Sept. 19, 1950 D. C. HUBBART 2,522,786

DRAFT CHECK FOR SMOKE PIPES

Filed July 22, 1946

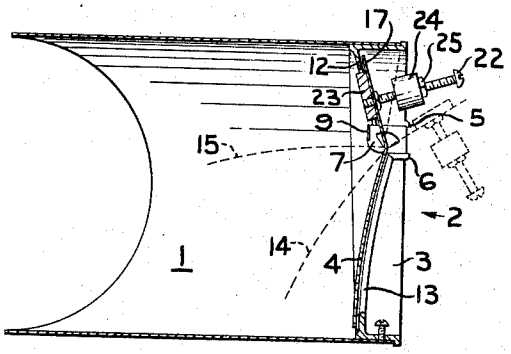


FIG-1

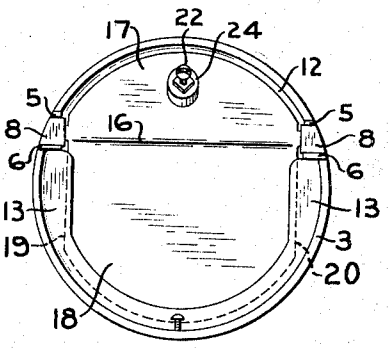


FIG-2

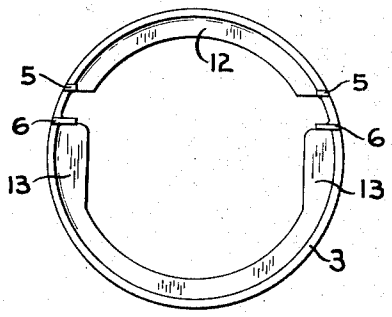


FIG-3

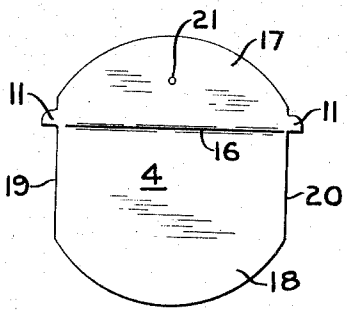


FIG-4

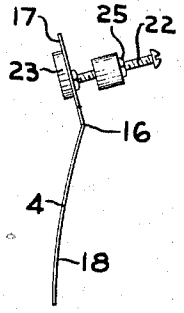


FIG-5

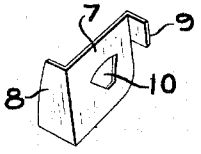


FIG-6

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DRAFT CHECK FOR SMOKE PIPES

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9 Claims. (Cl. 236—45)

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My present invention relates to a device for controlling draft and, while this invention might have other applications, it is intended primarily for attachment to a conduit or smoke pipe extending from a combustion chamber or furnace, of domestic or commercial type, to a chimney.

Changing weather conditions, variance of outdoor air movement, and fluctuation in flue gas temperatures are common causes for fluctuating draft intensity in the gravity-type chimney. In many heating installations, a relatively low draft of uniform intensity is desired.

Among the objects of this invention are the provision of means for maintaining a desired uniform draft value on the furnace or combustion chamber when a variance of higher draft values in the chimney to which it is connected obtain; the provision of draft regulation by means of an apparatus which will simplify the fabrication of the control means and minimize the size of attached counterweights necessary for correct gate function; the utilization of parts of the weight of both the upper and lower portions of the damper or gate in securing the proper balance and functioning of the damper; the formation of the gate and its housing so as to utilize a favorable vector position with respect to the direction of the air entering through the upper portion of the housing; the construction of a damper and its housing in such a manner that the rear or inner face of the damper can be used practically to produce a highly desirable sensitivity when the damper is in a nearly wide open position; and such further objects, advantages, and capabilities as will hereafter appear and as are inherent in the construction disclosed herein. My invention further resides in the combination, construction, and arrangement of parts illustrated in the accompanying drawings and, while I have shown therein what is now regarded as the preferred embodiment of this invention, I desire the same to be understood as illustrative only and not to be interpreted in a limiting sense.

In the drawings annexed hereto and forming a part hereof,

Fig. 1 represents a central vertical section of a gas pipe leading to a smoke pipe and a damper according to my invention mounted therein;

Fig. 2 is an elevational face view of a damper and its supporting ring;

Fig. 3 is a similar view with the damper removed;

Fig. 4 is an elevational face view of the damper;

Fig. 5 is an edge view of the damper removed from the supporting ring and having a counterbalance weight attached thereto; and

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Fig. 6 is a perspective view of a supporting member for one edge of the damper, the same being shown in elevation in Fig. 1.

Reference will now be made in greater detail to the annexed drawings for a more complete description of this invention. A branch pipe 1 is shown as being cut at one end to fit against a smoke pipe of similar size, the same having a hole therein for the passage of air entering through the control member 2, comprising the supporting ring 3 and the damper 4.

The supporting ring 3 has two pairs of lugs 5 and 6 projecting outwardly, between which the two supporting members 7 are secured. Each supporting member has a flange 8 at one end and a second flange 9 at the opposite end, the flange 8 being received between the lugs 5 and 6 and the flange 9 projecting inwardly to serve as a stop to limit the swinging motion of the damper 4 in one direction. The supporting members 7 have openings 10 formed therein by punching out a piece of the metal, if made from metal. The damper 4 has ears 11 projecting laterally therefrom, each adapted to be received in one of the openings 10, each of the ears having at its bottom a knife-edge to rock in the bottom of the V-shaped opening 10.

Projecting inwardly from the upper portion of the ring 3 is a flange 12 against which the upper edge of the damper 4 closes to substantially prevent passage of air through the upper part of its opening movement. A flange 13 is integral with the lugs 6 and extends inwardly from the lower part of the ring 3, being positioned to be engaged by the lower part of the damper 4 when it closes. It is clear that, when the damper 4 closes against the flanges 12 and 13, the flow of air through the tubular member 1 will be entirely or substantially entirely cut off. However, as the draft through the smoke pipe increases, there is also an increased suction through the pipe 1 tending to turn the damper 4 about the lower edges of the ears 11. The turning of this damper is shown by the broken lines 14 and 15 which indicate different degrees of opening of the damper.

The damper 4 is bent along a transverse axis 16, being thus divided into an upper section 17 and a lower section 18. The upper section 17 is substantially flat while the lower section 18 is curved, the transverse elements of the surface being parallel to the line 16. This curvature may be cylindrical but I have found that it works better when the lower portion of the part 18 has

a shorter radius of curvature. As shown at 19 and 20, the lateral edges of the damper 4 are cut away along lines substantially perpendicular to the line 16. This permits the damper to swing upwardly about the pivot line 16 without the edges engaging the wall of the branch pipe 1.

A hole 21 is formed in the upper part 17 of the damper for the reception of the bolt 22 on which are mounted the counter-balancing weights 23 and 24. The weight 23 is adjusted at the factory to get a desired balance and is then secured in position to the damper. In order to vary the checking effect of the damper to fit the particular installation in which it is used, the counter-balancing weight 24 is provided, and then this is secured in position by a lock nut 25 after the desired adjustment has been made.

The location of the line 16 may be varied from a point on or slightly above the horizontal diameter of the damper to a point considerably above that position but I regard that a position approximating one-third of the distance from the top of the damper to the bottom thereof is the preferable location. I have shown its location a little closer than that to the bottom edge of the damper.

When the damper 4 is in the position shown at 14 in Fig. 1, the air pressure against the upper part 17 of the damper counteracts part of the lifting force of the air against the lower part 18 thereof. This is true also in all positions of the damper below the position 14, as well as being true in part in higher positions. However, as the damper rises above the position 14, the pressure of the air against the upper part 17 decreases, thus compensating in part for the decrease of pressure against the lower part 18, due to the rising thereof. Consequently, it is not necessary to have an increasing air pressure occasioned by the angle of incidence of the air against the damper. From the foregoing and the attached drawings, it is obvious that the degree of control effected depends for its value on the means by which air is metered through the control member 2 in the direction of the smoke pipe, and from the pipe 1 into the smoke pipe to which the pipe 1 is attached. It is further obvious that, by positioning the gate, as illustrated by 4 in Fig. 1, no appreciable entry of air into the branch pipe 1 is allowed above the pivot line 16, as shown in Fig. 5, as the gate swings from a closed position, as indicated by 4 in Fig. 1, through approximately its first one-third of full swing range to position 14. Thus, by allowing entry of air substantially only below the pivot line 16 through the first approximately thirty degrees (30°) of opening to position 14, a high degree of accuracy can be maintained when only a small corrective function of entering air is required to overcome a slight excess draft in the chimney beyond the minimum value desired in the furnace or combustion chamber. To achieve this objective, two conditions must be present; first, the damper 4 must be bent, not only as indicated in Fig. 5, but, second, it must also be so located in the branch pipe 1 as to allow the upper edge of the damper 4, extending upward from the pivot line 16, to remain within the branch pipe 1 during the first approximately thirty degrees (30°) of opening from closed position to position 14 of the damper. The uniqueness of control is dependent upon the foregoing combination.

It is of course understood that the specific description of structure set forth above may be departed from without departing from the spirit of this invention as disclosed in this specification and as defined in the appended claims.

Having now described my invention, I claim:

1. A draft check for the purpose stated comprising, in combination, a supporting ring for insertion in a branch air inlet pipe connected to a smoke pipe, said ring having a pair of oppositely related V-shaped notches serving as bearings for supporting a damper, a damper having opposite parallel sides to be arranged substantially vertical in said ring, said damper having supporting lugs extending laterally from said parallel sides and engaged in said V-shaped notches whereby to swingingly support the damper in said ring, said damper being bent on a transverse axis approximately in alignment with the supporting edges of said lugs, and abutment means in the ring projecting inwardly to be engaged by the two sections of the damper.

2. A draft control for a smoke pipe comprising a ring for insertion into a branch pipe leading into a smoke pipe, said ring having an inwardly extending flange around its upper part against which a damper may close to substantially stop the entrance of air through said upper part, a damper mounted in said ring for oscillatory motion about a transverse axis, said damper being bent along said transverse axis, the part of the damper above the bend being flat and the part below the bend being convex inwardly toward the smoke pipe, said ring having a flange extending inwardly about its lower part, said flange being curved to substantially fit the edge portion of the concave face of the lower part of the damper, and an adjustable counterweight attached to the damper, said damper having laterally projecting trunnions for pivotally mounting it in the ring.

3. A draft check for the purpose stated comprising, in combination, a supporting ring for insertion in a branch air inlet pipe connected to a smoke pipe, said ring having a pair of oppositely related V-shaped notches serving as bearings for supporting a damper, a damper having opposite parallel sides to be arranged substantially vertical in said ring, said damper having supporting lugs extending laterally from said parallel sides and engaged in said V-shaped notches whereby to swingingly support the damper in said ring, said damper being bent on a transverse axis approximately in alignment with the supporting edges of said lugs, and abutment means in the ring projecting inwardly to be engaged by the two sections of the damper, the bottom of the lugs being V-shaped in cross-section.

4. A check for a furnace smoke pipe comprising a ring to be mounted in a branch pipe leading into the smoke pipe, bearings connected with said ring to furnish support for a damper, said bearings being located above the horizontal diameter of the ring, and a damper having lateral projections to be mounted in said bearings to furnish a turning axis about which the damper may oscillate, the damper being located inwardly from the free end of the branch pipe a distance such that the damper will turn approximately thirty degrees (30°) about its pivotal axis before allowing any appreciable amount of air to pass through its upper part, the turning axis dividing the damper into an upper substantially flat section and a lower curved section, said two sections making a substantial angle with each other.

5. In a draft check to be mounted in a branch pipe leading into a smoke pipe, the combination of a supporting ring adapted to be connected to

the branch pipe to support a damper in position to control the flow of air therethrough, said ring having V-shaped notches for the reception of pivot members, a damper having substantially parallel sides from which extend pivot members to cooperate with the notches in supporting the damper in the ring, said damper being bent along an axis extending substantially perpendicular to said substantially parallel sides, whereby to make the upper and lower sections of the damper extend inwardly toward the smoke pipe at an angle toward each other whereby to allow the lower section of the damper to open before the upper section starts to open, the upper part of the damper being substantially flat and the lower part being roughly cylindrically convex inwardly, and a counterbalance weight mounted on said damper for varying the resistance to air draft entering the pipe.

6. In a check for a branch pipe opening into a smoke pipe, a check damper having a flat upper portion and a curved lower portion and substantially straight lateral edges provided with laterally projecting fingers upon which the damper is supported for oscillatory motion, said fingers being spaced inwardly from the outer extremity of the branch pipe a distance such that the check damper must swing about its axis at least fifteen degrees (15°) before the upper portion of the damper will permit any substantial entrance of air into the pipe.

7. In a check for a branch pipe opening into a smoke pipe, a check damper having curved lower sections and substantially straight lateral edges provided with laterally projecting fingers upon which the damper is supported for oscillatory motion about a turning axis, said fingers being spaced inwardly from the outer extremity of the branch pipe a distance such that the check damper must swing about its axis at least fifteen degrees (15°) before the upper portion of the damper will permit any appreciable entrance of air into the pipe, and a counterbalancing weight having a part rigidly connected to and forming a part of the upper section of said damper, another part of said weight being adjustable with reference to the first part to vary the balance of the damper, and said damper being bent along the transverse axis defined by the turning axis of the fingers, the lower portion of the damper being located inwardly from the plane of the upper portion.

8. A check damper for installation in a draft

control pipe, said damper being fabricated primarily from sheet metal and provided upon opposite edges with supporting pivotal members, the body of the damper being bent along an axis substantially coincident with the turning axis of the damper defined by the lower edges of the pivotal members, the two segments of the damper above and below the line of bend thereof being at a substantial angle with reference to each other, the upper section of the damper being smaller than the lower section thereof, and both sections leaning inwardly from said turning axis which is located inwardly from the outer end of the draft control pipe so that the upper section of the damper will remain closed through a substantial angle of turn while the lower section is opening.

9. A device for regulating fluid flow in a tubular conveyor comprising a mounting branch for attachment to the conduit in which the flow is to be regulated, in which a damper, bent along a transverse axis above the center of the damper, is located for pivotal swing within said mounting branch to allow opening access through said mounting branch into said conduit, the flow in which is to be regulated, the opening through the branch being substantially on one side only of the turning axis of said damper during the first fifteen degrees (15°) to thirty-five degrees (35°) of said damper swing from closed position, the opposite side of said damper being so formed and positioned within said mounting branch as to allow substantially no degree of opening to said conduit until after said damper has turned at least fifteen degrees (15°) from closed position, from which position, on further damper swing, opening into said conduit gradually is increased as the edge of said opposite side of the damper, above the turning axis of the damper, leaves the outer extremity of the mounting branch.

DONALD C. HUBBART.

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