Nov. 11, 1952 M. RESEK ET AL 2,617,371

MECHANICAL DRAFT INDUCER FOR COMBUSTION APPARATUS, INCLUDING PROVISIONS FOR RELEIVING BACK DRAFTS

Filed Sept. 3, 1947 4 Sheets-Sheet 1

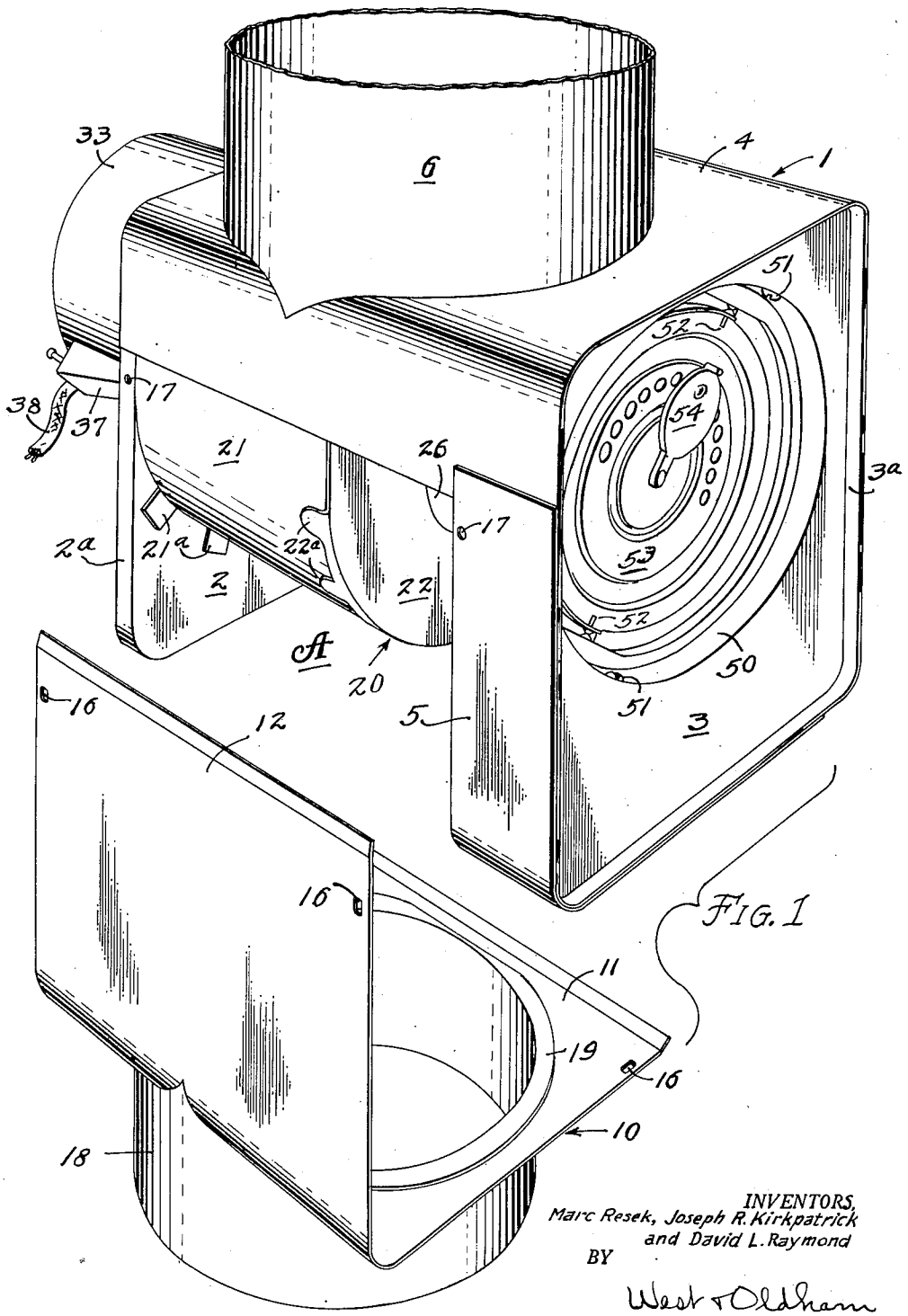


FIG. 1

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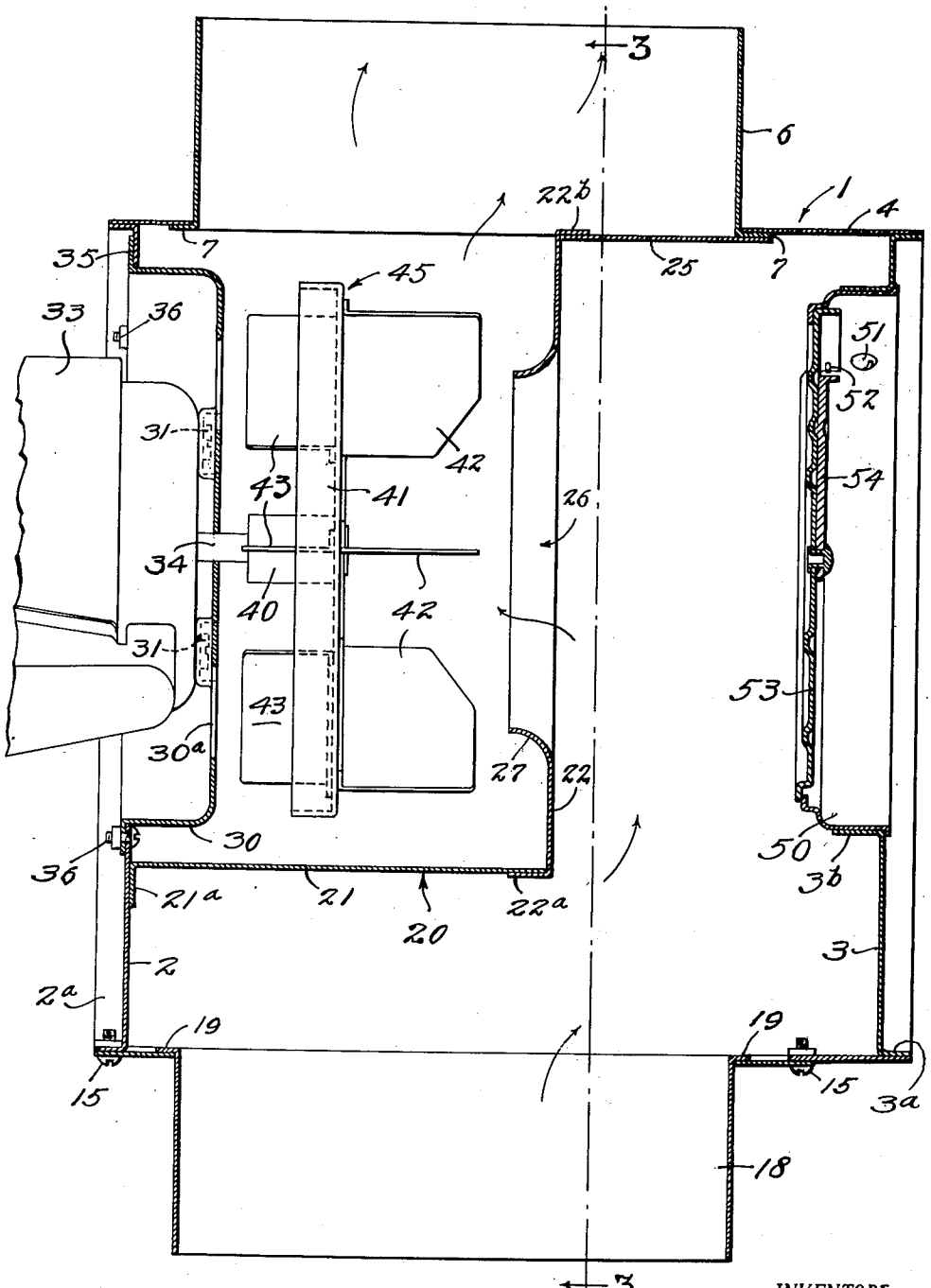


FIG. 2

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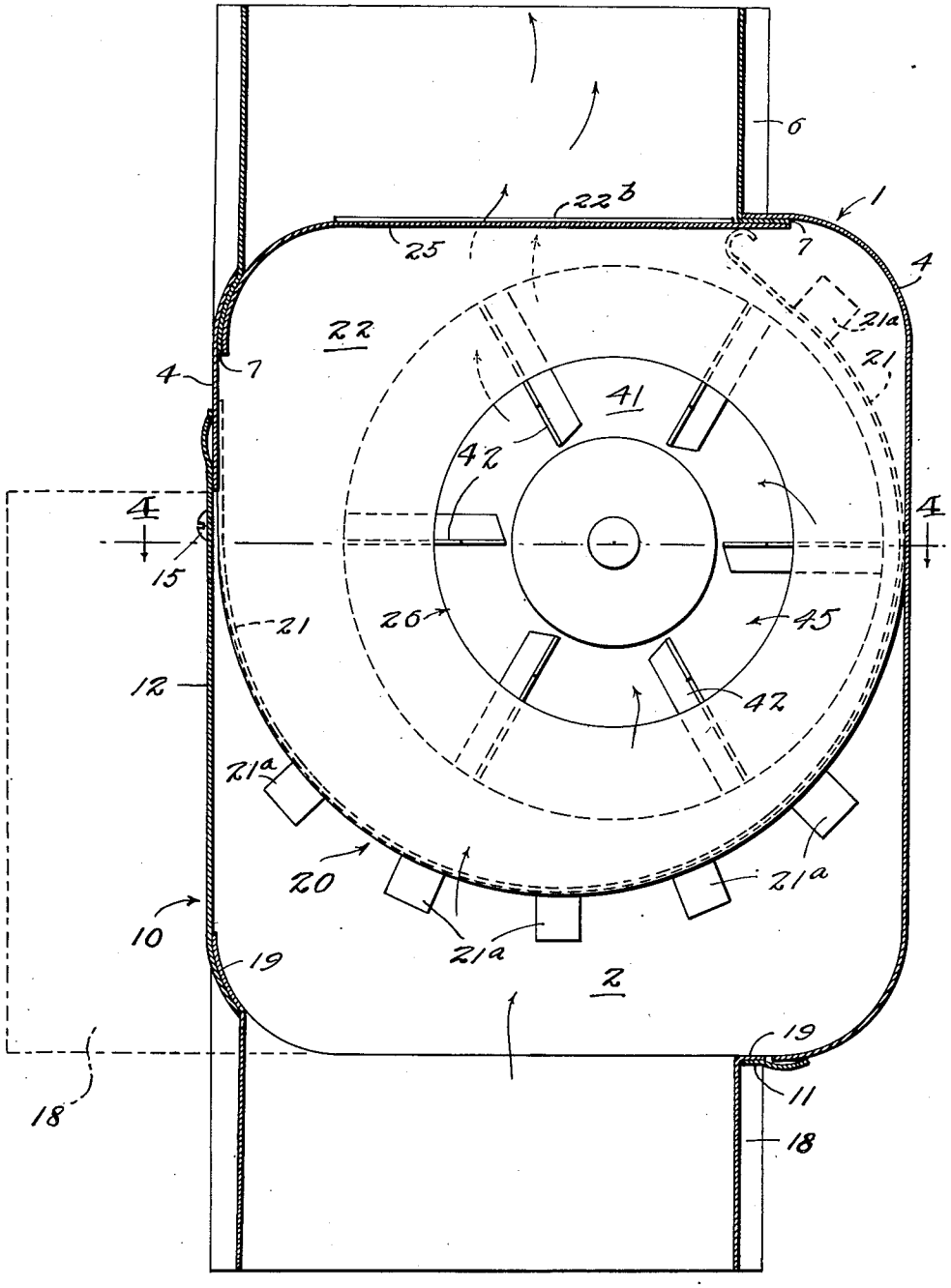


FIG. 3

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Filed Sept. 3, 1947 4 Sheets-Sheet 4

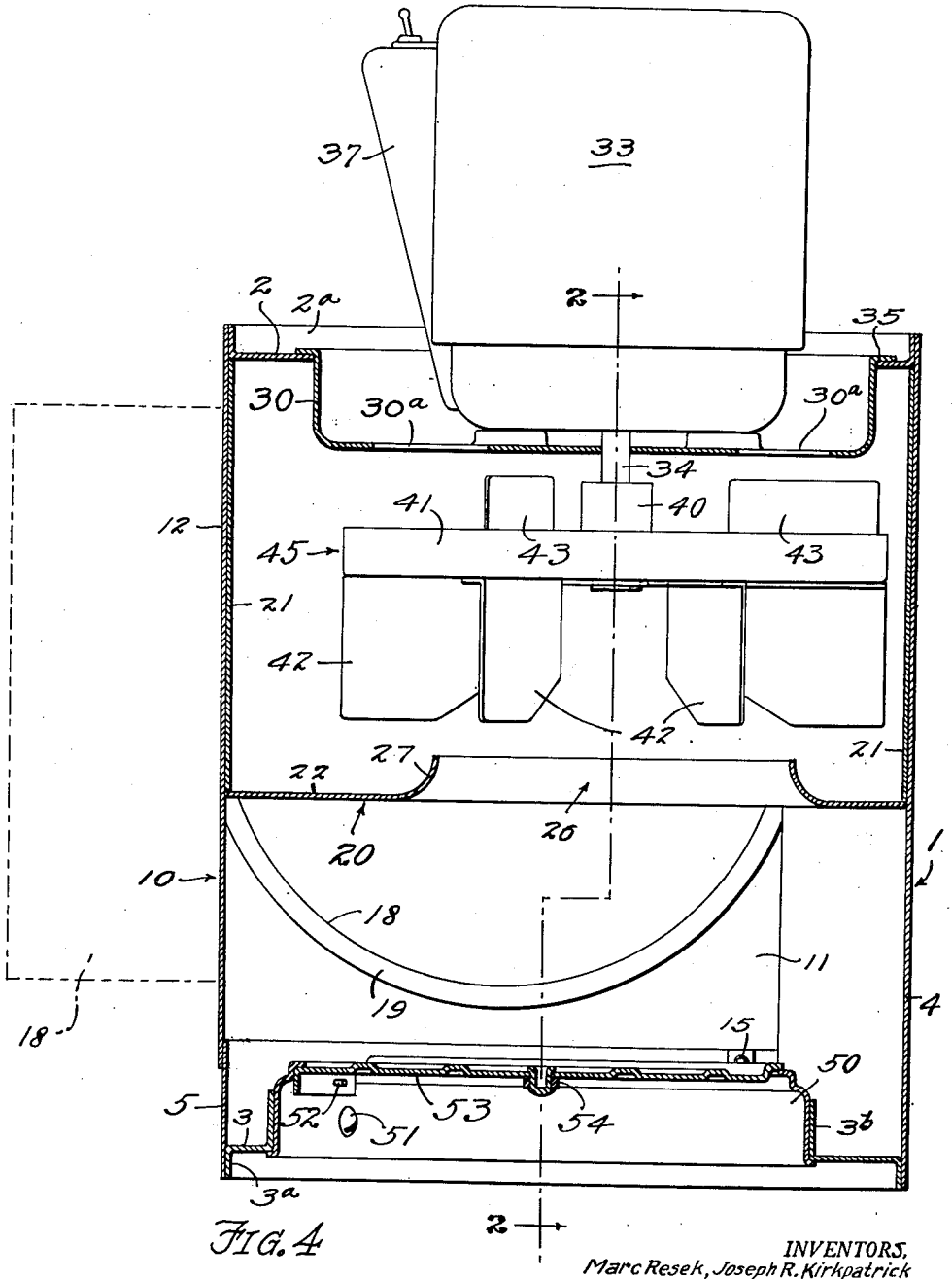


FIG. 4

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Patented Nov. 11, 1952

2,617,371

UNITED STATES PATENT OFFICE

2,617,371

MECHANICAL DRAFT INDUCER FOR COMBUSTION APPARATUS, INCLUDING PROVISIONS FOR RELIEVING BACK DRAFTS

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Application September 3, 1947, Serial No. 771,828

5 Claims. (Cl. 110—162)

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This invention relates to devices for inducing and stabilizing drafts through combustion apparatus. In purpose and general character, the present invention is similar to the mechanical draft inducer and back draft diverter disclosed and claimed in the application of Marc Resek, Serial No. 674,013, filed June 3, 1946, which application has now been issued as Patent No. 2,561,135, dated July 17, 1951.

Although the invention may be used to advantage with different kinds of combustion apparatus, its use with liquid fuel burning apparatus, such as oil furnaces, oil stoves, oil burning space heaters, and the like, is especially efficacious and desirable.

The primary object of the invention is to provide a draft creating device or draft inducer that serves to maintain a thoroughly satisfactory and substantially uniform draft through the combustion chamber of the apparatus, regardless of inadequate or abnormal draft conditions of the chimney to which the apparatus is connected. Also, to include therein a back draft relief that will provide an escape for down drafts or gusts through the chimney, thereby to prevent them from reaching the combustion chamber and disturbing the normal draft conditions thereof.

Another object of the invention is the production of a draft creating device or inducer of simple, compact and sturdy construction, that is highly efficient and durable in service, and that may be quickly and easily installed in the pipe of a combustion apparatus through which the products are carried off.

The device of our invention is intended for application to the outlet stub of the combustion apparatus, or for insertion between adjacent sections of a pipe; and it is a further purpose of the invention to so design and construct the device that, by a simple reversal of one of its parts, its inlet and outlet stubs may be axially aligned, or disposed at right angles to each other, thereby to adapt the device to different installations.

A still further object of the invention is to provide a draft creating device or draft inducer incorporating a fluid impeller that is driven by an electric motor and which is of such nature that, besides the main draft, an auxiliary draft is created, the latter being satisfied by atmospheric air that is drawn in about the motor and serves to

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keep the same relatively cool. The fresh air thus drawn into the device is driven on through the flue and mixes with and dilutes the gases therein, reducing their temperature and, accordingly, preventing overheating of the flue.

In the attainment of the object last recited, according to the present embodiment of the invention, we utilize a dual air impeller or double fan; and it is a further object of the invention to make the section of the impeller or fan that is responsible for the auxiliary draft considerably weaker, so to speak, or of less power or capacity than the section that creates the main draft, thereby to permit back drafts or gusts of appreciable force to overcome the auxiliary draft and escape through the path thereof to the atmosphere.

The foregoing objects, with other more detailed ones that will appear as this description proceeds, are attained in the embodiment of the invention illustrated in the accompanying drawings, wherein Fig. 1 is a perspective view of our improved draft creating device or inducer, showing the inlet stub or connection removed from the casing; Fig. 2 is a longitudinal section through the device, the offset planes of which are indicated by the line 2—2 of Fig. 4, the fluid impeller and an adjacent part of the electric motor that drives it being shown in elevation; Fig. 3 is a transverse section on the line 3—3 of Fig. 2, and Fig. 4 is a horizontal section through the casing of the device, on the line 4—4 of Fig. 3, the motor and fluid impeller being in elevation.

The casing of the device, designated by the reference numeral 1, is generally rectangular in form, having rounded longitudinal corners of liberal radius. The casing is fabricated of sheet metal parts including end walls 2 and 3 and a peripheral wall that is composed principally of a plate 4. The respective end walls have outwardly projecting edge flanges 2^a and 3^a, and the ends of the plate 4 overlie said flanges and are suitably fastened thereto, desirably by welding. Because of the thinness of said sheet metal parts and the manner of their connection, the near edges of the plate 4 and the flange 3^a appear as a continuous surface in Fig. 1. As best appears from Figs. 1 and 3, the plate 4 follows the flanges of the end walls from points about one third down their left hand sides (as the casing is viewed from the

front), upwardly, across and down their opposite sides, to points immediately beyond the lower curved corners thereof. A relatively narrow sheet metal strip 5, which forms a part of the peripheral wall of the casing, has one of its edges extended over and fastened to the flange of the end wall 3, while its ends overlie and are connected, as by welding, the adjacent corners of the plate 4. With the casing constructed as so far described, a relatively large opening designated A in Fig. 1, occupies two angularly related areas or faces of the casing, said opening being defined by the longitudinal edges of the plate 4, the marginal portion of the end wall 2 between said edges, and the inner edge of the strip 5. An outlet stub or connection 6 rises from the casing. According to the present construction, said stub is projected upwardly through a hole in the top of the peripheral wall, and a flange 7, that surrounds the inner end of said stub, engages the inner surface of said wall (Figs. 2 and 3), the flange being connected, as by welding, to the wall.

Adapted to be detachably connected to the casing over the aforesaid opening A, and in either of two positions, is an angle fitting designated generally by the reference numeral 10. The body portion of said fitting is shown as formed from a single piece of sheet metal to provide right angularly related parts 11 and 12. The fitting is of a length to overlap the flange of the end wall 2 and the inner marginal portion of the strip 5, and it may be connected to said parts by fastening means 15, shown as bolts, that are engaged through registering apertures in the parts referred to, said apertures of the fitting being designated 16, and those of the casing, 17. The part 11 of the angle fitting has a relatively large hole through which is extended an inlet stub or connection 18. Said stub or connection is provided with an end flange 19 that is engaged with the inner surface of the part 11, the flange and said part being connected together by welding or otherwise. It is apparent that the angle fitting 10 is reversible with respect to the casing 1 so that the inlet stub 18 may be axially aligned with the outlet stub 6, as shown in full lines in Figs. 2 and 3, or so that said stub extends from the side of the casing, as indicated in broken lines in the latter view. Therefore, the draft creating device or inducer may be installed in a vertical pipe or flue, between upper and lower sections that are engaged, respectively, over the stub 6 and within the stub 8; or between substantially right angularly related pipe or flue sections, in a manner readily understood.

A fan housing 20, in the nature of a snail shell casing, is formed within the casing 1 by a curved wall 21 and a transverse wall 22, the former extending from the end wall 2 a little beyond the longitudinal center of the casing 1. The lower edge of the wall 22 is shaped to conform to the curvature of the wall 21 while the upper portion thereof corresponds in outline to the cross sectional shape of the upper region of the casing. In the present embodiment, the wall 21 is formed with lugs 21^a that are secured, as by welding, to the end wall 2. About its lower edge, the wall 22 is shaped to engage over the adjacent marginal portion of the wall 21 and is formed with lugs 22^a (Fig. 1) to facilitate welding. The upper edge of the wall 22 has a forwardly directed flange 22^b that overlies a plate 25 which shuts off communication between the outlet stub 6 and the interior of the casing forwardly of the wall 22.

The wall 22 has a relatively large opening 23 that is surrounded by an inwardly curved lip 27. Said opening provides the main inlet for the fan housing, the outlet whereof is formed by the stub 6. The end wall 2 has a circular opening that is in substantially axial alignment with, but is considerably larger than, the opening 26, and into the opening of said end wall is fitted a dished mounting plate 30. To the outer side of this plate is secured, as by screws 31, an electric motor 33, the shaft 34 of which extends through a central aperture in the mounting plate. A flange 35 that surrounds the outer end of the dished mounting plate overlies the adjacent marginal portion of the end wall 2 and is detachably connected thereto by fastening means or bolts 36. On the side of the motor is a switch casing 37, and current is supplied to the motor under control of said switch through a cable 38 (Fig. 1).

Fastened to the motor shaft 34, within the housing 20, is the hub 40 of a disk 41, to the front side of which is secured a suitable number—six, for example—of relatively large blades 42, and to the rear side, a lesser number, as three, of smaller blades 43. These parts 40 to 43 constitute a dual fluid impeller, or, more specifically, a double centrifugal fan, designated generally, by the reference number 45. It is by means of the section involving the blades 42 of this dual impeller or double fan that a strong main draft is created upwardly through the inlet stub 18 and the portion of the interior of the casing 1 that communicates with said stub, thence through the opening 26, the adjacent portion of the fan housing 20 and the outlet stub 6. Simultaneously, by means of the section of said impeller or fan involving the fewer and smaller blades 43, a weaker draft of atmospheric air is drawn inwardly about the adjacent end of the motor 33 through openings 30^a in the mounting plate 30, and this air is driven on through the adjacent portion of the housing and through the outlet stub 6 and mixes with the products of combustion carried by the main draft, diluting them and reducing their temperature.

Occupying a relatively large opening in the end wall 3, which is surrounded by a cylindrical flange 3^b, is the annular body portion 50 of an automatic draft regulator of a well known type, the same being detachably fastened to said flange by screws 51. Pivotally supported within the opening of said annular body portion 50, on pins 52 which define an inclined pivotal axis somewhat above a parallel central axis of the regulator, is a circular damper 53, to the center of which is pivoted an adjustable weight 54. By adjusting this weight, the ease with which the damper will swing on its pivotal axis in response to an inward draft, may be changed, as will be readily understood by those acquainted with the art to which the invention relates. As will also be understood, the draft regulator must be readjusted in the flange 3^b through 90° when the position of the device is changed between one in which its outlet stub is vertical and one wherein said stub is horizontal.

It is apparent from the foregoing that, when current is supplied to the motor 33, the fluid impeller or fan 45 will be driven to create the main and auxiliary drafts. So that the main draft through the combustion apparatus will remain substantially uniform, incremental fluctuations in chimney draft, augmenting the main draft, will be satisfied by atmospheric air drawn in through the draft regulator as the damper 53 swings open in response to the increased pull.

On the other hand, down drafts or gusts from the chimney that are of any appreciable power will overcome the weaker auxiliary draft, created by the section of the impeller or fan involving the blades 43, and will escape through the openings 30a to the atmosphere, leaving unaffected the main draft through the combustion apparatus.

Having thus described our invention, what we claim is:

1. A mechanical draft inducer comprising a substantially rectangular casing including end walls and a peripheral wall, the end walls having relatively large openings, inlet and outlet stubs carried by the peripheral wall and spaced apart a substantial distance about the casing, partition means within the casing preventing direct communication between said stubs and including a transverse wall and a curved wall which, with the adjacent wall portions of the casing, constitute a snail shell housing, said transverse wall having an opening for admitting fluid to the housing from the interior portion of the casing wherewith the inlet stub communicates, the housing being arranged to discharge through said outlet stub, a mounting plate occupying the aforesaid opening of the end wall of the casing which forms one of the end walls of the housing, an electric motor attached to said mounting plate on the outer side thereof, the mounting plate having an aperture through which the shaft of the motor projects into the housing, and a centrifugal fan secured to the shaft within the housing, said mounting plate having air admitting openings about said aperture.

2. A mechanical draft inducer comprising a casing including end walls having relatively large apertures and a peripheral wall having an opening occupying adjacent angularly related areas thereof, an angular fitting shaped to cover said angularly related areas in either of two positions and provided with an inlet stub so related to said fitting that the stub is disposed at different angles to the casing when the fitting occupies said two positions, the peripheral wall of the casing having a stub spaced about the casing a substantial distance from said opening, partition means within the casing setting off a fluid impeller housing arranged to discharge through said outlet stub, said housing having an inlet for fluid that is admitted to the casing through the inlet stub, the region of one of said end walls occupied by the aperture thereof constituting a wall of the housing, a mounting plate supported across the aperture of the last mentioned end wall, an electric motor secured to the mounting plate on the outer side thereof, said mounting plate having a hole through which the shaft of the motor projects into the housing, a fluid impeller within the housing operatively connected to said shaft, and a draft regulator occupying the aperture of the other end wall of the casing, said draft regulator being responsive to the differential in pressure between the exterior and interior of the casing and operating to admit air from the exterior to the interior thereof when the air pressure within the casing is lower than atmospheric.

3. A mechanical draft inducer comprising a substantially rectangular casing including end walls and a peripheral wall, the latter wall having an opening occupying a considerable area of adjacent angularly related portions thereof, an angular fitting for application to the casing in either of two positions for closing said opening, an inlet stub carried by said angular fitting and

so related thereto that it is disposed at different angles to the casing when the fitting occupies said two positions, an outlet stub carried by the peripheral wall and which is in axial alignment with the inlet stub when the angle fitting is applied to the casing in one of said positions, a transverse wall and a curved wall within the casing constituting, with adjacent portions of the walls of the casing, a snail shell housing having a discharge opening formed by a part of the outlet stub, a plate closing the remaining part of said stub, said transverse wall having an opening providing a fluid inlet for the housing, the portion of the end wall of the casing that forms an end wall of the housing having a relatively large aperture, a mounting plate supported across said aperture and having a substantially central hole and air admitting openings spaced about said hole, an electric motor attached to the mounting plate on the outer side thereof and having its shaft projecting through said hole into the housing, a disk secured to the shaft inside the housing, and a series of fan blades attached to each side of the disk.

4. A mechanical draft inducer comprising a casing made up of substantially rectangular end walls and a peripheral wall including a plate extending about two adjacent angularly related sides of the end walls and part way about the other angularly related sides of said walls, a second plate including angularly related parts adapted for attachment in either of two positions to the casing with its ends overlapping the ends of the former plate, an inlet stub carried by one of the angularly related parts of the second mentioned plate, an outlet stub carried by one of the angularly related parts of the first mentioned plate, partition means within the casing setting off an impeller housing arranged to discharge through the outlet stub, said housing having an inlet for fluid admitted to the casing through the inlet stub, one of the end walls of the casing forming a wall of said housing, a motor supported from said end wall on the outer side thereof, said end wall having an aperture through which the motor shaft projects into the housing and provided with air admitting means in proximity to said aperture, and an air impeller carried by the motor shaft inside the housing.

5. A mechanical draft inducer comprising a casing having an inlet connection and an outlet connection, partition means within the casing setting off a fluid impeller housing that provides the sole means of communication between said inlet and outlet connections, the housing being arranged to discharge through said outlet connection and having an inlet for fluid that is admitted to the casing through the inlet connection of the latter, a wall of the casing serving as an end wall of the housing and having a shaft accommodating aperture and provided between said aperture and the edge of the wall with air admitting means through which atmospheric air is adapted to be drawn into the housing, a dual fluid impeller in the housing having one section operatively associated with the housing inlet whereby to draw fluid inwardly of the housing therethrough, and another section operatively associated with the air admitting means whereby to draw air inwardly of the housing therethrough, both sections of the impeller being operatively associated with the outlet connection of the casing whereby to discharge both fluid and air therethrough, and an electric motor situated on the outer side of said wall with its shaft projected

through said aperture and mounting said impeller, said wall being dished inwardly in general conformity with, and in slightly spaced relation to, the adjacent end of the motor to provide an air passage about said end of the motor.

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