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MECHANICALLY DRIVEN IMPELLER TYPE DRAFT INDUCER FOR COMBUSTION APPARATUS

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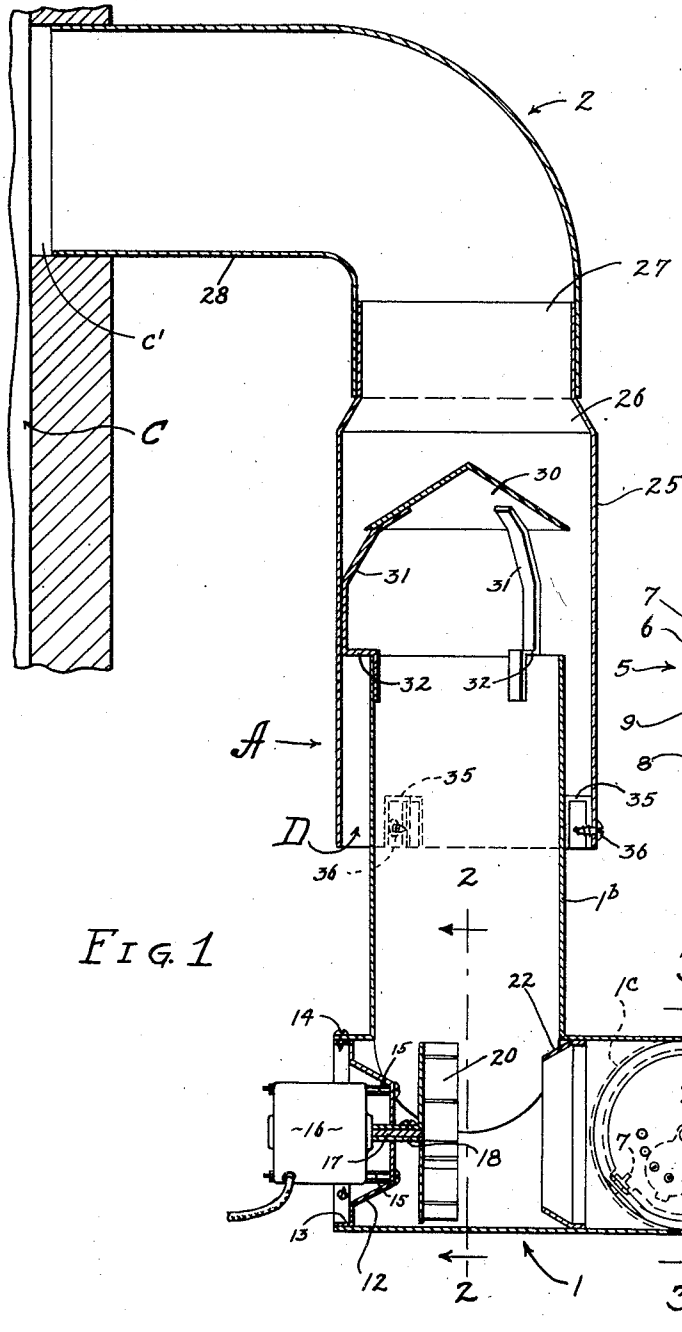


FIG. 1

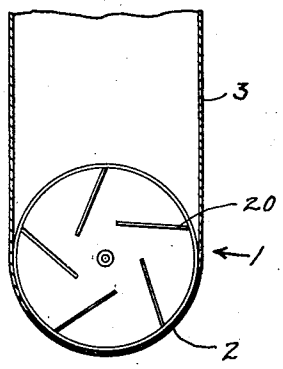


FIG. 2

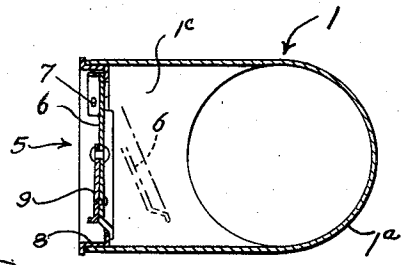


FIG. 3

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MECHANICALLY DRIVEN IMPELLER TYPE DRAFT INDUCER FOR COMBUSTION APPARATUS

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5 Claims. (Cl. 110—162)

1

This invention relates to draft producing and stabilizing devices for combustion apparatus.

The principal object of the invention is to provide a mechanical draft inducer combined with automatic regulating and control means by which an even draft is maintained through the combustion chamber of the apparatus regardless of fluctuations in the chimney draft, back drafts, or adverse draft conditions arising from outside atmospheric changes or other external influences.

While the invention may be used to advantage with different kinds of combustion apparatus, it is especially efficacious as an adjunct to liquid fuel burning stoves, space heaters, furnaces or the like.

Particularly with liquid fuel burning apparatus, it is important that the draft through the combustion chamber be maintained practically uniform or even, and that no back drafts reach the chamber. Otherwise, proper combustion is hindered, efficiency is impaired, and a smoky fire condition prevails, leading to excessive soot accumulation. In the case of back drafts, the fire is liable to be extinguished. However, such adverse draft conditions are usually only momentary, amounting to little more than a short gust or puff. As a consequence, the incoming fuel is instantly vaporized by the hot burner parts, and if ignited thereby explodes, frequently with serious consequences.

Another object of the invention is to provide a mechanical draft inducer involving a fluid impeller, desirably electrically driven, which, in the event of stoppage of the impeller due to any cause, such as current failure, flow of the products from the combustion chamber will proceed to the chimney under natural draft. More limitedly stated, it is a purpose of the invention to so construct the device of my invention that the fluid impeller or other parts of the structure are so arranged as not to obstruct or interfere with the free passage of the products of combustion through the device in case of stoppage of the impeller.

A further object of the invention is to provide a back draft diverter of such character and capacity that the escape of flue gases to the surrounding atmosphere is avoided under ordinary back draft conditions, and even when a more severe back draft causes a slight escape of the flue gases, said gases will be recovered upon resumption of normal draft conditions.

A further advantage of my improved back draft diverter is the admission of atmospheric air to the flue during normal operation which

2

dilutes the flue gases and so moderates their temperature as to avoid overheating of the flue.

These several objects and advantages with others hereinafter appearing are attained in the embodiment of the invention illustrated in the accompanying drawing wherein like reference characters designate the same parts in the different views.

In the drawings, Fig. 1 is a central vertical section through the mechanical draft inducer and back draft diverter of my invention, and Figs. 2 and 3 are sectional views taken on the respective lines 2—2 and 3—3 of Fig. 1.

The invention consists of a casing structure or conduit, designated generally by the reference letter A, through which communication is established between a combustion apparatus B and a flue or chimney C. The conduit A is made up of an inlet section 1, and an outlet section 2, the former having branches 1a and 1b. The branch 1a is engaged over the flue collar b' of the combustion apparatus B, and this branch desirably has a lateral extension 1c, within the outer end of which is disposed a draft regulator 5. This regulator of itself forms no part of my invention and may be of any approved type, the one shown consisting of a disk-like damper 6 that is pivotally supported by pintles 7 carried by a ring 8. This ring is fitted into the end of the extension 1c and may be secured thereto by screws or other means, and adjustably connected to the damper 6 is a weight 9 by which its action may be made more or less responsive to air currents.

Disposed within the end of the branch 1a of the conduit section 1 remote from the combustion apparatus, is a disk 12, shown as dished throughout its central region and as having a peripheral flange 13. Said flange fits into the end of the conduit branch and is preferably detachably connected thereto by screws or bolts 14. Fastened to the disk 12, by a suitable number of bolts 15, is an electric motor 16, the shaft 17 of which extends through an aperture of the disk 12 and has mounted upon and secured to it the hub 18 of a fluid impeller 20, shown as a centrifugal fan. It will be observed that the fluid impeller is situated beyond the central vertical plant of the branch 1b in a direction away from the combustion apparatus so that ample space is left for the passage of the products of combustion between the impeller and the side of the branch 1b remote therefrom. In order to direct the flow of products from the combustion apparatus toward the central portion of the fluid impeller 20, I mount a frusto conical throat member 22 with-

in the branch 1a, adjacent the latter's junction with the branch 1b and in opposed relation to the impeller.

Disposed over and about the upper end of the branch 1b, with its lower edge spaced well below the top edge of said branch, is a sleeve-like bonnet 25 of the back draft eliminator. The upper end of this bonnet is convergent for a distance and extending beyond the convergent portion, designated 26, is a cylindrical collar 27, somewhat greater in diameter than the branch 1b of the conduit section 1. Fitting over the collar 27 is one end of an elbow portion 28 of the conduit section 2, the opposite end of the latter projecting into an opening c' of the flue or chimney C. Supported centrally within the bonnet 25, in suitable relation to the convergent portion 26, is a deflector 30, desirably in the form of a shallow cone, although the same may take other shapes. In any case, its peripheral portion must be suitably spaced from the cylindrical wall of the bonnet. In the present instance, the deflector 30 is attached, as by welding to the convergent upper ends of brackets 31 whose body portions are welded or otherwise secured to the bonnet 25. Below their body portions, the brackets are extended inwardly to form ledges 32 and thence downwardly and their lower ends are engaged within the top of the branch 1b, with said ledges 32 bearing thereon. The lower end of the bonnet 25 is properly spaced from the branch 1b by members 35, shown as fastened to the bonnet by screws 36.

With electric current supplied to the motor 16, the impeller 20 is driven at relatively high speed and is caused to create or induce, by centrifugal action, a draft through the combustion chamber of the apparatus B and, under usual conditions, on through the conduit A to the chimney. While passing upwardly through the bonnet 25 and about the edge of the deflector 30, the products are joined by atmospheric air that enters through the comparatively long annular space or passageway D between the lower portion of the bonnet and the upper portion of the branch 1b. The influx of the atmospheric air is induced by the thermal action of heat radiated from the branch 1b and by the upward flow of the products of combustion about the deflector 30. The speed and capacity of the fluid impeller 20 is such that, under normal conditions, a proper draft is induced through the combustion chamber of the apparatus B.

In this connection it may be pointed out that the back draft diverter provides means that compensates to a substantial degree for increase in chimney draft, above what is regarded as normal, preventing such increase from interfering with, or disturbing, the proper draft through the combustion chamber for which the impeller is responsible. This is because abnormal chimney draft is largely satisfied by atmospheric air drawn in through the space D. However, if air from this source is insufficient to satisfy the demands of the flue, the damper 6 of the regulator 5 swings open and admits enough additional air to substantially balance the abnormal draft conditions thereby avoiding appreciable increase in the draft to which the combustion chamber is subjected.

In the case of a back draft, the flue gases will be diverted by the deflector 30 into the space D. This will cause the products of combustion from the branch 1b to be blown down into said space. As previously pointed out, a back draft ordinarily amounts to little more than a puff. Consequently, before the gases reach the lower end of the relatively long space D, conditions will revert to normal and the gases will pass on to and out of the chimney. Even under a more severe back draft, resulting in a slight escape of the gases through the open bottom of the bonnet 25, the suction will, upon resumption of normal conditions, draw the gases back into the bonnet.

Having thus described my invention, what I claim is:

1. A device of the class described comprising a casing structure that serves as a conduit and that is provided with a first branch adapted for connection at its inlet end to the products outlet of a combustion apparatus and with a second branch disposed at a sharp angle to the first branch, a fluid impeller in the form of a centrifugal fan located in the casing adjacent the side of the second branch remote from the first branch and with its axis substantially aligned with the axis of the latter for drawing products from the combustion apparatus and forcing them on through the casing, a convergent throat member disposed in said casing about the discharge end of the first branch and with its smaller end directed toward the center of the impeller for concentrating the products toward the central region of the impeller, said impeller and said throat member being spaced apart in an axial direction a substantial distance so as not to interfere with the free flow of products through the casing when the impeller is inactive, and means for driving the impeller.

2. A device of the class described comprising a conduit including a first branch adapted to have its inlet end connected to the products outlet of a combustion apparatus and a second branch disposed at substantially right angles to the first branch, a fluid impeller consisting of a centrifugal fan supported within the conduit at the junction of the branches and adjacent the side of the second branch remote from the first branch and with its axis substantially coincident with the axis of the first branch whereby said impeller when active forces fluid into the second branch while leaving said second branch unobstructed to the free admission of fluid from the first branch when the impeller is inactive, a throat member within the first branch between the inlet end thereof and its junction with the second branch, the throat member being spaced a substantial distance in an axial direction from the impeller and being convergent toward the same and serving to concentrate the products toward the central region of the impeller, and means for driving the impeller.

3. A device of the class described comprising a conduit including a first branch adapted to have its inlet end connected to the products outlet of a combustion apparatus and a second branch disposed at substantially right angles to the first branch, a fluid impeller consisting of a centrifugal fan supported within the conduit at the junction of the branches and adjacent the side of the second branch remote from the first branch and with its axis substantially conicident with the axis of the first branch whereby said impeller when active forces fluid into the second branch while leaving said second branch unobstructed to the free admission of fluid from the first branch when the impeller is inactive, a throat member of convergent shape having its larger end connected to the first mentioned branch of the conduit and its smaller end di-

rected axially of the impeller toward its center and serving to concentrate the products toward the central region of the impeller, the first branch having an opening intermediate its inlet end and the throat member for admitting atmospheric air, a damper controlling the admission of air through said opening, said damper being biased toward closed position and opening in response to a suction in excess of that created by the impeller, and means for driving the impeller.

4. A device of the class described comprising a conduit including a horizontal cylindrical branch having its inlet end adapted for connection with the products outlet of a combustion apparatus, a circular disk-like member fitted into the end of said branch remote from its inlet end, an electric motor supported by said member on the outer side thereof, said member having a central aperture through which the shaft of the motor extends, a centrifugal fan within said branch adjacent said member, the fan being only slightly less in diameter than the member and having a hub connected to the motor shaft, a vertical conduit branch communicatively connected to the horizontal branch with its axis adjacent the vertical plane of the air receiving side of said fan so that the flow of fluid created by the centrifugal action of the fan is directed up the vertical branch a free flow of fluid from the horizontal to the vertical branch is permitted when the fan is inactive.

5. A device of the class described comprising a conduit including a horizontal cylindrical branch having its inlet end adapted for connection with the products outlet of a combustion apparatus, a circular disk-like member fitted into the end of the horizontal branch remote from its inlet end, an electric motor supported by said member on the outer side thereof, said member having a central aperture through which the shaft of the motor extends,

a centrifugal fan within said branch adjacent said member, the fan being only slightly less in diameter than the member and having a hub connected to the motor shaft, a vertical conduit branch communicatively connected to the horizontal branch with its axis adjacent the vertical plane of the air receiving side of said fan so that the flow of fluid created by the centrifugal action of the fan is directed up the vertical branch and a free flow of fluid from the horizontal to the vertical branch is permitted when the fan is inactive, and a conical throat member having its larger end connected to the first mentioned branch of the conduit and its smaller end in axial alignment with and spaced a substantial distance from the fan, said smaller end being directed toward the center of the fan, thereby to concentrate the flow of products toward the central region of the fan.

MARC RESEK.

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