Jan. 30, 1940. E. N. BERG 2,188,564

DRAFT REGULATOR FOR CHIMNEYS

Filed Feb. 8, 1939

Fig. 1.

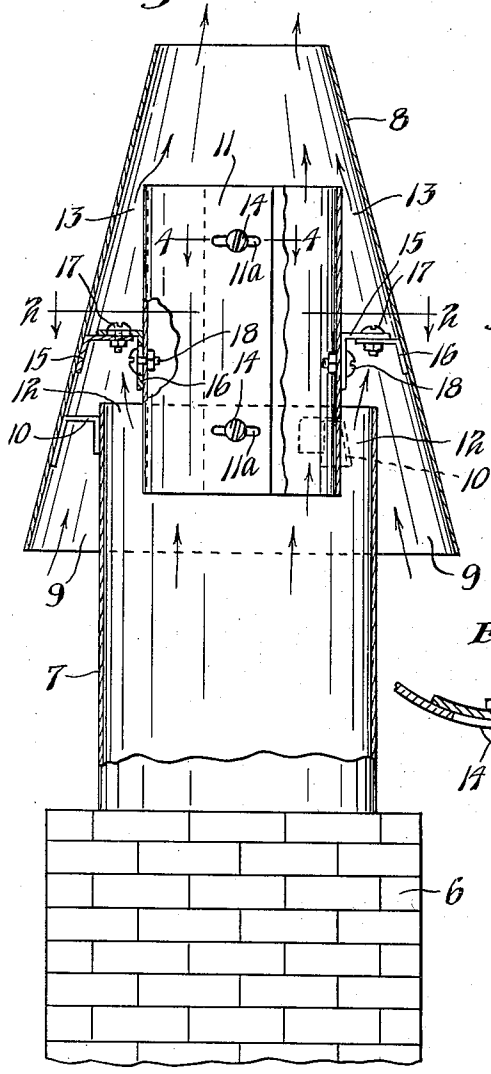


Fig. 2.

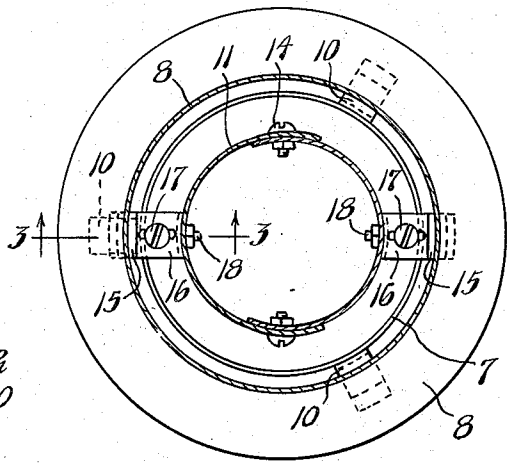


Fig. 4.

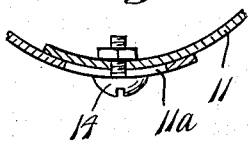
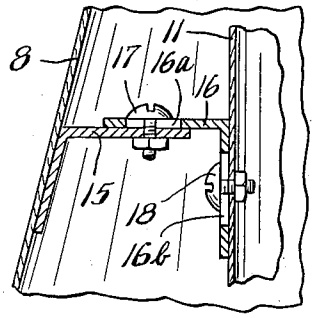


Fig. 5.

Fig. 3.



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DRAFT REGULATOR FOR CHIMNEYS

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7 Claims. (Cl. 98—78)

My invention relates to chimney cowls and particularly to chimney cowls having a draft-regulating action.

In connection with heating plants it is desirable to have an ample but not excessive draft when operating with a heavy fire and a relatively slight draft when operating with only a small fire since too much draft for a given size of fire will cause poor economy in the use of fuel for the reason that the hot gaseous products of combustion will pass out of the furnace before very much of the heat contained in the gases has been transferred to the heating system.

A object of my invention is to provide a draft-regulating device the action of which will not be affected by atmospheric conditions and which will cause the draft to vary in accordance with the size of the fire in the furnace until a maximum draft condition is secured whereupon no greater draft will be obtained even if the furnace fire burns more strongly.

Another object is to provide such a draft-regulating device which will be highly sensitive to furnace fire conditions and which may be adjusted as to the sensitivity of operation thereof and the maximum draft obtainable therewith.

Still another object is to provide such a regulation device which is adapted to be installed on the top of any chimney without necessitating any appreciable changes being made in the same.

A further object is to provide such a regulator of simple, light, rugged and inexpensive construction.

These and other objects and advantages will be more apparent from the following description made in connection with the accompanying drawing, wherein like reference characters refer to the same or similar parts throughout the several views, and, in which:

Fig. 1 is a vertical sectional view of a preferred embodiment of my invention shown in operative association with a chimney;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1 as indicated by the arrows;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2 as indicated by the arrows;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 1 as indicated by the arrows, and

Fig. 5 is a vertical sectional view of another form of my device.

Referring to the drawing and particularly to Figs. 1 to 4 inclusive thereof, an embodiment of my invention is shown in operative relation with a chimney 6. A vertically disposed tubular member 7 is placed upon the top of the chimney in communication with the interior thereof to project upwardly therefrom. The member 7 comprises one of the parts of my device when the same is constructed for use in connection with a chimney built of brick or the like but, where my device is to be applied to the top of a tubular steel stack or the like, the member 7 may consist of the uppermost portion of the tubular stack.

An outer member 8 of hollow frusto-conical form is disposed in co-axial relation with the tubular member 7 with the lower portion of the outer member 8 associated with the upper part of the tubular member 7 in radially outwardly spaced, partially telescoped relation therewith so as to leave an annular space or passage 9 therebetween. Several brackets 10 are provided connecting the lower portion of the frusto-conical member 8 to the upper portion of the tubular member 7 for support therefrom.

An inner element 11 of tubular shape is placed within the frusto-conical member 8 in co-axial relation with the same and the tubular member 7. The lower portion of the tubular element 11 is telescoped into the upper end of the tubular member 7 in radially inwardly spaced relation therewith so as to provide therebetween an annular space or passage 12 in communication with the interior of the tubular member 7. The upper edge of the tubular element is in radially inwardly spaced relation with the upper portion of the frusto-conical outer member 8 so as to provide an annular passage 13 therebetween.

The inner tubular element 11 is so arranged as to be adjustable in diameter for the purpose of adjustively varying the effective cross-sectional area of the annular passage 12 previously described. The tubular element is formed of a pair of rectangular sheets of material rolled and assembled into tubular form as indicated in Fig. 2 with longitudinally extending marginal portions thereof overlapping in a circumferential direction. As shown in Fig. 4, one of the overlapping marginal portions, at each joint between the respective sheets, is apertured and the other overlapping marginal portion is provided with circumferentially extending slots 11a, and nutted bolts 14 are extended through the slots 14 and apertured portions to enable adjustive variation in the degree of overlap and locking of the overlapping portions in any adjusted relation thereof.

Means is provided for supporting the inner tubular element 11 from the outer frusto-conical member and permitting adjustive longitudinal movement of the inner tubular element 11 relative to the frusto-conical member 8 for the pur-

pose of adjusting the effective cross-sectional area of the annular passage 13 therebetween. As shown in Fig. 3 radially inwardly projecting apertured brackets 15 are provided on the inner side of the frusto-conical member 8 in line with the medial portion of the tubular inner element 11. Angle pieces 16 having longitudinal slots 16a and 16b in the respective legs thereof are associated with the brackets 15 and the tubular element 11 as shown for interconnecting the same. Nutted bolts 17 are passed through the apertures of the brackets 15 and the slots 16a of the angle pieces 16 to interconnect the same and nutted bolts 18 are passed through the slots 16b of the angle piece 16 and apertured portions of the inner tubular element 11 to connect the angle pieces 16 to the tubular element 11. The slot-equipped connections between the brackets 15 and the angle pieces 16 enable adjustment to compensate for adjustive variation in the diameter of the tubular element 11 in the manner previously described. The slot-equipped connections between the angle pieces 16 and the tubular element 11 enable adjustive longitudinal movement of the tubular element 11 relative to the frusto-conical outer member 8 to vary the cross-sectional area of the passage 13 therebetween. Where the cross-sectional area of the passage 13 is changed due to adjustive change in the diameter of the tubular element 11, compensation for this change may be made by raising or lowering the inner tubular element 11.

In operation of the device the hot flue gases rising in the tubular member 7 will divide with part thereof passing upwardly through the interior of the inner tubular element 11 and part passing upwardly through the annular passage 12 and then through the annular passage 13 to draw cold air therewith through the passage 9. The hot gases passing through the passage 12 will mix with the cold air entering through the passage 9 before the mixture thereof passes upwardly through the passage 13. Above the top end of the inner tubular element 11, gases and air passing upwardly from the passage 13 will create the equivalent of a venturi for exerting suction on the gases issuing from the upper end of the inner tubular element 11, and hence will increase the effective degree of draft. The extent of the above described venturi action will vary up to a maximum set limit as the temperature of the flue gases increases and hence a strong draft will exist when a large fire is burning and a very mild draft will exist when a small fire is burning in the furnace connected to the chimney 6.

Variation in the area of the passage 13 varies the degree of suction or draft obtained for any given conditions and determines the maximum draft that can be obtained in any chimney. Variation in the area of the passage 12 varies the sensitivity of the device as to speed of adjustment of the draft to the fire conditions. Adjustments of the areas of these passages by means of the adjustment features previously described will adapt the device for use with heating plants and chimneys of widely different characteristics. Due to the venturi action which constantly takes place outside atmospheric conditions cannot affect the chimney draft. Thus down draft or irregular draft is prevented. In other words when the draft created by the device under a hot fire has reached a certain pressure, the friction of the air running through passage 13 is such by reason of the size of the passage that no greater draft can be created. Thus adequate draft for a hot fire is secured without excessive draft to waste fuel when the device is adjusted properly to produce a passage 13 of the proper size.

Fig. 5 illustrates another form of the device wherein the adjustment features are not incorporated. This form of the device includes a tubular member 19, a frusto-conical outer member 20 and a tubular inner element 21 respectively similar to the tubular member 7, frusto-conical outer member 8 and the inner tubular element 11 of the previously described form of the device in all particulars except that the inner tubular element in Fig. 5 is of fixed rather than adjustable diameter. The frusto-conical outer member 20 is connected to the tubular member by means of brackets 22 similar to the brackets 10 of the first form of the device. The inner element 21 is connected near its upper end to the frusto-conical outer member 20 by means of non-adjustable brackets 23. The principle of operation of the device of Fig. 5 is, of course, the same as the principle of operation described in connection with the first form of the device.

Full sized models of the device have been built and placed in regular service over a period of time and have been found to improve the fuel economy of heating plants to a very substantial degree.

It is apparent that I have invented a novel, simple, effective and inexpensive form of draft regulator for the chimneys of heating plants.

It will, of course, be understood that various changes may be made in the form, details, proportions and arrangement of parts without departing from the scope of my invention.

What is claimed is:

1. A draft-controlling device for a tubular smoke stack comprising, a tubular element smaller in diameter than a stack with which it is associated, said element being supported in co-axial, partially telescoped, inwardly spaced relation with the upper end of said stack, and a downwardly divergent frusto-conical element supported in co-axial and spaced encircling relation with said tubular element and the upper portion of said stack and having open upper and lower ends.

2. A draft-controlling device for a tubular smoke stack comprising, a tubular element smaller in diameter than a stack with which it is associated, said element being supported in co-axial, partially telescoped, inwardly spaced relation with the upper end of said stack and being formed of a rectangular sheet rolled to encircle a cylindrical space and having overlapping marginal portions which may be overlapped to various degrees to adjustively vary the diameter of said element, and a downwardly divergent frusto-conical element open at top and bottom and supported in outwardly spaced encircling relation with said tubular element and the upper portion of said stack.

3. The combination defined in claim 2 and radially extending brackets connecting said tubular element to said frusto-conical element for support therefrom, said brackets being adjustively extensible in a radial direction to compensate for variation in the diameter of said tubular element.

4. A draft-controlling device for a tubular smoke stack comprising, a tubular element smaller in diameter than a stack with which it is associated, said element being supported in co-axial, partially telescoped, inwardly spaced relation with the upper end of said stack, and a downwardly divergent frusto-conical element

supported in co-axial and spaced encircling relation with said tubular element and the upper portion of said stack, said tubular element being supported in such manner as to enable axial adjustive shifting thereof to vary the spacing between the upper end thereof and the conical internal periphery of said frusto-conical element.

5. A draft-controlling device for a tubular smoke stack comprising, a frusto-conical element open at top and bottom and supported from said stack in co-axial relation therewith, the lower portion of said frusto-conical element being disposed in radially outwardly spaced encircling relation with the uppermost portion of said stack, a tubular element of smaller diameter than said stack disposed within said frusto-conical element and the uppermost portion of said stack in radially inwardly spaced co-axial relation therewith, and means supporting said tubular element from said frusto-conical element permissive of adjustive axial shifting of said tubular element relative to said frusto-conical element to vary the spacing between the upper end of said tubular element and the conical internal periphery of said frusto-conical element.

6. A draft-controlling device for chimneys comprising, a tubular member adapted to be placed on the top of a chimney to constitute an upward extension thereof, a tubular element smaller in diameter than said member supported in co-axial relation therewith in partially telescoped spaced relation with the upper portion thereof, and a downwardly divergent hollow frusto-conical element open at top and bottom supported in co-axial and spaced encircling telescoped relation with said member and said tubular element and having upper and lower ends disposed at levels respectively above the upper end of said tubular element and below the upper end of said member.

7. A draft-controlling device for a tubular smoke stack comprising, a hollow downwardly divergent frusto-conical member open at both ends and arranged for fixed mounting thereof on the upper end of a tubular stack in co-axial, radially outwardly spaced, partially telescoped relation therewith, a tubular element disposed within said member and the upper portion of said stack in co-axial inwardly spaced relation with both thereof, the wall of said tubular element having a longitudinally split and circumferentially overlapped portion of which the overlap may be varied for adjustive variation in the diameter of said tubular element to alter the radial spacing between said tubular element and said stack and between said tubular element and said frusto-conical element, and radially extending, radially extensible brackets connecting said adjustable diameter tubular element to said frusto-conical element for support therefrom, said tubular element being connected to said brackets in axially shiftable relation therewith to enable adjustive variation in the level of said tubular element relative to said frusto-conical element and hence in the spacing between the upper end of said tubular element and said frusto-conical element.

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