Nov. 11, 1941. J. ROLAND 2,262,252

AUTOMATIC DAMPER CONTROL

Filed Jan. 28, 1939

FIG. 1

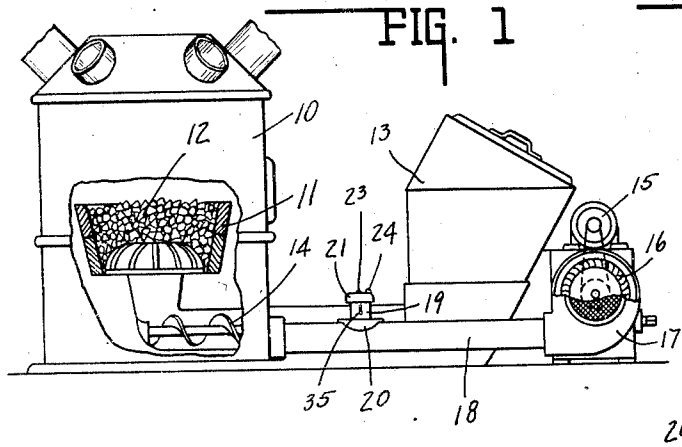


FIG. 5

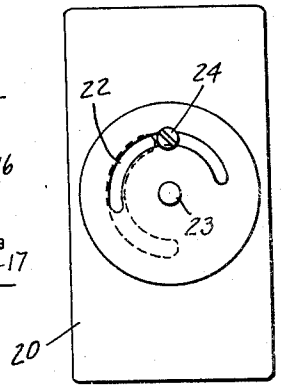


FIG. 2

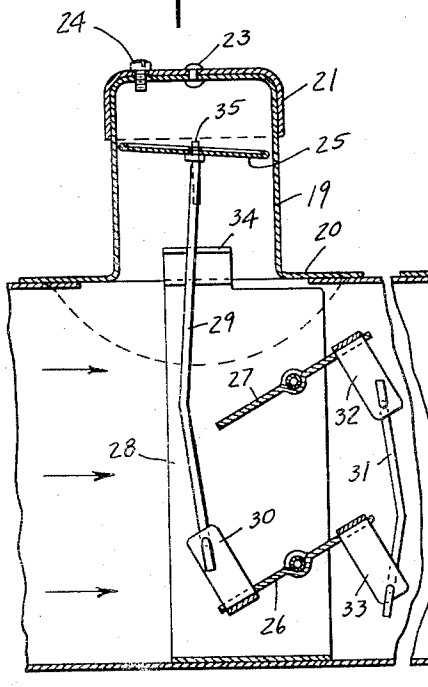


FIG. 3

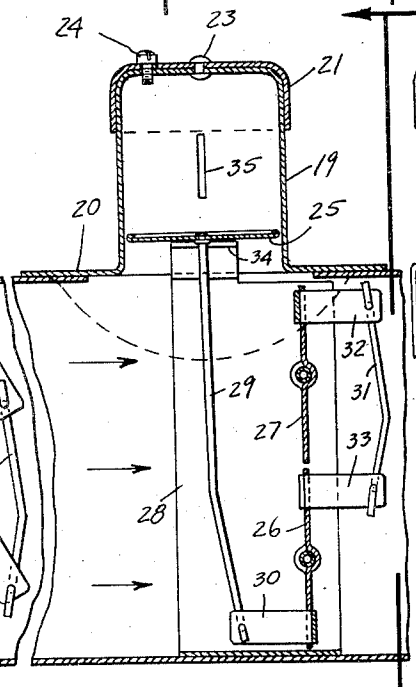
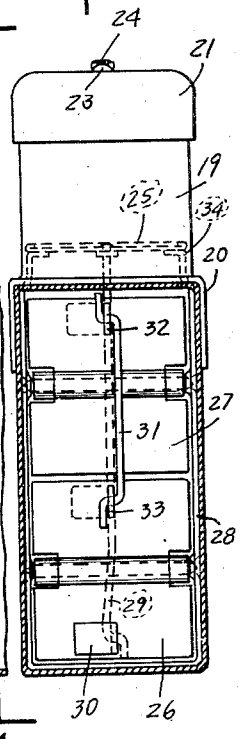


FIG. 4



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AUTOMATIC DAMPER CONTROL

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Application January 28, 1939, Serial No. 253,304

3 Claims. (Cl. 236—45)

This invention relates to an automatic damper control especially suitable for use with furnace stokers and the like, representing an improvement over the control described in Letters Patent No. 1,997,833.

A forced draft is necessary in connection with an underfeed stoker to insure proper combustion of the coal or other fuel fed into the fire pot. The centrifugal blower customarily employed to furnish the forced draft and which operates during the fuel feeding periods must be capable of supplying a sufficient quantity of air regardless of the condition of the fuel bed. The resistance to the passage of air offered by the fuel bed is naturally dependent upon its compactness and depth—the more compact and impermeable it is the more resistance it will offer. It is characteristic of a centrifugal blower that when the resistance against which it is operating is increased the volume of air it delivers will decrease and conversely when the resistance decreases the volume increases. This being so, a blower able to furnish sufficient air when the fuel bed is of maximum compactness, unless controlled, will supply too much air when the fuel bed is shallow and open, resulting in a too rapid and uneconomical consumption of fuel with the resulting difficulties of operation on account of clinkers forming in the burner and burning out the tuyères.

It is one object of this invention, therefore, to provide an automatic damper control which will operate to furnish an additional resistance to the passage of air from the blower when necessary for a constant air delivery. Thus, when the fuel bed is of maximum compactness and depth the blower conduit will be completely open allowing free passage of the air, but when the fuel bed is otherwise the damper control will compensate for the reduced resistance by fully or partially closing the conduit, depending upon the exact condition of the fuel bed, thereby causing the blower to work against a constant static pressure which insures a constant air delivery. It follows from the above that the air delivery of a centrifugal blower operating against a constant static pressure is constant at the same number of revolutions. Since, under ordinary conditions, the rate of fuel feed under a given setting of the stoker feed is constant the quantity of air supplied should also be constant. With this control there is no likelihood of the fuel being uneconomically consumed under any fuel bed condition, and operating difficulties are eliminated and less care required for the operation of the stoker such as manual adjustment for outside temperatures.

The combined resistance of the fuel bed and the resistance of the damper will make the blower work under constant pressure, thereby giving a constant volume of air.

This and other objects are accomplished by means of the construction described in the following specification and illustrated in the accompanying drawing:

With reference to the drawing, Fig. 1 is a diagrammatic illustration of a furnace and stoker showing a firepot and blower conduit with an automatic damper control embodying the invention applied thereto. Fig. 2 is a sectional view through a portion of the blower conduit and damper control showing the damper blades in substantially open position. Fig. 3 is the same as Fig. 2 except that the damper blades are in closed position. Fig. 4 is a section on the line 4—4 of Fig. 3. Fig. 5 is a plan view of the top of the cap surmounting the damper control housing.

In the drawing, Fig. 1 shows a furnace 10 having a firepot 11 with a bed of fuel 12 therein. Fuel is fed into the bottom of the firepot from the hopper 13 by the screw 14 driven by the motor 15 which also drives the centrifugal blower 16 enclosed by the housing 17.

Positioned on top of the blower conduit 18 and in open communication therewith is the uppermost part of the damper control unit including a housing 19 secured to the conduit by a saddle portion 20, said saddle portion being co-extensive with the cylinder portion.

In the cap 21 of the housing there is a curved aperture or vent 22 which, by turning the cap on the swivel 23, can be made to coincide with a similar opening in the top of the housing. The screw 24 serves only to make the adjustment secure and may be omitted. Thus, means are provided to restrict the flow of air from the housing 19 to the atmosphere.

Reciprocal within the housing 19 there is a loosely fitting blade regulating disc or piston 25 which operates to swing the damper blades 26 and 27. Said blades are separately and pivotally mounted on the frame 28, so as to swing to closed or open position depending upon the static pressure within the blower conduit. The control rod 29 connecting the piston and damper blade 26 fits the bracket 30 loosely, and the link rod 31 is similarly connected to brackets 32 and 33.

As is apparent from the drawing, the damper blades 26 and 27 work in unison and are in open

or horizontal position when the piston is uppermost in the housing (Fig. 2) and are in vertical or closed position (Fig. 3) when the piston rests on the seat **34**.

The slot or vent **35** in the housing provides an additional air release which makes for easier ascent of the piston when the piston is at its lowermost point and the position of the control rod is not favorable for leverage. This arrangement further provides an immediate and more sensitive response of the piston to initial pressure in the air conduit. It can be readily seen that as the piston moves upward in the housing the exposed area of slot below the piston increases and thus the pressure urging the upward movement of the piston decreases.

The normal position of the damper blades when the blower is not in operation is vertical, and the blower conduit is closed to the passage of air. Upon operation of the blower sufficient static pressure to raise the piston soon accumulates. The upward movement of the piston swings the blades to open position allowing the air to pass freely to the fuel bed. Should the fuel bed be deep and dense the resistance offered by it will be such as to maintain a static pressure sufficient to keep the piston in a raised position and the blades horizontal. Thus, the maximum draft, usually desirable when the fuel bed is compact, is had. If the fuel bed is loose and shallow, offering little resistance to the passage of air, the static pressure will drop, the piston will move downwardly commensurately, and the blades will tend to return to their normal closed position. The effect is to restrict the draft and thereby prevent the uneconomical consumption of fuel.

With a plurality of simultaneously actuated damper blades, the effect of the velocity of the air against the damper is reduced to such a point that it will respond more readily and be more sensitive to the variations in pressure, resulting in a constant volume of air. A more complete closure of the blower conduit is also possible when the damper blades are in closed position. Further, by reason of the areas of the individual blades being smaller and closer to the pivot point, the rush of air through the conduit offers less resistance to their operation.

Under conditions of little heat requirement, when it is desirable to restrict the draft even when the fuel bed is of near maximum compactness the aperture **22** should be practically closed to cause pressure to build up on the upperside of the piston, thus reducing the volume of air delivered. This permits regulating of the total air volume necessary for the type and amount of fuel fed to the fuel bed and makes a greater static pressure necessary to raise the piston, whereby the conduit will be less frequently open.

The invention claimed is:

1. In a forced draft regulator, an air conduit, a movable damper in said conduit, a housing on said conduit in communication with the latter, a piston in said housing movable by air pressure therein, a control rod operatively connecting said piston with said damper, said damper being in closed position when the piston is retracted and opening progressively as the piston advances, and said housing having an elongated vent in one side disposed parallel to the path of travel of said piston and so positioned that the effective area thereof beyond the piston is progressively decreased as the piston advances; the construction and arrangement rendering the piston more sensitive to pressure within the conduit in its retracted position and progressively less sensitive to such pressure as the piston advances.

2. In a forced draft regulator, an air conduit, interconnected damper blades movably mounted for simultaneous operation in said conduit to close the latter to the passage of air when in one position and to open said conduit when in another position, a housing on said conduit in communication with the latter, a piston movably mounted in said housing, a control rod operatively connecting said piston with said blades, and said housing having an elongated vent in one side disposed parallel to the path of travel of said piston and so positioned that the effective area thereof beyond the piston is progressively decreased as the piston moves outwardly; the construction and arrangement rendering said piston more sensitive to pressure within the conduit in its initial retracted position and progressively less sensitive to such pressure as the piston advances.

3. In a forced draft regulator, an air conduit, a movable damper in said conduit, a housing on said conduit in communication with the latter, a piston in said housing movable by air pressure therein, a control rod operatively connecting said piston with said damper, said damper being in closed position when the piston is retracted and opening progressively as the piston advances, said housing having a restrictable air relief opening in the end of the housing remote from the conduit to regulate resistance to the outward movement of the piston, and said housing having an elongated vent in one side disposed parallel to the path of travel of said piston and so positioned that the effective area thereof beyond the piston is progressively decreased as the piston advances, the construction and arrangement rendering the piston more sensitive to pressure within the conduit in its retracted position and progressively less sensitive to such pressure as the piston advances.

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