No. 840,520. PATENTED JAN. 8, 1907.

G. H. SCHARF.

DRAFT REGULATOR FOR FURNACES.

APPLICATION FILED MAR. 11, 1905.

3 SHEETS—SHEET 1.

Fig. 1.

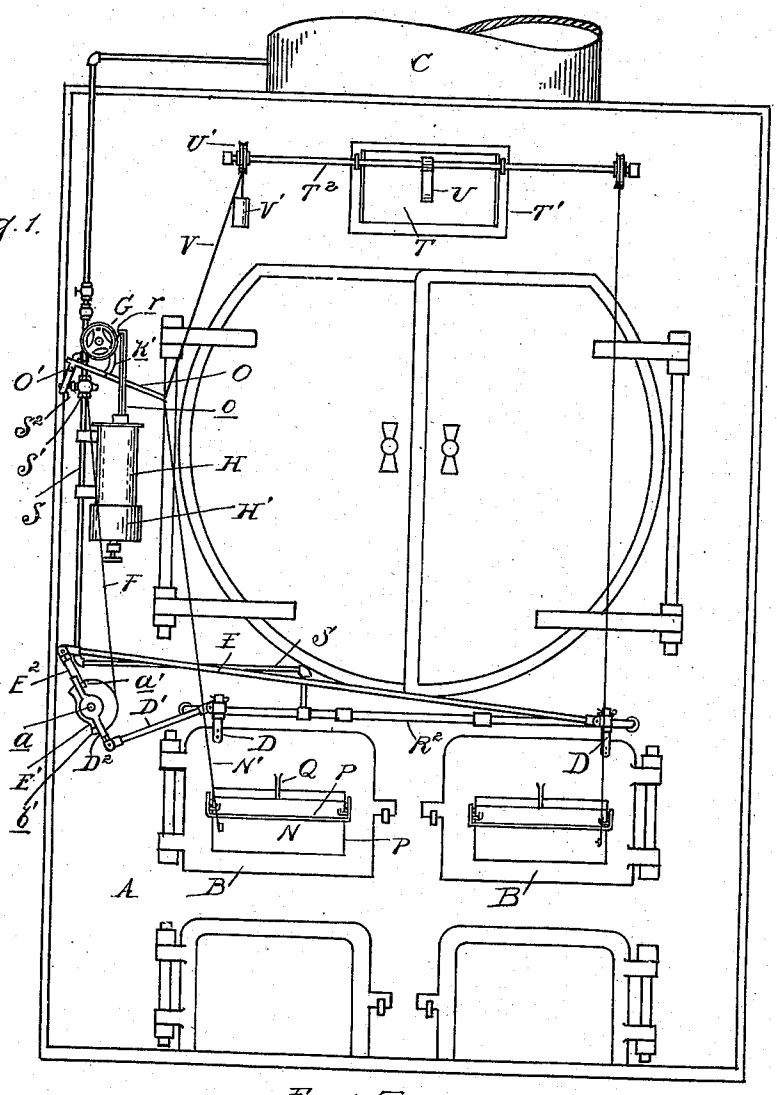
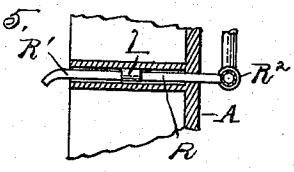


Fig. 5.



Witnesses
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3 SHEETS—SHEET 2.

Fig. 2.

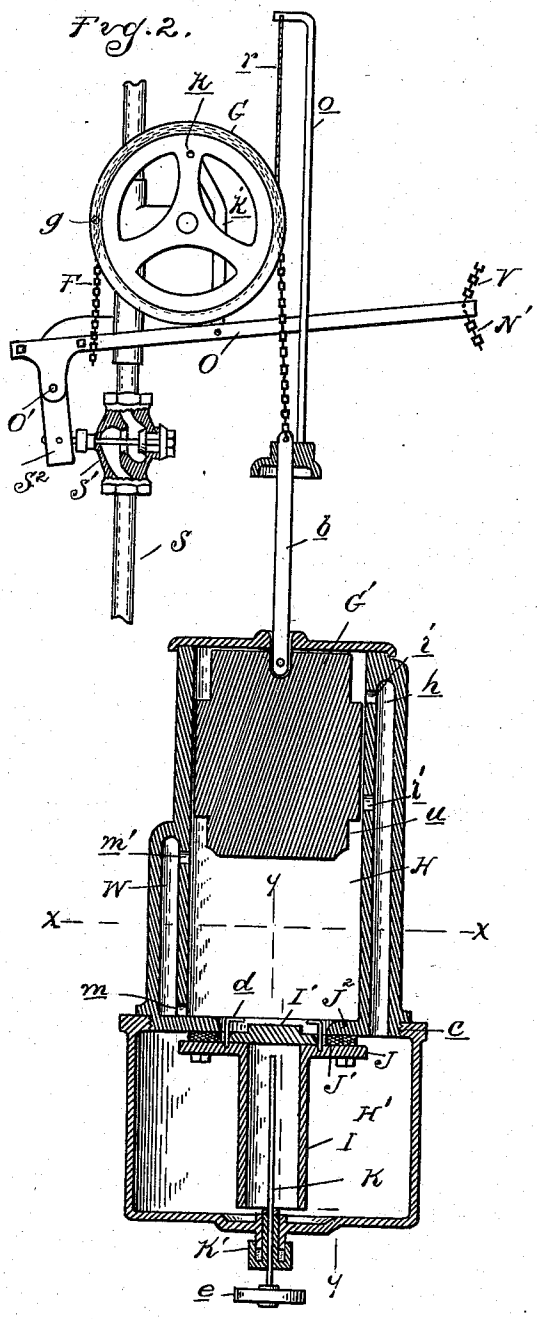


Fig. 4.

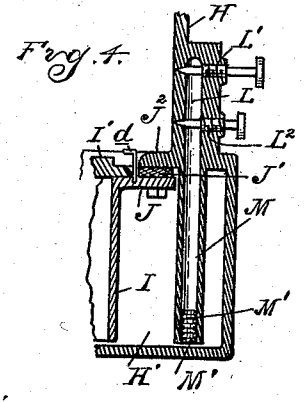
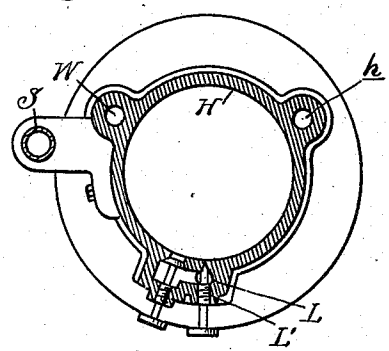


Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 6.

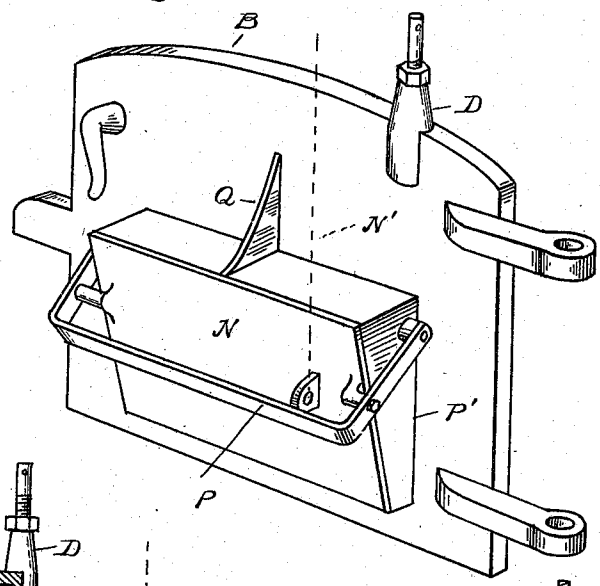


Fig. 7.

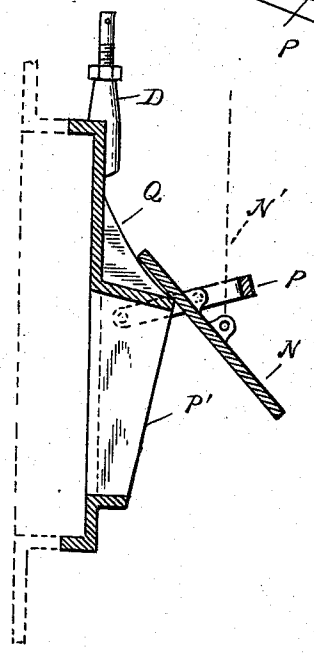


Fig. 9.

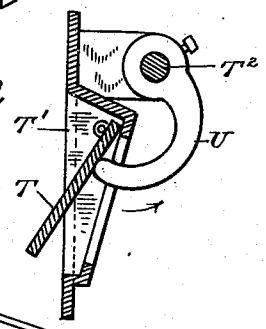
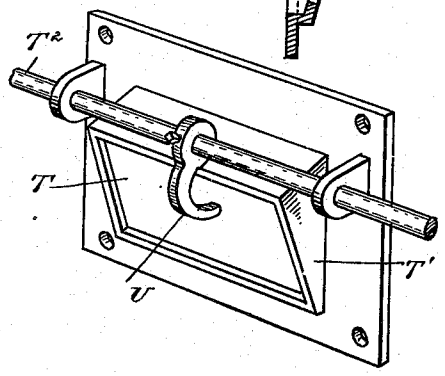


Fig. 8.



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UNITED STATES PATENT OFFICE.

GREGORY H. SCHARF, OF YPSILANTI, MICHIGAN.

DRAFT-REGULATOR FOR FURNACES.

No. 840,520. Specification of Letters Patent. Patented Jan. 8, 1907.

Application filed March 11, 1905. Serial No. 249,595.

To all whom it may concern:

Be it known that I, GREGORY H. SCHARF, a citizen of the United States, residing at Ypsilanti, in the county of Washtenaw and State of Michigan, have invented certain new and useful Improvements in Draft-Regulators for Furnaces, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to new and useful improvements in draft-regulators for furnaces, and particularly in the construction of the timing mechanism and in the arrangement and combination of the various parts, as more fully hereinafter described.

In the drawings, Figure 1 is a front elevation of a furnace, showing my invention applied thereto, the dash-pot or timing mechanism being shown in elevation. Fig. 2 is an enlarged vertical central section through the timing mechanism or dash-pot. Fig. 3 is a horizontal section on line *x x*, Fig. 2. Fig. 4 is a vertical section on line *y y*, Fig. 2. Fig. 5 is a vertical section through one of the steam connections into the furnace, illustrating its construction. Fig. 6 is a perspective view of one of the furnace-doors with the damper closed. Fig. 7 is a central section therethrough, showing the damper in the door open. Fig. 8 is a perspective view of the damper in the smoke-pipe. Fig. 9 is a vertical central section therethrough, showing the damper open.

A represents the ordinary boiler-front on a steam-generating furnace, and B represents the furnace-doors.

C is a stack.

My device is intended upon the opening of the furnace-door to open a steam-jet which discharges into the furnace above the fuel as long as the door is open and with the timing mechanism to gradually shut it off after the door is closed. Upon closing the furnace-door the damper therein is opened, and that is also controlled by the same timing mechanism to gradually close the damper. At the same time a damper in the stack is immediately closed, and that is gradually opened by the same timing mechanism.

To each furnace-door is secured by a casting thereon or in any other desired manner a lug D. Pivotally connected to these lugs are the connecting-rods D′ E, which at their other ends are pivotally connected with the levers D^2 E^2, journaled on the shaft *a*, preferably supported on the boiler-front.

Secured to the shaft *a* is a segment E′, to which is secured a chain F, which extends upward and runs over a wheel G, suitably journaled on a proper shaft above the segment E′. On the segment E′ are two lugs *a′* *b′*, which are on opposite sides of and adapted to be engaged by the levers E^2 D^2, respectively, when either of those levers is actuated to thereby rotate the segment, and when one lever strikes its lug and turns the shaft the other lug will be drawn away from its lever, so that the opening of either or both doors will rock the segment for the purpose to be explained. The chain F, running over the wheel G, is connected to the rod *b*, which in turn is connected to the plunger G′, which operates in a cylinder H, Fig. 2. At the lower end of this cylinder is an oil-reservoir H′. In this construction I have shown the cylinder and the reservoir connected together by a screw-thread engagement at *c*. Secured to the cylinder H is a vertical tube I, open at its lower end and communicating with the interior of the reservoir and its upper end having an opening leading into the interior of the cylinder. The port at the upper end of the tube I is closed by a metal check-valve I′, working in guides *d*. Surrounding the upper end of the tube I is a horizontal flange J, bolted to a flange J^2 on the lower end of the cylinder H. Between the flanges J and J^2, I place a packing J′, so that when the tube and the cylinder are secured together the packing will be tightly clamped in position and make a tight joint at that point.

K is a pin passing through a stuffing-box K′ in the lower end of the reservoir and having a suitable handle *e* at its lower end, which may be when desired pushed in and upward to raise the valve I′ from its seat for the purpose hereinafter described.

Leading from the top of the cylinder H is a passage *h*, connecting at its lower end with the top of the oil-reservoir and its upper end having one or more ports *i*, so that in the upward movement of the plunger G′ any air above the same will pass through these ports through the passage *h* and into the reservoir, and thus the space in the reservoir will be supplied with air as fast as the oil is exhausted therefrom. Any oil carried on top of the piston will also flow back into the reservoir through this passage. Leading from the lower portion of the cylinder is an oil-exit passage L, which I control by one or more valves L′ L^2. This passage connects into a

tube M, which extends into the oil-reservoir to near the bottom thereof and at its lower end is open to allow the oil to pass freely from the tube into the reservoir. Having this tube extend to the bottom of the reservoir prevents the air from entering beneath the plunger in its upward movement. Over the exit of this tube I preferably arrange a strainer M′, of fine wire-cloth or other suitable material, so that any sediment that may be in the oil will be collected in this oil-tube. It will be observed that the valves L′ L² are at different heights, and the purpose of this is so that the speed at which the plunger will descend may be controlled either throughout its entire movement or at different points in its movement or travel.

The parts thus far described operate as follows: Upon opening one of the doors B or both of the doors B, as may be the case, through the connections described the segment E′ will be rocked, the chain will be pulled down, and the plunger G′ will be lifted to the upper position. (Shown in Fig. 2.) In the upward movement of the piston the valve I′ will be lifted from its seat, and the oil will be drawn from the oil-reservoir into the cylinder H below the piston, and the air in the upper part of the cylinder will pass through the air-passage *h* into the reservoir. As soon as the door is closed the plunger G′ will begin to descend, and the oil will be forced out through the valve-openings controlled by the valves L′ L². If both the valves L′ and L² are opened, the plunger will descend more rapidly during the first part of its movement, as it has the two discharge-ports, than it will after it has passed the port controlled by the valve L′, and by the two valves the speed of the plunger, through part of its movement at least, can be better controlled than if but a single valve is used. In opening the door the damper N in the door will also be opened, this damper having attached to it a chain N′, which is connected to the lever O, fulcrumed at O′. The lever is connected to a crank-pin *k* on the wheel G by means of the connecting-rod *k′*, so that through the operation of the chain already described the lever will be raised and the damper opened as the door is opened. When the door is shut, the damper will be gradually closed, as the lowering of the plunger rotates the wheel G in the reverse direction, and the time that the damper is being closed will be determined by the size of the openings controlled by the valves L′ L². The damper N is pivoted to the bail P, which is in turn pivoted to the side of the rectangular casing P′, forming the sides of the damper-opening through the door, and an inclined guide Q is above this frame or casing, so as to cause the damper in its open position to slide up this frame and project as little as possible into the room, this open position of the damper being shown in Fig. 7.

The mechanism already described is intended also to control the steam-jets which discharge above the furnace-doors. These steam-jets I have shown in Fig. 5 at R, being a pipe passing through the boiler-front and preferably provided with a slightly-curved nozzle, so as to direct the steam therefrom down toward the burning fuel. The nozzle R′, I connect into the pipe R by a coupling *l*, so that in case the nozzle becomes burned by the intense heat in the furnace the pipe R can be withdrawn and a new nozzle placed thereon without the necessity of replacing the entire pipe. The nozzles R′ are connected to a header R², extending across the front of the boiler-front, and this header is connected by the pipe S with the steam-space in the boiler. In the pipe S is a valve S′, (shown in Fig. 2,) its stem being pivotally secured to the lever S² to open and close the same. When the lever is raised, as previously described, it will open the valve, as shown in Fig. 2, allowing the steam to pass through the pipe and into the furnace-space through the nozzles. The reverse motion of the lever, as already described, will withdraw the arm S², and with it the valve-stem, and allow the valve to gradually close, controlled by the downward movement of the plunger G′.

When the parts are in the position shown in Fig. 2, it is obvious that the lever O is acted on by the weight of the dampers N as well as by the plunger G′, the latter connection being through a chain F, which is secured at one point, as at *g*, to the wheel G and the rod *k′*, which is connected to the lever. If some means were not provided to hold back the lever, the weight of the dampers would rock the lever, rotate the wheel, and close the steam-valve, the chain between the wheel G and plunger G′ simply becoming slack, and thus the control of the plunger upon the valve and damper would be lost. In order to cause the lever to move positively with the movement of the plunger, I employ the bar *o*, connected to the piston-rod *b* and extending up beside the sheave G. From the upper end of the bar I provide a counteracting cord *r*, passing around the sheave G, a separate groove (not shown) being provided in the sheave for this cord to run in. With this construction the lever cannot lower any faster than the plunger lowers. I also desire this same mechanism to control the damper in the stack, the damper being shown in Fig. 1 at T and also in Figs. 8 and 9. This damper is hinged on the casing T′, surrounding the damper-opening, and closes outwardly by gravity. Across the front of the damper-frame is a rock-shaft T², upon which is a curved finger U. The rock-shaft T² has upon one end a sheave U′, around which passes a chain V, connected to the lever O. This chain is provided at its end with a counterweight V′. The upward

movement of the lever will cause the chain to rotate the sheave U′, and as this is secured to the shaft T² the shaft is also rocked and the curved finger U, impinging against the damper T, will move it inward to open and in its return movement allow it to close, as shown in Fig. 9 and indicated by the arrow. The reverse movement of the lever O, controlled by the plunger G′, will likewise control the slowly-closing movement of the damper T. These parts are constructed so that upon the opening of the furnace-door the damper T will be closed, the finger U being withdrawn from the door by this movement. When the furnace-door is closed, the movement of the plunger draws down the lever O, and with it the chain V, and the finger U, which is withdrawn some distance from the damper T during the initial closing movement of the damper in the furnace-door, approaches the damper T and finally impinges against and slowly opens it during the final closing movement of the door-damper. Thus I obtain the full draft of the stack while the door-damper and the steam-valve are open; but as these close I reduce the draft through the stack slightly.

In order to insure the full closing the dampers and the steam-valve, I provide in the cylinder H a by-pass W, connected by ports *m* and *m′* at top and bottom with the interior of the cylinder. If there is any oil in the bottom of the cylinder when the plunger G′ approaches the lowermost point of its movement, the continued downward movement of the plunger will force that oil up into the by-pass W, and thus be sure to reach its lowest point and positively close the dampers and valve. In case any oil should be carried up by the plunger it can flow back into the reservoir through the air-passage *h*. To insure the complete downward movement of the plunger, I preferably reduce the size of the lower end of the plunger by forming thereon an annular marginal groove *u*, into which the last bit of oil below the plunger will be forced, this groove being of such a height that the lower valve L² will be opposite the groove, so that any surplus oil raised in the groove will pass by the valve into the reservoir. The oil standing in the by-pass W if allowed to stand for some time will drain out through the air-vent port by passing around the cylinder at this reduced portion. With this mechanism I find in practice that I am able to control the closing of the dampers and steam-valve with great niceness and can time them to any desired degree by the valves L′ and L² and be certain that after each opening of the door they will be positively and firmly closed, so as to prevent leaking of steam or air in the closed position of the ports. In case it is desired to more quickly close them the operator can push up upon the stem K, open the check-valve I′, and allow the plunger to rapidly descend, forcing the oil directly back into the reservoir.

What I claim as my invention is—

1. In a draft-regulator for furnaces, the combination of a valve or damper, means for operating the same in one direction, and a controlling device for operating the same in the reverse direction comprising a cylinder, a plunger therein, a reservoir below the cylinder, ports permitting the fluid in the reservoir to pass into the cylinder as the plunger is lifted, and a restricted outlet from the lower part of the cylinder leading to, at or near the lower end of the reservoir, for the purpose described.

2. In a draft-regulator for furnaces, the combination of a valve or damper, means for operating the same in one direction, and a timing device for controlling the reverse movement thereof comprising a cylinder, a plunger therein connected to the valve or damper, a reservoir below the cylinder, a restricted outlet from the cylinder to the reservoir, and a comparatively large inlet into the cylinder from the reservoir, a check-valve controlling the same, and an air-vent passage leading from the upper end of the cylinder into the reservoir.

3. In a draft-regulator, the combination of a valve or damper, of a controller therefor, comprising a cylinder provided with a pipe M, a plunger therein connected to the valve or damper for controlling the movement of the same in one direction, a valve-controlled exit from the lower end of the cylinder to the pipe M forming the exit-pipe from said valve-controlled exit, and a strainer in said outlet-pipe.

4. In a draft-regulator the combination of a valve or damper, means for operating the same in one direction, and a timing device for controlling the reverse movement thereof comprising a cylinder, a plunger therein connected to the valve or damper, a reservoir below the cylinder, and a restricted outlet connection from the cylinder to the reservoir, a comparatively large inlet connection from the reservoir to the cylinder, a check-valve controlling the same, and external means for opening said check-valve to permit the escape of the fluid beneath the plunger, to more rapidly control the opening of the valve or damper.

5. In a draft-regulator the combination with the valve or damper of means for operating the same in one direction, a timing device for controlling the reverse movement thereof, comprising a cylinder, a plunger therein connected to the valve or damper, a reservoir below the cylinder, a restricted discharge from the lower end of the cylinder into the reservoir, means responsive to the upward movement of the plunger for establishing free communication between the res-

ervoir and the cylinder and manually-operable means adapted to control the aforesaid means to establish free communication between the cylinder and the reservoir.

6. In a furnace-regulator the combination with a furnace-door, means for opening the damper by the opening of the door, and timing means for controlling the closing of the damper, a casing P′ around the damper-opening, the damper N fitting on said casing, the bail P connected to the damper and the inclined bearing Q on which said damper slides in its open position.

7. In a draft-regulator for furnaces the combination with a timing means, of a door, a bail pivoted on said door, a damper pivoted in said bail and connections between said damper and said timing means, for the purpose described.

8. In a draft-regulator, the combination of a valve or damper, a controller therefor comprising a cylinder and a plunger therein connected to the valve or damper for controlling the movement of the same in one direction, a reservoir communicating with the cylinder, and a strainer arranged to purify the reservoir contents.

9. In a draft-regulator for furnaces, the combination of the furnace-door, a damper operated in one direction by the opening of the door, a controlling-plunger lifted by the opening of the door, a connection from the plunger to the damper to control the reverse operation thereof, a cylinder in which the plunger operates, and a reservoir operably connected thereto.

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

GREGORY H. SCHARF.

Witnesses:

AMELIA WILLIAMS,

JAS. P. BARRY.