(No Model.) 5 Sheets—Sheet 1.

G. L. THIELL.

APPARATUS FOR CONTROLLING THE ADMISSION OF AIR TO FURNACES.

No. 526,510. Patented Sept. 25, 1894.

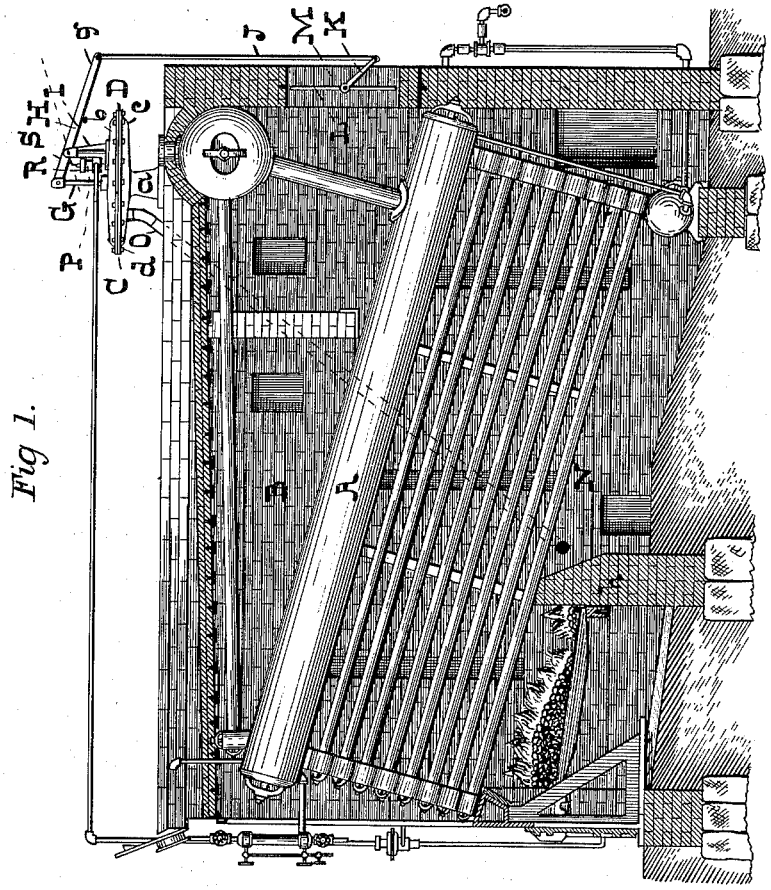


Fig 1.

WITNESSES

Dan'l Fisher

Thomas Conroy

INVENTOR

George Landon Thiell,

by Wm. W. J. Ward, Atty.

(No Model.) 5 Sheets—Sheet 2.

G. L. THIELL.

APPARATUS FOR CONTROLLING THE ADMISSION OF AIR TO FURNACES.

No. 526,510. Patented Sept. 25, 1894.

Fig 2.

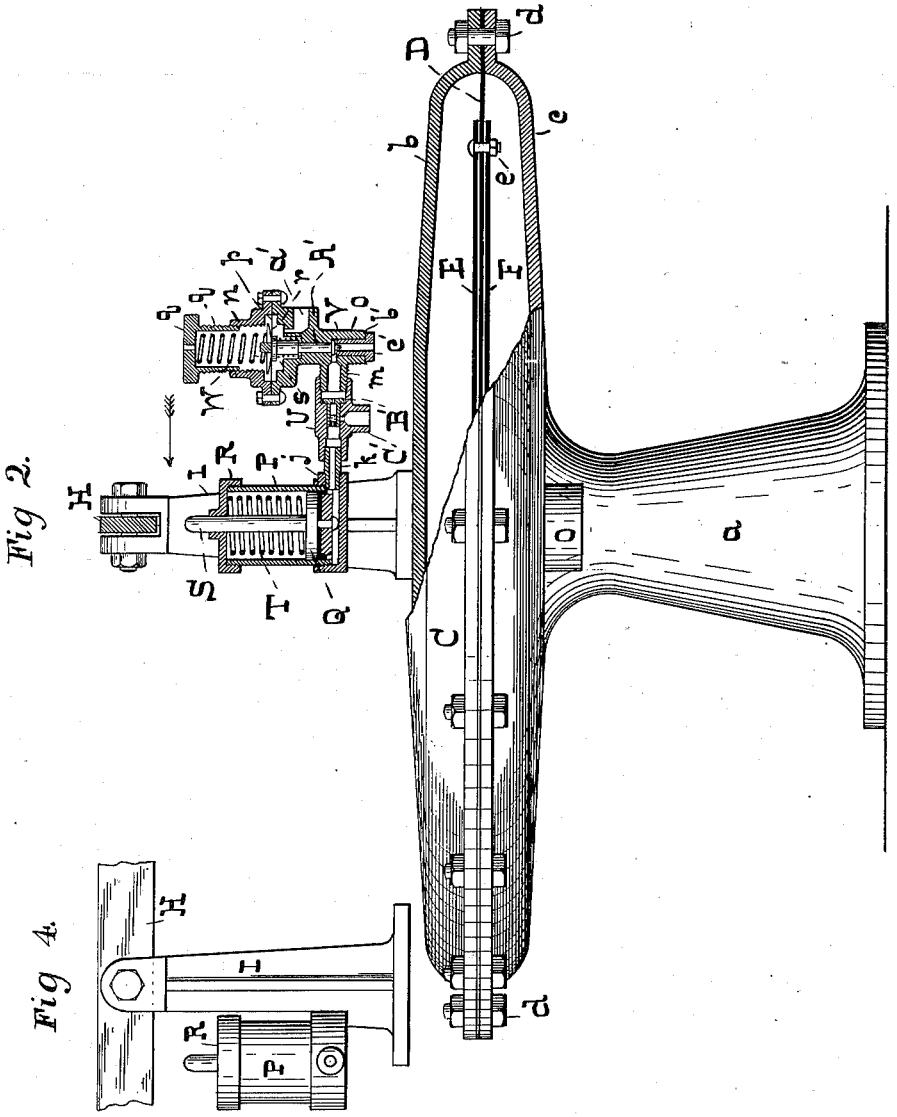


Fig 4.

-WITNESSES-

Dan'l Fisher

Thomas Conroy.

-INVENTOR-

George Landis Thiell,

by Geo. W. Howard, Atty.

(No Model.)

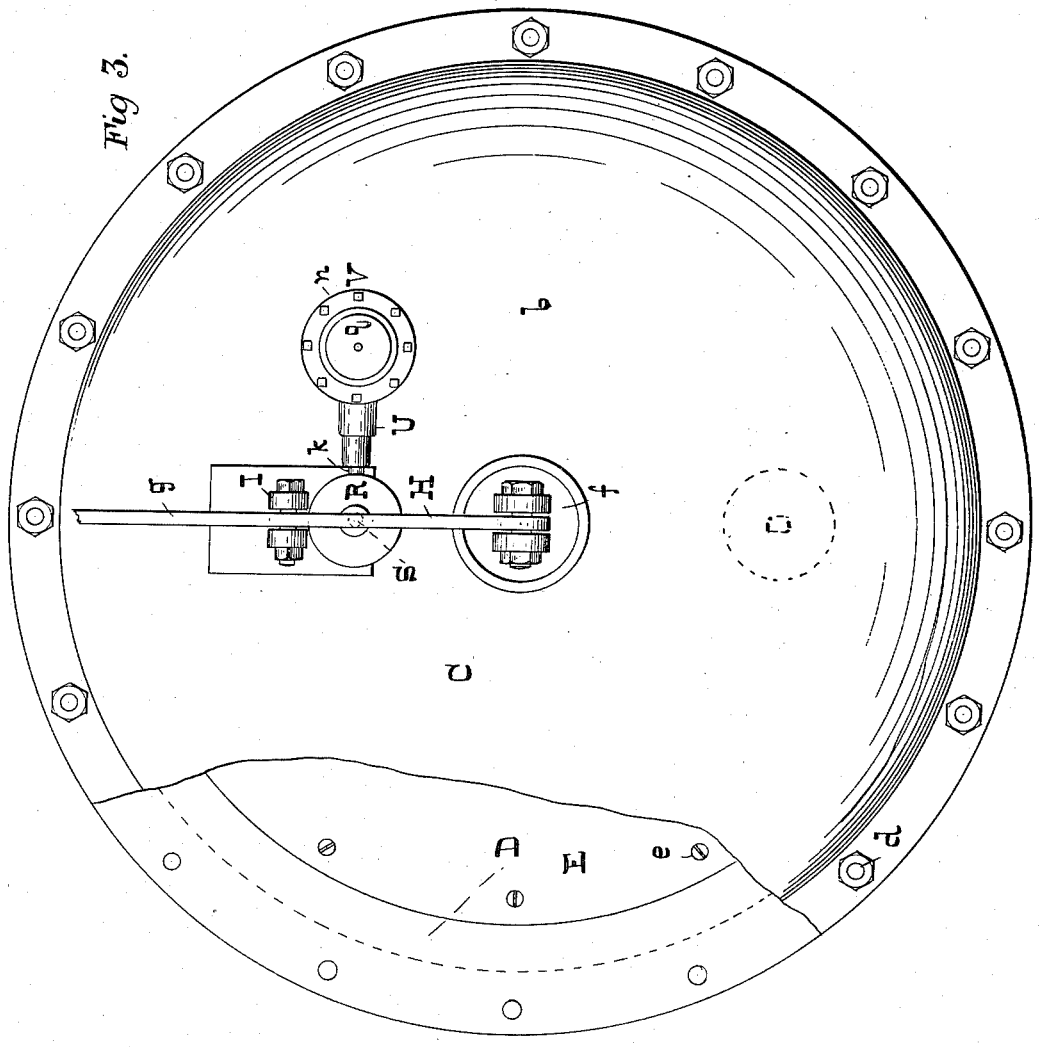
5 Sheets—Sheet 3.

G. L. THIELL.

APPARATUS FOR CONTROLLING THE ADMISSION OF AIR TO FURNACES.

No. 526,510. Patented Sept. 25, 1894.

Fig 3.



-WITNESSES-

Dan'l Fisher

Thomas Conroy

-INVENTOR-

George Landon Thiell,

by Geo. W. T. Howard atty.

(No Model.) 5 Sheets—Sheet 4.

G. L. THIELL.

APPARATUS FOR CONTROLLING THE ADMISSION OF AIR TO FURNACES.

No. 526,510. Patented Sept. 25, 1894.

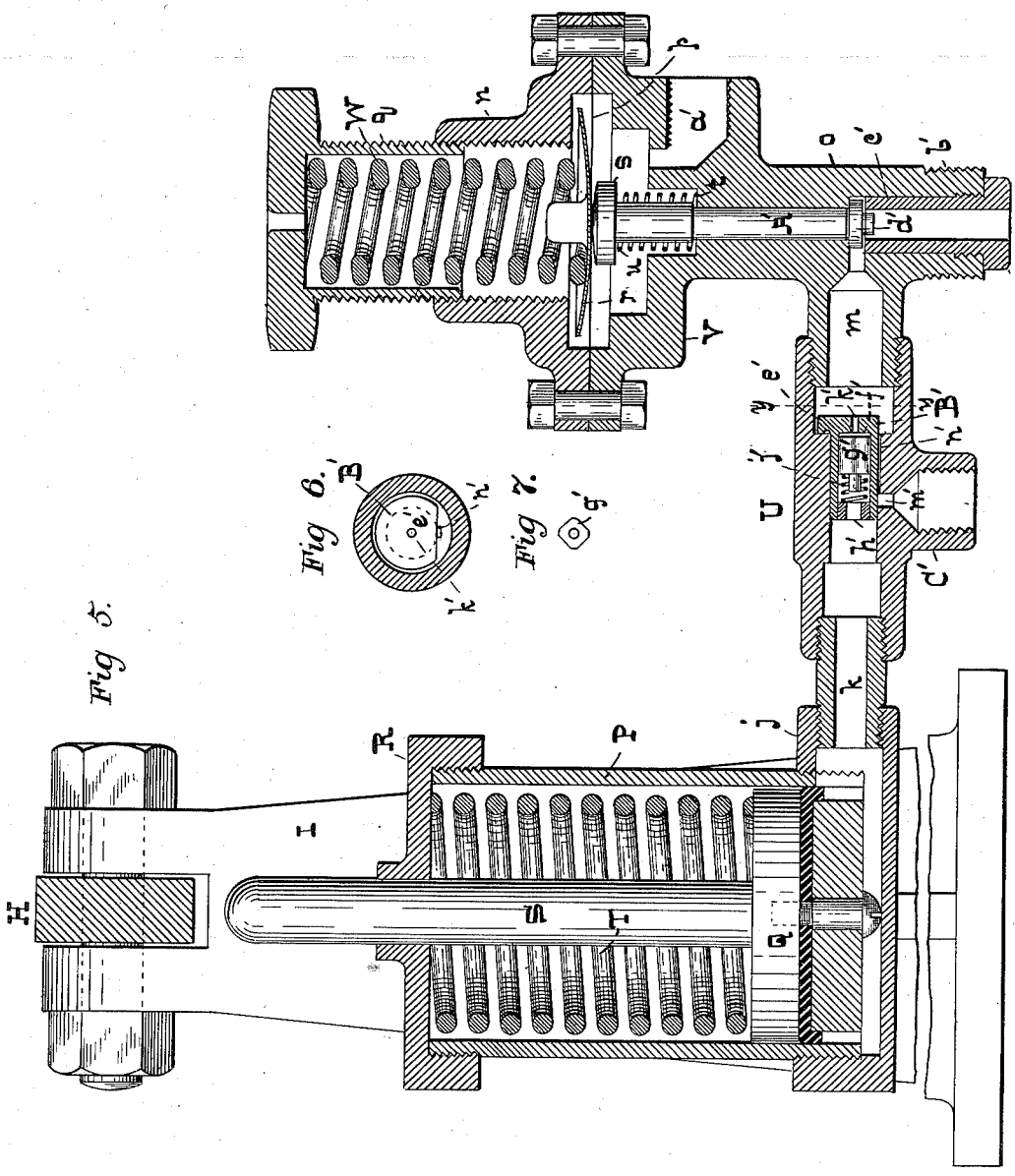


Fig 5.

Fig 6.

Fig 7.

WITNESSES-

Dan'l Fisher

Thomas Conroy

INVENTOR-

George Landon Thiell,

by Wm. H. Howard,

atty.

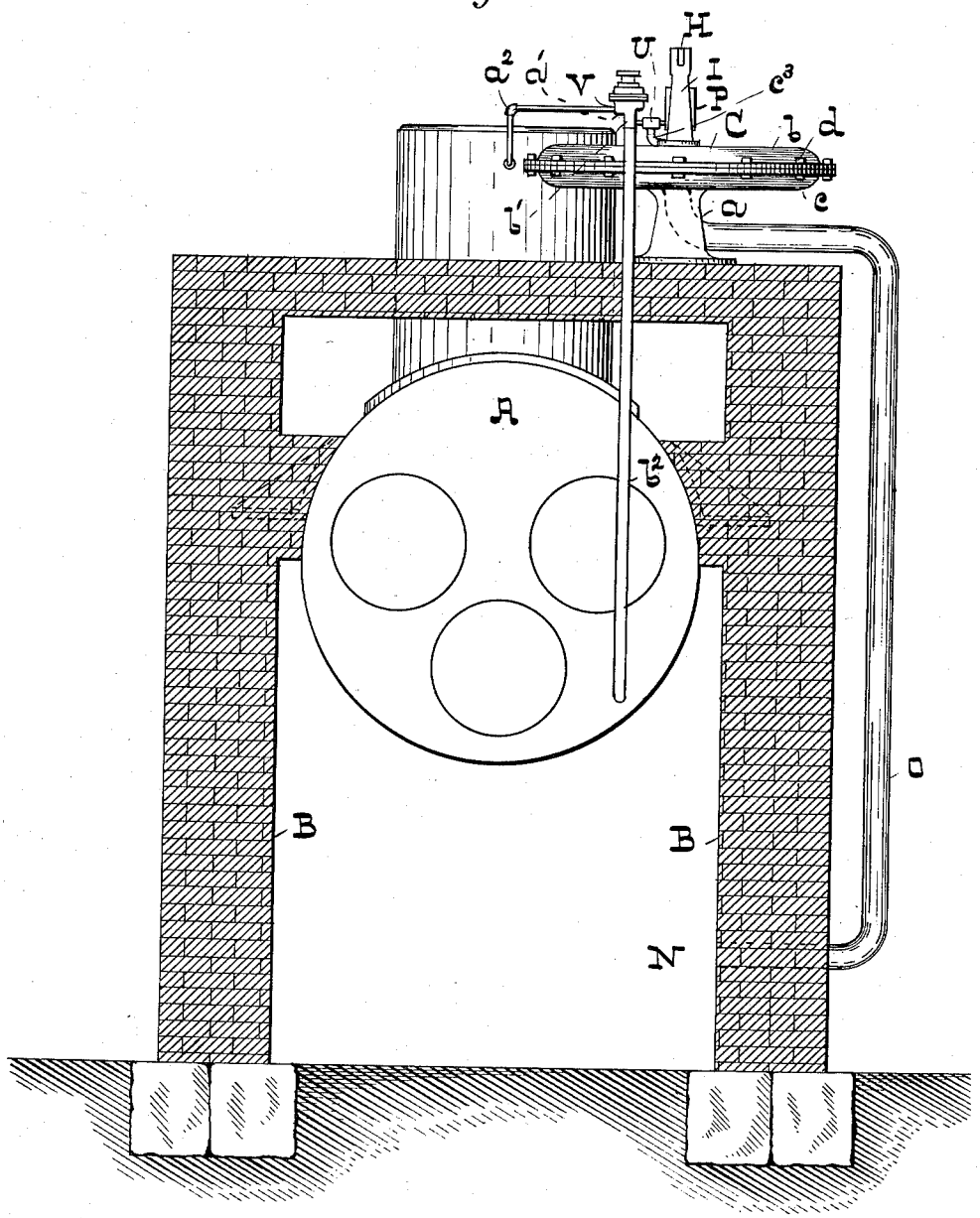
(No Model.) 5 Sheets—Sheet 5.

G. L. THIELL.

APPARATUS FOR CONTROLLING THE ADMISSION OF AIR TO FURNACES.

No. 526,510. Patented Sept. 25, 1894.

Fig 8.



-WITNESSES-

Dan'l Fisher

George Hemsley

-INVENTOR-

George Landis Thiell,

by Chas. H. J. Mann,

attys.

UNITED STATES PATENT OFFICE.

GEORGE LANDER THIELL, OF BALTIMORE, MARYLAND, ASSIGNOR TO THE THIELL COMBUSTION GOVERNOR AND MANUFACTURING COMPANY OF BALTIMORE CITY.

APPARATUS FOR CONTROLLING THE ADMISSION OF AIR TO FURNACES.

SPECIFICATION forming part of Letters Patent No. 526,510, dated September 25, 1894.

Application filed March 24, 1893. Renewed February 27, 1894. Serial No. 501,729. (No model.)

To all whom it may concern:

Be it known that I, GEORGE LANDER THIELL, of the city of Baltimore and State of Maryland, have invented certain Improvements in Apparatus for Controlling the Admission of Air to Furnaces, of which the following is a specification.

In the description of the said invention which follows, reference is made to the accompanying drawings forming a part hereof, and in which—

Figure 1 is a longitudinal section of a water tube boiler and its brickwork setting, provided with the present invention. Fig. 2 is an enlarged partially sectional view of the improved apparatus. Fig. 3 is a top view of Fig. 2. Fig. 4 is an exterior view of certain parts of the apparatus looking in the direction indicated by the arrow in Fig. 2. Fig. 5 is a still enlarged view of certain parts of the invention shown in Fig. 2. Figs. 6 and 7 are details of the invention, the former being a section of Fig. 5 taken on the dotted line *y*—*y*. Fig. 8 is an enlarged cross section of a flue boiler to which the invention is applied.

Referring to the drawings, A represents a boiler which in Fig. 1 is of the water tube, and in Fig. 8 of the ordinary flue type, and B the brick work setting.

C is a box in two parts or sections having a suitable stand *a*. This box is placed in any convenient position near the boiler A, and in the drawings is shown as seated on the top of the brick work setting.

Between the two parts *b* and *c* of the box C is a flexible diaphragm D held in place by the bolts *d* which also hold the two parts *b* and *c* of the box C together. This diaphragm may be made of any suitable material, but cotton duck treated with rubber is preferred.

E and F are circular metal plates flat or corrugated situated respectively on the top and bottom of the diaphragm D to which they are fastened by bolts *e*.

G is a stem which passes through an aperture *f* in the top section *b* of the box C, and at the lower end the stem is attached in any suitable manner to the plate E. The upper end of this stem is jointed to a lever H having its fulcrum in a stand I seated on the section *b* of the box C. The long arm *g* of the lever H is connected by a rod J to the damper lever K of the damper L which damper is hung in the flue M of the brick work setting B.

The lower section *c* of the box C is in communication with the combustion chamber N of the boiler at the back of the bridge wall *h* by means of a pipe O. This pipe is shown in Figs. 1 and 8, and the nozzle on the box C to which the pipe is attached is represented in dotted lines in Fig. 3.

The upper section *b* of the box C is in communication with the outer air through the medium of the aperture *f* before referred to.

From this description it will be seen that the lower side of the diaphragm is exposed to the gases in the combustion chamber, and the upper side exposed to the outer air, and that the position of the diaphragm within the box is governed by the relative pressures of the said gases, and the air.

Supposing the damper L to be in such position in the flue M as will give the proper admission of air to the furnace to effect economical combustion of the fuel therein, and by careless firing, a portion of the grate bars becomes exposed thereby admitting more air to the combustion chamber than is requisite, the pressure in the combustion chamber is increased, or brought nearer to that of the outer air. This causes the diaphragm to rise and the damper L to close.

The conditions just described are well illustrated in Fig. 1 in which a bare spot is shown on the grate bars, and the damper closed. When the bare spot is covered with coal, the damper is opened automatically and placed in its proper position.

When the furnace door is opened in the firing operation, the damper is closed in a similar manner to that above described. When, however, by bad firing, the bed of coal

on the grate bars becomes too thick so that the air admitted is insufficient, the pressure in the combustion chamber is reduced, and by the depression of the diaphragm the damper is opened.

From the foregoing it will be seen that the diaphragm thoroughly and effectually controls the admission of air to the furnace and is effective in opening and closing the damper to prevent the admission of too much or too little air to the furnace, and the waste of fuel; but the economical expenditure of a certain quantity of fuel may produce more steam than is required for the work to be performed, and it is necessary, therefore, to close the damper independently of the devices before described when the extreme limit of allowable pressure is attained. I effect this result as follows: Immediately underneath the short arm of the lever H and supported, preferably, by the stand I, is a steam or water cylinder P having a piston Q therein. Between the top of the piston Q and a screw cap R and coiled about the piston rod S is confined a spiral spring T. Leading from the space under the piston Q is a nozzle *j* connected by a nipple *k* to a valve chamber U hereinafter described. To the other end of this valve chamber is attached the nozzle *m* of a regulating valve chamber V. This regulating valve chamber is in two parts *n* and *o* which are flanged and bolted together, and between them is confined a metallic diaphragm *p*. Between the upper side of the diaphragm *p* and a hollow adjusting nut *q* screwed into the part *n* of the valve chamber, is a spiral spring W seated on a convex plate *r*. Beneath this diaphragm *p* is a stem A′ having a head *s* in contact with the said diaphragm.

Confined endwise between the head *s* and the bottom of a recess *t* in the part *o* of the valve chamber is a spiral spring *u*.

A nozzle *a′* leads from the space below the diaphragm *p* and into it is screwed a pipe a^2 shown particularly in Fig. 8 which connects the said space with the steam room of the boiler. The lower end *b′* of the part *o* of the valve chamber V is threaded to admit of the connection of a pipe b^2, shown in Fig. 8, which unites that part of the valve chamber with the water space, of the boiler, or to any source of supply of water under pressure. Screwed into this end *b′* is a sleeve *c′* the upper end of which serves as a seat for a valve *d′* which is situated between it, and the lower end of the stem A′.

Within the valve chamber U is a hollow cylindrical slide valve B′ with one side of the flange *e′* which forms the joint cut away, see Figs. 5 and 6, and in this valve, and adapted to seat itself against the face *f′* is a smaller valve *g′*, see Fig. 7 which is an end view of the valve, and between this valve and the plug *h′* is a spring *j′*. This inner valve *g′* when seated, closes a hole *k′* in the valve B′.

C′ is a nozzle to which a pipe c^3 shown only in Fig. 8 is attached to carry off waste water or steam from the chamber U, under circumstances hereinafter described.

Between the port *m′* and the face on which the valve B′ seats itself is a channel *n′* cut in the wall of the chamber U for a purpose hereinafter described.

To prepare this second part of the invention for use the hollow adjusting nut *q* is screwed either up or down, until the strain on the spring W is such that it will be overcome only by the maximum pressure of steam to be carried on the boiler. Now supposing that the steam in the boiler should attain that pressure which is, say, one hundred pounds to the square inch, the diaphragm *p* is forced up by the steam thereby compressing the spring W. In this movement the stem A′ is allowed to rise and the pressure of water or steam under the valve *d′* lifts it, and water or steam from the boiler or some other source of supply passes into the valve chamber U and forces the valve B′ to its seat. At the same time the water or steam passes through the central perforation *k′* in the valve B′ and unseats the spring-supported valve *g′*. This allows the full pressure of steam or water to pass to the cylinder P, and raise the piston therein, in which operation the spring T is compressed.

The lifting of the piston brings the piston rod S forcibly into contact with the under side of the short arm of the lever H and the damper L is immediately closed.

In the seating of the valve B′ the port *m′* leading to the discharge nozzle C′ is closed but there is a small discharge through the channel *n′*.

The relative positions of the parts as described are maintained until steam in the boiler falls below the maximum limit, one hundred pounds, when the spring W overcomes the steam pressure below the diaphragm *p* and that device is forced down. In this movement the valve *d′* is seated and the further passage of steam or water to the chamber U prevented.

The pressure in the nozzle *m* is now reduced to that of the atmosphere by the leakage of water or steam through the channel *n′*, and in view of this, the valve B′ is forced from its seat by the steam or water in the cylinder P and the port *m′* exposed which allows the contents of the cylinder P to escape through the nozzle C′; but before the valve B′ is unseated the smaller valve *g′* is seated which prevents the raising of the pressure in the nozzle *m*, or the establishment of an equilibrium of pressure in the cylinder P and the nozzle *m*. In this last described movement, the piston rod S is withdrawn from the lever H and that device is then free to be operated solely by the combustion governor as before described.

I claim as my invention—

1. In combination with a lever operated primarily from a diaphragm which derives its movement from variations in pressure be-

tween the gases in the combustion chamber and the atmosphere, a steam or water actuated device which is set in operation by the rise in pressure of the said steam or water to a certain pre-arranged height, and which device operates the said lever independently of the said diaphragm, substantially as specified.

2. In combination with a lever operated primarily from a diaphragm which derives its movement from variations in pressure between the gases in the combustion chamber and the atmosphere, a cylinder having a piston therein held yieldingly in a depressed position by means of a spring with a piston rod adapted in the rise of the said piston by the application of steam or water under pressure thereto to move the said lever, and valve mechanism whereby upon the said steam or water reaching a prearranged pressure, will be admitted to the said cylinder, and the piston placed in operation, substantially as specified.

3. In combination with a lever operated primarily from a diaphragm which derives its movement from variations in pressure between the gases in the combustion chamber and the atmosphere, a steam or water actuated piston and rod adapted to operate the said lever independently of the said diaphragm a valve to control the admission of steam, or water under pressure, to the said cylinder by the withdrawal from contact with the valve of a stem held down by a spring loaded diaphragm which is overcome by the steam rising to the prearranged limit, substantially as specified.

4. In combination with devices for actuating a damper in a chimney or flue, a steam or water cylinder having a loaded piston therein, and also a piston rod adapted to operate the said damper actuating devices, a valve chamber having therein a loaded diaphragm and provided with a pipe to convey steam from a boiler to the space under the said diaphragm, a stem with its end bearing against the under side of the said diaphragm and its lower end resting on a valve which controls the passage of water under pressure or steam to the said cylinder, and a second valve chamber in the passage way between the first valve chamber and the steam cylinder having therein a perforated hollow valve adapted to close with the pressure of the entering steam, a spring supported inner valve to close the perforation in the main valve as steam pressure is removed therefrom, the said chamber having a discharge port which is uncovered as the first or main valve is forced from its seat and the contents of the steam or water cylinder discharged, substantially as specified.

5. In combination with the valve chamber U having the channel n' the hollow valve B' having the opening k' and the spring supported valve g', substantially as specified.

GEORGE LANDER THIELL.

Witnesses:

DANL. FISHER,

Z. F. WILLIAMS.