DRAFT CONTROL DEVICE FOR SOLID OR FLUID BURNING FURNACES

FIG. 9

FIG. 10

FIG. 12

FIG. 13

FIG. 14

FIG. 15

FIG. 16

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My invention relates to draft controls and has for its objects to provide a new and efficient draft control device for solid or fluid burning furnaces in which the draft through the flue to the stack is controlled and with the back draft down the stack into the flue shut off by a valve in the device.

A further object is to provide a draft control device having a double plate valve formed at acute angles to each other and mounted through the top of a casing with a partition in said casing having a port therethrough said valves to close or partially close said port depending upon the velocity of draft through said casing or upon the back draft through said casing with an adjustable device for setting the draft opening to prevent excessive draft from entirely shutting the port in the partition and smothering the fire in the furnace.

A still further object is to provide a draft control device having a valve mounted therein and so balanced and counterbalanced as to shut off excessive draft up through the stack or back draft down the stack.

A still further object is to provide an adjustable draft control device for use in coal burning furnaces which will automatically shut off excessive draft in the flue leading to the stack and which will completely shut off back draft down the stack and which by such operations will save fuel in the furnace and reduce stack losses.

A still further object is to provide a valve in the flue pipe which will close limiting the draft to a predetermined amount when excessive draft conditions occur thereby preventing excessive burning of the fuel in the furnace.

A still further object is to provide a draft control device which under normal stack draft conditions allows a full opening of the passage into the flue, thereby eliminating any stricture or unnecessary friction, which would prevent complete or efficient burning during normal or low draft periods.

A still further object is to provide a draft control device which may be used on either solid fuel burning furnaces or on furnaces burning fluids, and such device to be provided with means for shutting off the back draft and allowing the consumed gases to escape through a port in the top thereof, the valve of the port being opened by, and simultaneously with, the back draft in the flue.

A still further object is to provide a draft control device which may be used on either solid burning furnaces or on furnaces burning fluids, such device being provided with a draft relief plate in the bottom side thereof, said plate to open during excessive draft periods and to remain closed during normal or low draft periods.

A still further object is to provide means for escapement of gases only during back draft periods or during partial or complete flue stoppage.

A still further object is to provide an upward discharge of the products of combustion from the furnace, thereby preventing build up of pressure with no resistance to the escaping gases, giving them free passage from the device.

These objects I accomplish with the device illustrated in the accompanying drawings in which similar numerals and letters of reference indicate like parts throughout the several views and as described in the specification forming a part of this invention and pointed out in the appended claims.

In the drawings Figure 1 is a vertical section through the device.

Figure 2 is an end view of Figure 1. Figure 3 is a vertical cross section through the device on line 3—3 of Figure 1. Figure 4 is a modified form of balancing the valves of the invention.

Figure 5 is another form of balancing the valves.

Figure 6 is a form of balancing the opposite side of the valve to that shown in Figure 4.

Figure 7 is a form of balancing the valves with a weight carried on a cross shaft therebetween.

Figure 8 is a diagrammatic side elevation of the furnace, flue and stack with my device in place in the flue.

Figure 9 is a vertical section of the device modified.

Figure 10 is an end view of Figure 9.

Figure 11 is a section on line 11—11 of Figure 9. Figures 12, 13, 14, and 15 are diagrammatic views of the valve used in the type of device shown in Figure 9.

Figure 16 is a diagrammatic side elevation of a furnace, flue and stack with my device shown in the flue pipe leading to the stack.

Figure 17 is a vertical section of a type of device using a single pivoted control valve and having double ports on each side thereof; the valve to close either of said ports as desired.

Figure 18 is an end view of Figure 17.

Figure 19 is a vertical cross section on line 19—19 of Figure 17.

Figure 20 is an edge view of the valve used in Figure 17.

Figure 21 is an edge view of the valve showing forms of adjusting the balance thereof.

Figure 22 is a diagrammatical view of a fur-
nace and stack with my device in place in the flue pipe.

Figure 23 is a modified form of Figure 17 showing means to open a port into the atmosphere surrounding the device and a draft relief plate thereon.

Figure 24 is an end view of Figure 23.

Figure 25 is a section on line 25—25 of Figure 23.

Figure 26 is an edge view of the valve used in Figure 22.

Figure 27 is an edge view of the valve showing the method of balancing.

Figure 28 is a diagrammatical view of the nace and stack with this modified device shown in the flue pipe.

In the drawings I have shown the draft control as made of a rectangular casing A, having an inlet pipe connection 1 leading therefrom to one end and an outlet pipe connection 2 leading thereinto from the opposite end. The pipe 1 is connected with the flue pipe B by a flue pipe 3 and the pipe 2 is connected with the stack C by a pipe 4.

25 Within the casing A there is a vertical partition 5 dividing the casing A into inlet chamber E and outlet chamber R and said partition having a port 6 therethrough. Across the top of an arm directly above the partition 5 is a slot 7 through which a control valve V is mounted, said valve V being made of valve plates 9 and 10 formed together at the top and at an acute angle to each other. The valve V may be made of a single plate bent to form the plates 9 and 10 or of separate plates secured together at the top. On each end of the valve V is a boss 11 through which pivot or pintle pins 12 are passed. The pins 12 set into bearing blocks 13 which are secured onto the top side of the casing A, at each end of the slot 7. The plates 9 and 10 extend down into the casing A on each side of the partition 5 sufficient distance to allow the valve 10 to entirely close the port 6 when back draft actuates the valves and to normally allow the valve 9 to close the port 6 but in order to prevent the complete closing of the port 6 by the valve plate 9 I provide an adjustable valve stop 15 mounted on a screw shaft 19 through the partition 5 and extending out through the end 17 of the casing A with a crank handle 18 thereon by which the amount of opening allowed between the valve 9 and port 6 may be controlled. The end 17 of the casing A is reinforced at 18 surrounding the shaft 19 where it passes through the partition 5. This provides a stop for the valve 9 and an adjustable feature to control the amount of opening through the port 6 thereby controlling the excess draft through the casing A.

Medially on the top of the valve V bisecting the angle between the valves I mount a counterbalance shaft 25 said counterbalance shaft carrying a weight 26 thereon secured adjustable thereto by a set screw 27.

In Figures 4, and 6 I have shown a weight adjustment feature for the valve plates 9 and 10 made by a rod 29 extending out from either of the valves and carrying a weight 30 thereon secured thereto by a set screw 31.

In Figure 7 I have shown a cross bar 33 mounted between the plate valves 9 and 10 with a weight 33 carried thereon and adjustably secured thereto by a set screw 34 the weight being moveable in either direction on the bar 32 to provide for adjustment of either valve as desired.

In Figure 9 I have shown the casing as A1, having the inlet pipe 1 in one end and the outlet pipe 2 in the opposite end. Onto one side of the valve V1 I provide an extended arm 35 said arm carrying a roller 36 thereon at right angles to the main body of the arm said roller to be engaged with the under side of a closure plate 37 which closure plate normally shuts off a vent port 38 in the top side of the inlet chamber E1 of the device.

The plate 37 is hingedly connected to one side of the top of the casing by the hinge pin 39.

Through the bottom of the outlet chamber F1 I provide a draft relief vent or port 40 carrying a closure plate 41 therewith said plate being mounted on vertical pins 42 through holes in the plate with sufficient play in the holes surrounding the pins to allow the plate to raise when sufficient suction is created in the chamber F1 to lift the dead weight of the plate.

A valve stop 43 is screwed through a reinforced portion 44 of the partition 5a to control the amount which the valve 9a may close when sufficient draft is through the device to draw the valve to closing the port through the partition.

In Figures 12, 13, 14 and 15 the only difference from those shown in Figures 4, 5, 6 and 7 being that the extended arm 35 is shown thereon.

In Figures 17, 18 and 19 I have shown the casing A2 divided into three chambers by partitions 45 and 46 with ports 47 and 48 through the partitions respectively. Centrally through the top of the central chamber between the partitions I provide a slot 49 through which a single closure valve 50 is passed. The valve 50 is mounted similarly to the valve V having bosses 51 formed on the top outside edges with pintle pins passed therethrough to pivot the valve in blocks 52 on the top of the casing A2. Thus the valve 50 is pivotally mounted so as to close either port depending upon the direction of draft through the device. A valve stop 53 carried on a shaft 55 which is mounted through the reinforced portion 54 of the partition 46 and extended out through the end of the casing with a crank handle 57 on the end thereof by which the stop may be adjusted to adjust the amount of draft through the port 48.

The valve 50 may be provided with a cross shaft 58 therethrough on which balance weights 59 and 60 may be secured by set screws 61. This is to provide means for balancing the valve and a counter balance shaft 62 is secured to the top of the valve carrying a weight 63 adjustable secured thereon by a set screw 64.

In Figures 23 to 28 inclusive I have shown a type of device which has only one valve but which may be used with either gas, solid fuel or other fluid fuels and the casing A3 is divided similar to Fig. 17 with partitions 45a and 46a mounted therein and having ports 47a and 48a therethrough with the plate valve 50a mounted therebetween to close the ports 47a or 48a.

On one side of the valve 50a I provide an arm carrying a roller 66 at right angles to the end thereof and said roller is adapted to engage the under side of a closure plate 67 through a port 68 in the top of the casing A3. This plate 67 is hingedly mounted on the top side of the device by a hinge pin 69. Thus if back draft closes the valve 50a over the port 47a the arm 65 will open the port 68 into the atmosphere.

A relief port 70 is formed through the bottom of the casing A2 between the partition 46a and
the end of the casing said port to be normally closed by a draft controlled closure plate 71 mounted on pins 72 with the holes surrounding the pins large enough to allow for free opening of the valve when excessive draft lifts the dead weight of the plate. A valve stop 74 is passed through a reinforced portion 75 in the partition 46b to prevent complete closing of the port 48b and provide adjustable means for controlling the amount of draft through the device should excessive draft periods occur through the device.

The operation of my invention is as follows:—

The inlet pipe 1 is connected with the pipe 3 and the outlet pipe 2 with the pipe 4. The size of the draft opening having been predetermined the stop 15 is set to allow only that amount of draft through the port 8 when the plate 9 is touching the stop 15. The weight 26 is set to balance the valve V as may be necessary and should other means be needed for balancing the valve the weights 29 or a single weight 33 as shown in Figure 7 may be used.

During normal draft conditions there would be very slight fluctuations of the valve V. When increased draft conditions occur the valve V will pivot but only touching the plate 9 to the stop 15 when sufficient draft occurs to draw the valve thereagainst. During low draft conditions or normal draft conditions the valve V is pivoted so as to allow free passage of air through the entire device.

When back draft occurs down the stack C the valve 10 will be forced toward the partition 5 depending upon the amount of back draft. If sufficient back draft occurs the valve plate 10 will shut off the port 6 preventing this back draft from entering the furnace or effecting the fire therein.

The operation of the type shown in Figure 9 is identical with the operation described above with the following additions:

When excessive draft conditions occur the valve V1 is drawn to make the plate 8a engage the stop 15. Should this draft continue the relief valve 41 will be lifted and the draft relieved on the stack side or outlet chamber F1 casing, thereby preventing excessive velocity through the port 6.

When back draft conditions occur in this type of device the closing of the valve V1 takes the side 10a to the partition at the same time the arm 35 and roller 36 will raise the plate 37 opening the vent port 38. Thereby providing means to escape the products of combustion to the surrounding atmosphere. This port will remain open or partially open as long as the back draft conditions continue. When normal draft conditions again exist the plate 37 closes the vent port 38. The valves in this device may be balanced by the weights used to hold the valve V1 in the full open position under normal or predetermined draft conditions and to open the port 38 when these conditions cease to exist and back draft or subnormal conditions occur. In case of partial or complete flue stoppage the valve V1 will partly or entirely close depending upon the degree of stoppage thus escaping a portion or all of the consumed gases into the atmosphere commensurately with the stoppage. This prevents any possibility of smothering the fire in the furnace and any possibility of the formation of carbon monoxide gases.

In the other two modifications of the device the operations will be identical to the operations hereinbefore described. The results accomplished will be the same the only difference being that single valve will control the two ports instead of the double valve controlling the one port.

Having thus described my invention, I desire to secure by Letters Patent and claim:

1. In a draft control the combination of a casing having a partition therethrough; a port through said partition; a double valve mounted through said casing with one plate on each side of said partition; means to prevent one plate from entirely closing said port; an arm secured onto one side of said valve; a port through the top of said casing on the side of the casing which is connected with the furnace; a closure plate hingedly connected to said casing to close said port and a roller on the end of said arm to open said plate when back draft through said casing closes the port through the partition.

2. In a draft control for use in the flue pipe of furnaces, the combination of a casing having a partition therethrough and a port through said partition; a double valve mounted through said casing with one plate on each side of said partition; means to prevent one plate from entirely closing said port; an arm connected onto one side of said valve; a port through the top of said casing on the side of the casing which is connected with the furnace; a closure plate mounted to the top of said casing over said last-mentioned port; a roller on the end of said arm to open said closure plate when back draft through the casing closes the port through the partition; means through said partition to prevent complete closing of said port when excess draft is passing through said casing; a draft relief port through the bottom of said casing in the end which is connected to the stack; and a plate carried over said port to open said port when excess draft occurs in said casing.

3. In a draft control the combination of a casing having a partition therein; a port through said partition; a counterbalanced double plate valve mounted with one plate on each side of said partition, said plate to close or partially close said port depending upon draft conditions through said casing; and means carried on said valve to weight either of said valve plates as necessary.

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