Sept. 5, 1944. W. E. FIREHAMMER 2,357,642

FURNACE CONTROL

Filed March 30, 1942

Fig. 1.

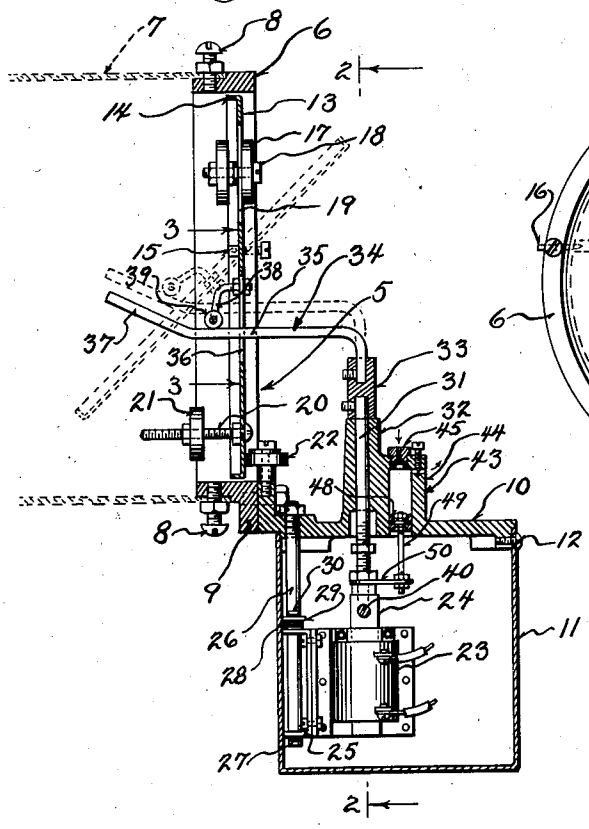


Fig. 2.

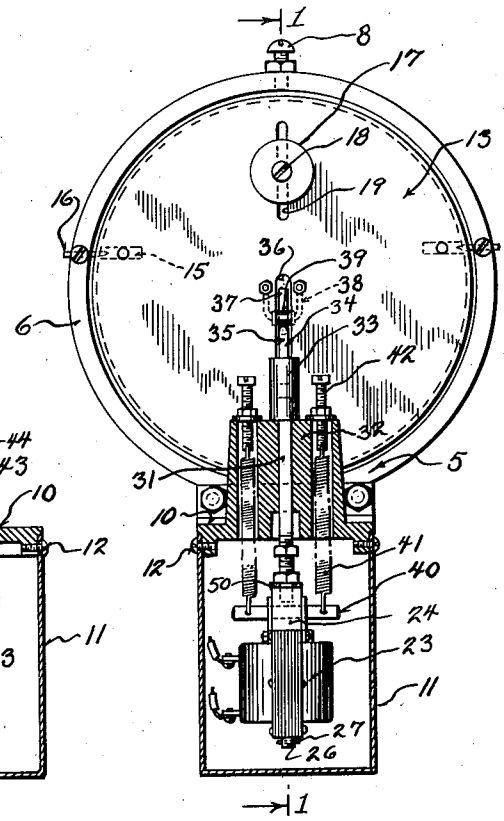


Fig. 3.

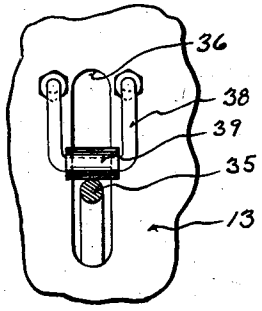
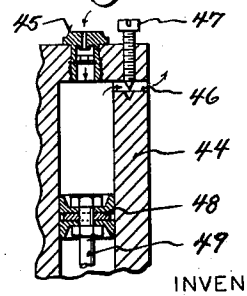


Fig. 4.



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FURNACE CONTROL

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5 Claims. (Cl. 126—285)

This invention appertains to smokepipe dampers, and more particularly to furnace dampers of the general character shown in my Patent No. 2,179,120, issued November 7, 1939, and in my application Serial No. 298,679, filed October 9, 1939; now matured into Patent No. 2,259,973, issued October 21, 1941.

One of the primary objects of my present invention is the provision of novel means for operating the damper gate from its inner face and directly from a lift arm, whereby the necessity of employing swinging levers and the like is dispensed with.

Another salient object of my invention is to provide novel means for forming the lift arm in such a manner that no binding action will take place between the arm and the damper, and whereby to permit the damper gate to open with a comparatively slight movement of the lift arm and with a progressively accelerated motion.

A further important object of my invention is to provide means operating in direct conjunction with the lift arm for checking or delaying the opening movement of the damper, said means including a dashpot having a check valve and a sleeve, the active size of which can be governed for accurate control.

A still further object of my invention is the provision of novel means for associating the weights with the damper gate, whereby the weights can be accurately set for balancing the damper, and whereby the weights will be spaced a maximum distance from the center of the gate for eliminating torque, etc.

With these and other objects in view, the invention consists in the novel construction, arrangement, and formation of parts, as will be hereinafter more specifically described, claimed, and illustrated in the accompanying drawing, in which drawing:

Figure 1 is a central, vertical, sectional view through my improved damper control, the view being taken on the line 1—1 of Figure 2, looking in the direction of the arrows.

Figure 2 is a view partly in section and partly in plan, the section being taken substantially on the line 2—2 of Figure 1, looking in the direction of the arrows.

Figure 3 is a detail sectional view taken on the line 3—3 of Figure 1, illustrating the connection between the lift arm and the roller bracket on the damper.

Figure 4 is an enlarged, fragmentary, detail, sectional view illustrating the dashpot or check mechanism for the damper.

Referring to the drawing in detail, wherein similar reference characters designate corresponding parts throughout the several views, the numeral 5 generally indicates my improved device, and the same includes an annular damper ring or frame 6, which is securely fastened to a breach pipe 7, which can be connected to an intermediate part of a smokepipe leading from any suitable heating plant or the like.

The fastening means for securing the ring 6 to the pipe 7 can consist of fastening screws 8. Likewise, the periphery of the ring can be rabbeted to receive the pipe. The extreme lower end of the ring or frame 6 has formed thereon a depending foot 9 to which is fastened a bracket 10 for supporting the various operating parts of the damper actuating mechanism and the casing 11 for said mechanism. As is clearly shown in Figures 1 and 2, the bracket 10 is in the nature of a laterally extending plate and forms a cover for the casing 11. Screws 12 can be employed for detachably connecting the casing to said bracket plate.

Rockably mounted within the ring or frame 6 is the damper gate or plate 13. This gate can be formed from sheet metal, and the periphery thereof is inturned to provide a reinforcing flange 14. Bearing blocks 15 are secured to the inner face of the damper gate at a point above its horizontal diametric center, and the outer ends of the bearing blocks receive the pointed bearing terminals of adjustable pintles 16 carried by the annular damper ring or frame 6.

Due to the mounting of the damper gate 13, it can be seen that the bottom of the gate overbalances the upper end of the gate, and, hence, the damper gate normally tends to swing to a closed position. However, in order to accurately balance and set the damper gate to suit various drafts, atmospheric pressures, etc., for different stacks and pipes, the gate has adjustably associated therewith above its pivot point weights 17. These weights 17 are mounted upon a cross bolt 18, which extends through a vertical slot 19 in said gate, and by tightening the bolt, the weights 17 can be set to a selected desired position. The gate below its horizontal center and adjacent its periphery has secured thereto an inwardly extending threaded rod 20, and a weight 21 is adjustably mounted on said rod. Hence, by adjusting the weights 17 and 21, the damper gate can be accurately balanced to suit varying conditions, and attention is directed to the fact that the weights are located as far away from the horizontal center of the gate as is practicable, so

as to reduce torque and the like during movement of the gate.

In order to liimt the outward swinging movement of the lower end of the damper gate, a resilient cushion **22** can be secured to the bracket **10** and arranged in the path of the lower end of said gate.

The operating mechanism for the damper gate includes a solenoid **23** having a vertically slidable plunger **24**. The solenoid is bolted to a U-shaped bracket **25**, which is slidably mounted on a guide rod **26**, which depends from the bracket **10**. A suitable stop **27** limits the downward movement of the U-shaped bracket **25** on the guide rod, and the bracket **25** is normally urged toward said stop by a spring **28**, which is coiled about the rod. The lower end of the spring bears against the upper end of the bracket, and the upper end of the spring engages a washer **29**, the upward movement of which is limited by a stop **30**. The plunger or movable core **24** of the solenoid has rigidly, but adjustably, fastened thereto an upstanding operating rod **31**, and this rod is slidably mounted in a guide sleeve **32**, which is formed on the bracket **10**.

Connected to the upper end of the operating rod **31** by a coupling **33** is the operating arm **34**. This operating arm is of an angle-shape and includes a horizontal portion **35**, which extends through a slot **36** in the damper gate **13**. The slot **36** is disposed below the pivot point of the gate and its extreme inner end is arranged on the inner side of the gate and is bent to form an upwardly extending angular extension **37**. Fastened to the inner face of the damper gate below the pivot point of said gate is a depending bracket **38** carrying an anti-friction roller **39**, which engages the upper surface of the lift arm **34**.

Also fastened to the plunger or core **24** of the solenoid is a transversely extending rod **40** having attached to its opposite ends upwardly extending contractile coil springs **41**. These springs extend through guide openings formed in the opposite sides of the sleeve **32**, and the upper ends of the springs **41** are secured to threaded rods or bolts **42** adjustably supported by the upper end of the sleeve **32**. These springs normally tend to pull up on the plunger, and, hence, raise the slide rod **31** and the lift arm **34**.

When the arm **34** is lifted, the same pushes up on the anti-friction roller **39** and the bracket **38**, and, consequently, swings open the damper gate. As the roller engages the upwardly inclined extension **37** of said arm, the gate will be further opened with an accelerated motion.

By this construction and arrangement, I am permitted to operate the gate from the inner face thereof and with the use of a simple lift arm. By varying the angularity of the extension **37**, the amount of opening of the gate can be changed.

Obviously, when the solenoid **23** is energized, the lift arm is pulled down away from the anti-friction roller **39**, and, hence, the weight **21** is free to move the damper gate to its closed position, and the damper gate can then actuate automatically under the influence of stack drafts, atmospheric pressures, etc.

While I have not shown the solenoid in the motor circuit of a coal stoker or oil burner, it is to be understood that the solenoid can be arranged in such circuits (see my patent above mentioned).

Thus, when the circuit to the motor for the feed of coal or oil is closed, the solenoid is energized and the damper gate will have a tendency to move to its closed position, and when the stoker or oil feed is not in operation, the solenoid is deenergized, and the damper gate is free to swing open to check the draft.

As the weights **17** and **21** are independent of one another, the said weights can be readily adjusted and set for any draft value.

In order to retard or check the upward movement of the rod **31** and the lift arm **34** under the influence of the springs **41**, I provide a dashpot mechanism **43**. This mechanism includes a cylinder **44**, which can be case on the bracket **10**, and this cylinder, in effect, forms a part of the guide sleeve **32**. The upper end of the cylinder is closed by an inwardly opening check valve **45**. A bleed passageway **46** opens out through the upper end of the cylinder, and the active size of this bleed passageway or orifice can be controlled by a set screw **47**.

Slidably mounted within the cylinder **44** is a piston **48**, and this piston has connected therewith a piston rod **49**. The piston rod **49** is, in turn, connected with the operating rod **31** by a connecting strap **50**. This strap **50** is secured to the rod **31** by means of suitable clamp nuts. Similar clamp nuts are employed on the piston rod **49** for connecting the strap **50** with the piston rod, and the rod **49** can be raised and lowered within certain limits relative to the strap by means of said clamp nuts.

By varying the size of the orifice or bleed port **46**, the time of the delay of the checking of the draft can be controlled, and upward movement of the rod **31** under influence of its springs **41** is checked by the movement of the piston or plunger **48** acting against the trapped air in the cylinder. Obviously, the sides of the port **46** can be accurately controlled by adjusting the screw **47**.

If desired, the rod **31** and the lift arm **34** can swing free on the plunger **24**, in view of the fact that the slot **36** will form an effective guide for said lift arm during the raising and lowering thereof.

From the foregoing description it can be seen that I have provided an exceptionally simple and positive mechanism for operating the check damper gate **13**, with means for controlling the opening movement of the damper.

Changes in details may be made without departing from the spirit or the scope of this invention, but what I claim as new is:

1. In a furnace control of the type having a supporting frame, a damper gate and means rockably supporting the damper gate in the frame above its horizontal diametric center, said gate having a slot therein; a vertically movable lift arm having a portion extending through said slot beyond the inner face of the damper gate, and a bracket on the inner face of said damper gate engaging the portion of the lift arm extending beyond the inner face of the gate.

2. In a furnace control of the type having a supporting frame, damper gate, and means rockably supporting the damper gate in the frame above its horizontal diametric center, said gate having a slot therein; a vertically movable lift arm having a portion extending through said slot beyond the inner face of the damper gate and a roller bracket on the inner face of said damper gate below the pivot point of the damper gate engaging the portion of the lift arm extending through the slot.

3. In a frame control of the type having a supporting frame, a damper gate, and means rockably supporting the damper gate in the frame

above its horizontal diametric center, said gate having a slot therein; a vertically movable lift arm having a substantially horizontal portion extending through said slot beyond the inner face of the damper gate and an upwardly and rearwardly inclined terminal portion, and a bracket on the inner face of the damper gate initially engaging the horizontal portion and then the inclined portion upon the opening of the damper gate.

4. In a furnace control of the type having a frame, a damper gate, and means rockably supporting the gate in the frame above its horizontal diametric center; a vertically movable lift arm having a portion thereof extending beyond the inner face of the damper gate, a bracket secured to the inner face of the gate below the pivot point of said gate for contact with said mentioned portion of the lift arm, spring means normally tending to raise the lift arm for opening the gate, means for lowering the lift arm against the tension of said spring means, and means for limiting the closing movement of the gate.

5. In a furnace control of the type having a frame, a damper gate, and means rockably supporting the gate in the frame above its horizontal diametric center; a vertically movable lift arm having a portion thereof extending beyond the inner face of the damper gate, a bracket secured to the inner face of the gate below the pivot point of said gate for contact with said mentioned portion of the lift arm, spring means normally tending to raise the lift arm for opening the gate, means for lowering the lift arm against the tension of said spring means, and means for limiting the closing movement of the gate, and means for checking the upward movement of the lift arm under the tension of said spring means.

WELTON E. FIREHAMMER.