normal pressure in the latter.

20 The invention is carried out as follows, reference being had to the accompanying drawings, wherein—

Figure 1, represents a plan view of the improved damper regulator. Fig. 2 represents a section on the line 2—2 shown in Fig. 1. 25 Fig. 3 represents a section on the line 3—3 also shown in Fig. 1. Fig. 4 represents a section on the line 4—4 in Fig. 2, partly shown in elevation. Fig. 5 represents an end view of the valve case. Fig. 6 represents a similar end view of the adjoining portion of the middle division block which separates the upper and lower cylinders. Fig. 7 represents a cross section on the line 7—7 shown in Fig. 4. Fig. 8 represents a similar cross section on the line 8—8 also shown in Fig. 4. Fig. 9 represents a cross section on the line 9—9 in Fig. 4 showing the valve in position for establishing communication from the upper to the lower cylinder. Fig. 10 represents a similar cross section showing the communication between the upper and lower cylinder as closed. Fig. 11 represents also a similar section showing communication between upper and lower cylinder as closed, and the latter in open communication with the escape-pipe. 45 Fig. 12 represents a partial side elevation and longitudinal section of the oscillating valve; and Fig. 13 is a sectional elevation showing my improved damper regulator in operative connection with a steam-boiler, its furnace and stack.

Similar letters and numerals refer to simi-

lar parts wherever they occur on the different parts of the drawings.

The pressure device connected with the live steam in the steam generator is constructed in a similar manner to that shown in my above mentioned patent and consists of a box or chamber A, connected to the steam space 1 of the generator 2 by means of a pipe *a*, as shown in Fig. 13. The said box is covered by a preferably cupshaped flexible diaphragm A' secured to it by means of bolts and a flanged inverted cup shaped cover A'' as shown in said Fig. 2. On top of the said flexible diaphragm rests a preferably cup shaped plate B, provided with an upwardly projecting pin *b*. The upper end after passing loosely through a perforation in the cup A'' rests against the under side of the weighted lever C, which is hung at C' and provided at the opposite free end with a series of weights C'' C'' as is usual in devices of this kind.

D, is a suitable slotted post or bracket secured to the metal frame A<sup>3</sup> which is preferably cast in one piece with the steam pressure box A, as shown in Fig. 2, and provided with adjusting stop screws *d d'*, for limiting the movement of said lever C, as usual.

The motor is fully represented in Fig. 3, and is similar to that shown and described in my above mentioned patent and consists of two independent cylinders, namely, an upper small cylinder E, and a larger lower one F, which are separated from each other by a diaphragm *g*, preferably made in one piece with the division block or casting G, as shown in which the ends of the cylinders E and F are secured.

*e* and *f* are the pistons in the respective cylinders E and F which pistons are secured to a preferably hollow stem H, passing through a central perforation and a stuffing box *g'* in the diaphragm *g*, so as to prevent the water from the upper cylinder from getting by the diaphragm into the lower cylinder in a manner as fully shown and described in my aforesaid patent.

I, is the closed lower end of the cylinder F, having a drip pipe *i*, connected to it, to permit any water in the cylinder F, below its piston to escape. Any water accumulating in the upper cylinder E, above its piston is also free to escape through said drip pipe by

going through a side perforation *h*, in the hollow piston rod H, and thence through the latter into the lower end of the cylinder F, below its piston in the same manner as shown and described in my aforesaid patent.

That portion of the piston rod H, which is above the piston *e*, is guided in a centrally perforated cap K, secured to the upper end of the cylinder E, and to the upper end of said piston rod is attached a chain L, connected in a suitable manner to a weighted damper lever M, which is secured in a suitable manner to the spindle of the damper *m*, arranged within the smoke stack or chimney M' Figs. 2 and 13, as is usual in damper regulating devices. Thus it will be seen that the downward motion of the piston rod H, causes the damper to open and vice versa.

N, is a pipe leading from any desired or convenient water pressure such as a street main, &c., into the lower portion of the upper cylinder E, through an always open port *n*, shown in Fig. 3.

To the side of the division block G, is secured the valve shell or case O, having a cylindrical bored out bearing in which is arranged the oscillating cylindrical balance valve P, (shown in detail in Fig. 12) said valve having a lateral diametrical passage *p*, through which communication is established from the upper cylinder E to the lower cylinder F when said valve is held in the position shown in Fig. 9 in which the valve passage *p*, is open to the valve shell ports O' O'' connected respectively to ports G' G'' leading respectively to the interior of the upper cylinder E, and lower cylinder F, as shown in Figs. 4, 7, 8, and 9. When the valve is in the position shown in Fig. 10 the communication is cut off from upper to lower cylinder. When the valve is in the position shown in Fig. 11 the water from the lower cylinder F, flows through ports G'' O'' and into a longitudinal groove P' on the side of the valve P, which communicates with an annular groove or channel *p''* on said valve (as shown in detail in Fig. 12, and from the latter out through the port O<sup>3</sup> leading into the exhaust pipe O<sup>4</sup>.

In practice I prefer to connect the drip pipe *i*, to the exhaust pipe O<sup>4</sup> as shown in Figs. 2 and 3 but this is not essential.

To the stem of the cylindrical balance valve P is secured a lever D' linked or otherwise suitably connected to the pressure lever C, so as to cause the valve P, to be automatically oscillated by the rise and fall of said lever.

The operation of the improved damper regulator is as follows: Figs. 2 and 3 represent the apparatus in position during the normal or standard pressure of the steam in the generator at which time the damper is held partly open as shown in Fig. 2, and during such time the valve P, is held in the position shown in Fig. 10. If the steam pressure falls below the desired normal one, the lever C, drops causing the valve P to be turned to the position shown in Fig. 9, by which the water un-

der pressure from the upper smaller cylinder E, is admitted into the larger lower cylinder F, by which the piston rod H is forced downward and by its connection to the weighted damper lever causes the damper to be gradually opened until the pressure in the boiler rises to the normal desired one. If on the other hand the pressure rises above the normal one in the steam generator, the lever C is raised causing the valve P to be turned to the position shown in Fig. 11, which allows the liquid in the lower cylinder to be ejected through the valve and causing the piston rod H to rise and by its connection to the weighted damper lever causing the damper to be gradually closed until the pressure in the steam generator is reduced to the desired normal one and so on.

By the employment of a cylindrical balanced valve as shown instead of the spring pressed face valve shown in my previous patent, I avoid all frictional resistance in the movement of said valve by which the apparatus is made more quickly and easily responsive to very slight changes in the steam pressure. Consequently the desired normal pressure may be maintained within very small fluctuations.

For the purpose of preventing uneven or spasmodic movements of the valve piston rod and damper I make use of an intermediate connecting mechanism between the piston rod H and the pressure lever C, which is constructed as follows: To the upper end of the piston rod H, is attached a cord or chain *r*, the lower end of which is wound up and secured to a grooved wheel or pulley R which is loosely journaled on a stud or spindle preferably attached to the cylinder E at or near its upper end. To said pulley is secured a somewhat smaller grooved pulley S, on which is wound and secured a chain or cord *s*, the lower end of which is connected to a lever T pivoted at *t*, and having attached to its preferably shorter end a spring U, the upper end of which is connected to the pressure lever C, as fully shown in Figs. 1 and 2. By this arrangement the too quick motion of the piston rod H, during the rise or fall of the pressure in the generator is controlled by the yielding resistance of the spring U causing the damper to be gradually opened and closed in an even manner without jerks or starts.

Having thus fully described the nature, construction, and operation of my invention, I wish to secure by Letters Patent and claim—

1. In a damper controlling mechanism, the combination with a generator, of a damper-motor comprising a pair of pistons of unequal diameters arranged in independent cylinders upon a single piston-rod which is connected with the damper, a fluid-conducting pipe for delivering fluid under pressure to the smaller cylinder, a valve chest and ports connecting said cylinders a cylindrical balance valve arranged in said chest and having a transverse passage adapted to register with both of said

ports to convey the fluid from the smaller to the larger piston, and an exhaust port adapted to register with the port of the larger cylinder, a pressure-lever operated by the pressure of steam in the generator, and a connection between the pressure lever and the valve, substantially as described.

2. In a damper-controlling mechanism, the combination with a generator, of a damper-motor, comprising a pair of pistons of unequal diameters arranged in independent cylinders upon a single piston-rod which is connected with the damper, a fluid conducting pipe for delivering fluid under pressure into the cylinders, a valve for controlling the flow of liquid to the large cylinder, a pressure-lever operated by pressure in the steam generator, a connec-

tion between the pressure-lever and the valve, two pulleys of unequal diameter constructed to revolve together, a cord or chain wound upon the larger pulley and secured to the piston-rod, a cord or chain wound upon the smaller pulley and secured at its end to one end of a pivoted lever, and a spring connected to the other end of said lever and to the pressure-lever, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 19th day of October, A. D. 1893.

FRANK L. T. CARLMAN.

Witnesses:

ALBAN ANDRÉN,  
E. E. TORREY.