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MOTOR OPERATED FLUE DAMPER CARRYING A PRESSURE OPERATED AUXILIARY DAMPER

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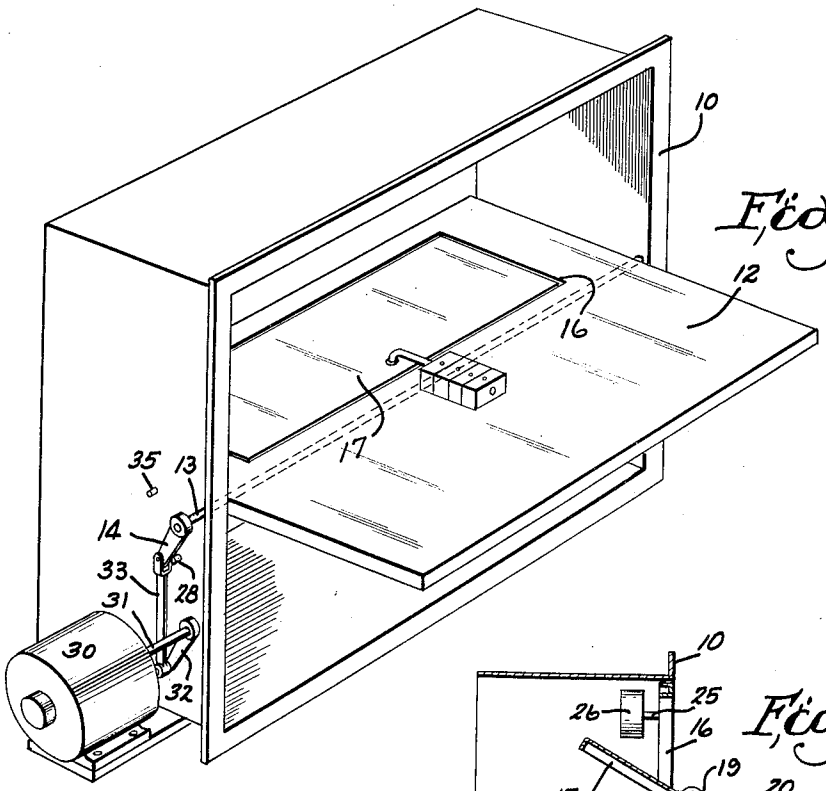


Fig. 1.

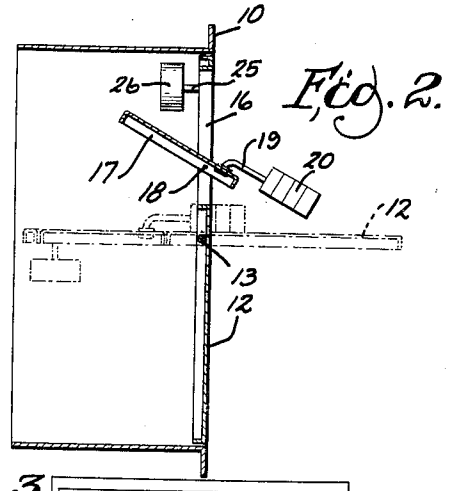


Fig. 2.

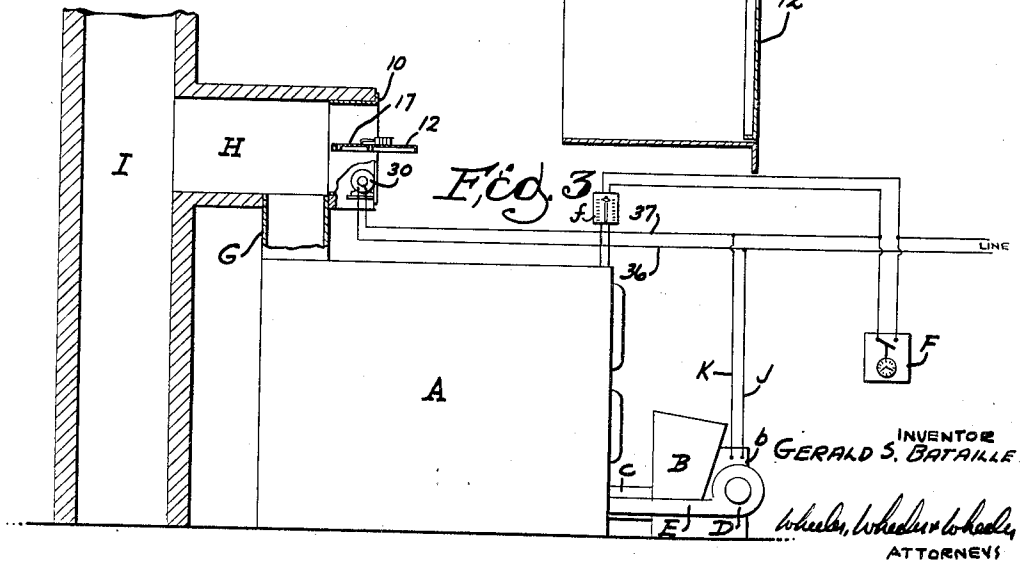


Fig. 3.

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MOTOR OPERATED FLUE DAMPER CARRYING A PRESSURE OPERATED AUXILIARY DAMPER

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12 Claims. (Cl. 110—163)

1

My invention relates to improvements in bleed damper mechanisms.

My primary object is to provide the outlet flue or breeching of a boiler or heater with a draft regulating air admission damper capable of automatic conversion into either a barometric control damper or a main check draft damper in accordance with the varying conditions under which the boiler is operated.

My invention is peculiarly adapted for use in connection with boilers provided with electrically controlled, intermittently operated fuel feeders, and my objects are to conserve fuel, obtain more complete combustion, and reduce or eliminate smoke by automatically regulating the admission of air to the outlet flue or breeching in accordance with varying or alternating natural draft or force draft conditions.

More particularly, my object is to provide the breeching of boilers of the above described type with a combination main damper and barometric control damper, operable in one position as a main damper to satisfy the suction pull of the stack during periods when no or little fuel is being fed into the boiler, and in another position as a barometric control damper for regulating the admission of air to the breeching during fuel feeding periods, as nearly as possible in proportion to requirements for complete combustion.

A further object is to provide the smoke outlet of a fuel burning boiler with a combination check damper and barometric control damper, and associated means for using said dampers alternately for admission of fresh air to the outlet flue.

In the drawings:

Figure 1 is a perspective view of the air inlet portion of a breeching equipped with my improved damper mechanism, showing the main damper plate in full open position, this being the position which it occupies during periods of natural draft.

Figure 2 is a view of the same in vertical section, showing the main damper plate in the closed position which it occupies during fuel feeding periods, the barometric damper being shown in one of the partially open positions which it occupies during such periods.

Figure 3 is a conventional illustration, in side elevation, of a stoker operated boiler with its breeching and stack illustrated in vertical section, and showing my improved damper mechanism in the position which it occupies during periods of natural draft.

Like parts are identified by the same reference characters throughout the several views.

2

The boiler A shown in Figure 3 may be assumed to be an ordinary coal burning heater provided with a stoker having a fuel magazine B. An electrically driven motor in the casing *b* is intermittingly operated to deliver fuel from the magazine B to the boiler through the feed tube C. This motor also drives a blower D which delivers air to the boiler through the pipe E. A timing clock in the casing F periodically connects up the circuit of the motor for operation at short intervals, and a control instrument, such as a pressurestat *f*, is also utilized to connect up the circuit of the motor when further fuel feeding is required. Only then will products of combustion be delivered from the boiler through the outlet duct G and breeching H into a stack I. All of these parts may be of ordinary construction, and it is immaterial to my invention whether the motor in the casing *b* is used for the delivery of solid fuel into the boiler, or whether it is used to operate a pump for the delivery of liquid fuel into the boiler, or a valve for delivery of combustible gas.

The end of the breeching H distant from the stack is provided with a damper supporting fitting 10, in which is mounted a main damper plate 12, the dimensions of which are preferably in substantial correspondence with the cross sectional dimensions of the breeching. This damper plate is connected with the fitting by a pivot shaft 13 which crosses its central portion, and has one end extended through the fitting and provided with an operating crank 14, whereby it may be swung from the full open position in which it is shown in Figure 1 to a closed position as shown in Figure 2.

The portion of the plate 12 above its pivot shaft 13 is provided with an opening 16 in which a barometric damper plate 17 is pivotally mounted at 18, the pivotal axis being located near the lower margin of the plate 17, whereby air pressure on the outer surface of this plate tends to swing it toward a partially open position, such, for example, as that in which it is illustrated in Figure 2. The portion below the pivotal axis 18 is provided with an arm 19 which carries a counter-weight 20 adapted to urge this barometric damper plate toward its closed position. When the main damper plate 12 is in the upright position in which it is shown in Figure 2, the differential pressures on the inner and outer surfaces of the plate 17 determine the degree to which this damper plate will be swung toward open position against the urge of the counterweight 20. In this position, operation of the

barometric damper plate 17 corresponds with that of any ordinary barometric damper, but when the upper half of the main damper plate 12 swings inwardly and downwardly within the fitting 10, its lower half swings outwardly and upwardly to the horizontal position in which it is shown in Figure 1. In so doing, it moves into contact with the counter-weight 20 and lifts it to the Figure 1 position, in which the counter-weight rests flatly on the upper surface of the damper and supports the auxiliary damper plate 17 horizontally in the opening 16. Therefore, when the main damper plate 12 is in its fully open position the damper plate 17 is in a fully closed position, and both dampers offer minimum obstruction to the flow of air into the breeching.

The main damper plate 12 always occupies one of its extreme positions. It is normally biased toward open position by a weight 26 supported from plate 12 by stem 25. Its motion in this direction may be arrested at any desired degree of opening by any suitable stop, as by contact of its pivot shaft crank arm 14 with a stop 28 on the exterior surface of the fitting 10.

But during fuel feeding periods power driven means are utilized to swing the main damper plate 12 to the closed position. In the construction illustrated, this power driven means comprises an electrically driven stall type motor 30, this motor having its shaft 31 provided with a crank 32, connected by a link 33 with the damper operating crank 14.

When the motor 30 starts, crank 32 swings upwardly in a clockwise direction as viewed in Figure 1, and correspondingly swings the crank arm 14 upwardly into contact with the stop 35, in which position the main or check damper 12 is in its upright or closed position.

The motor 30 is in a shunt circuit of the fuel feeding motor in the casing *b*, the feed wires J and K of the feed motor being connected through lines 36 and 37 with the motor 30. Therefore the motor 30 remains energized after it has been stopped by contact of the crank 14 with the stop 35 and it continues to hold the main damper in its closed position until the circuit of the motor in the casing *b* is interrupted and the feeding of fuel into the boiler is stopped. As soon as the motor 30 is deenergized the damper weight 26 will operate by gravity to swing the main damper 12 to its horizontal fully open position, thereby greatly relieving the vacuum in the breeching H.

It will be understood that my invention is adapted to be utilized in any type of heating system operating alternately under natural draft and forced draft, provided the means for operating the boiler under forced draft is adapted to control the operation of the motor 30 during the forced draft periods. Therefore it is immaterial what kind of fuel is used, and it is also immaterial whether the controlling means comprises a motor for driving a fuel feeder or for merely driving the fan D, or any equivalent means for establishing a forced draft through the combustion chamber of the boiler.

I claim:

1. For use in the flue of a fuel burning boiler provided with a motor driven blower for intermittingly operating said boiler under forced draft, the combination with a flue fitting having a draft checking air inlet, of a main damper for said air inlet, said main damper being biased toward fully open position, electromagnetic means having a coil for connection with said motor and an armature connected with said main damper for maintaining the main damper closed while the motor is in operation, and an auxiliary barometric damper operable when the main damper is closed to admit air to said flue.

2. For use in the flue of a fuel burning boiler provided with a motor driven blower for intermittingly operating said boiler under forced draft, the combination with a flue fitting having a draft checking air inlet, of a main damper for said air inlet, means for constantly urging said main damper toward fully open position, electromagnetic means having a coil for connection with said motor and an armature connected with said main damper for closing the main damper while the motor is in operation, an auxiliary barometric damper operable when the main damper is closed to admit air to said flue, and a barometric damper operator with which said main damper is engageable in opening for closing the barometric damper when the main damper is open.

3. For use in the flue of a fuel burning boiler provided with a motor driven blower for intermittingly operating said boiler under forced draft, the combination with a flue inlet fitting having an air inlet of a normally open main damper for said air inlet, and means for holding the main damper closed while the motor is in operation, said main damper having an opening provided with a barometric auxiliary damper operable for the admission of air into the flue when the main damper is closed.

4. A draft control device comprising the combination with a fitting providing an air inlet, of a damper pivoted to said fitting in said air inlet for movement between open and closed positions, said damper having an aperture therein, and a barometric damper mounted in said aperture adapted for the passage of air through said inlet when the main damper is closed and having pivotal connection with the main damper, said barometric damper being biased toward closed position and provided with an arm depending on the barometric damper and positioned in the path of opening movement of the main damper for engagement by the main damper during movement of the latter to hold the auxiliary damper closed while the main damper is open.

5. A flue draft device comprising the combination with a fitting provided with an air inlet, of a damper mounted in said air inlet, a motor having a connection with said damper for the operation thereof in one direction, the damper being biased for movement in the opposite direction, said damper having an aperture therein, and a barometric damper mounted in said aperture, adapted for the passage of air through said inlet when the main damper is closed and having pivotal connection with the main damper, said barometric damper having its center of weight disposed off center regarding its pivot for urging it toward closed position and provided with an arm positioned in the path of movement of the main damper toward its open position for engagement by the main damper during such movement to hold the auxiliary damper closed when the main damper is open, together with means for closing the main damper and comprising said motor having a connection to the main damper and means for energizing and de-energizing said motor, said barometric damper being released for barometric operation by disengagement of the main damper from said arm as the main damper moves toward its closed position.

6. The combination with a boiler outlet flue, of an apertured, pivotally supported main damper plate adapted to partially regulate admission of air to said flue, an auxiliary barometric damper plate carried by the main damper plate in a position to regulate the flow of air into said flue when the main damper is closed, a boiler flue draft blower provided with a motor adapted to intermittently feed and operate the boiler under forced draft, and a damper operating motor having an armature operatively connected to close the main damper, said motor being interconnected electrically for closing the main damper during periods of forced draft.

7. In the flue of a fuel burning boiler subject to alternate periods of high and low draft, a damper mechanism controlling pressures in the flue, including a main damper, means for constantly urging the main damper to a fully open position, power driven means for swinging it to a substantially closed position, and an auxiliary barometric damper mounted on the main damper in a position for operation when the main damper is closed to regulate admission of air to the flue in volumes proportionate to the difference in pressure between the exterior atmosphere and that in the flue.

8. The combination with the outlet flue of a fuel burning boiler, of a damper air inlet fitting, a damper pivotally mounted in said fitting and movable from a closed position to an open position, means biasing the damper normally toward its open position, said damper being apertured and provided with an auxiliary barometric damper mounted in said aperture, adapted for the passage of air through said inlet when the main damper is closed and pivotally connected with the main damper, means biasing said barometric damper toward closed position, and means for intermittently closing the main damper, the biasing means of said barometric damper comprising a weighting arm depending into the path of movement of said first damper from its closed to its open position, said arm being so disposed that engagement of the first damper therewith is effected substantially in the closed position of the barometric damper, whereby said main damper when open will support the barometric damper in a position with the barometric damper substantially fully closed.

9. In a heating system having fuel feeding means, the combination with a flue subject to suction and provided with an air inlet fitting, of a main damper having a pivot shaft mounted in said fitting and provided with an exterior operating crank, stops for limiting the movement of said damper to open and closed position, a weight connected with the main damper to constantly urge it toward full open position, a barometric damper carried by the main damper and supported thereby in an operative position adapted for the admission of air into the flue when the main damper is closed, and means for intermittently closing and holding the main damper in a closed position.

10. A flue fitting comprising the combination with an air inlet frame, of a main damper having a substantially horizontal pintle extending transversely of the frame and upon which said main damper is pivoted, said main damper having its center of mass disposed above said pintle

whereby the main damper is biased for gravity movement toward open position, a motor having an electrical armature provided with a link connection for the actuation of said main damper toward a closed position respecting the frame when the motor is energized, said main damper being provided with a port, a barometric damper disposed to control air flow through said port and provided with a pivotal mounting upon which it is movable to and from a closed position respecting said port, said barometric damper having its center of weight offset downwardly from said pivotal mounting whereby said barometric damper is biased toward movement to an upright position, said barometric damper comprising means disposed in the path of movement of said main damper upon its pintle toward open position and engaged by said main damper when the barometric damper substantially closes said port and is substantially in the plane of the main damper, whereby continued movement of the main damper will carry the barometric damper with it in substantially closed position respecting the port.

11. The device set forth in claim 10 wherein said motor comprises an electric motor of the stall type having an external shaft, said shaft and pintle having rocker arms between which said link is connected.

12. A draft control device comprising the combination with a flue fitting providing an air inlet, of a main damper comprising a plate pivoted intermediate its top and bottom ends to said fitting for movement between open and closed positions for controlling the flow of air through said inlet, said main damper having an aperture therein, and an auxiliary damper comprising a second plate pivotally mounted on the main damper for movement to and from a position of parallelism with the main damper, the auxiliary damper being adapted to substantially close said aperture when parallel to the main damper, and having its weight so disposed as to bias it toward said position of parallelism when the main damper is closed, the auxiliary damper having means in the path of opening movement of the main damper for engagement by said main damper during movement of the latter toward its open position, whereby to hold the auxiliary damper in parallelism with the main damper when the latter is open, and thus to assure substantially unobstructed flow of air through said inlet over and under said parallel dampers when the main damper is open.

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