Dec. 11, 1956 H. S. WHELLER 2,773,639

DRAFT INDUCERS

Filed Sept. 1, 1953 4 Sheets-Sheet 1

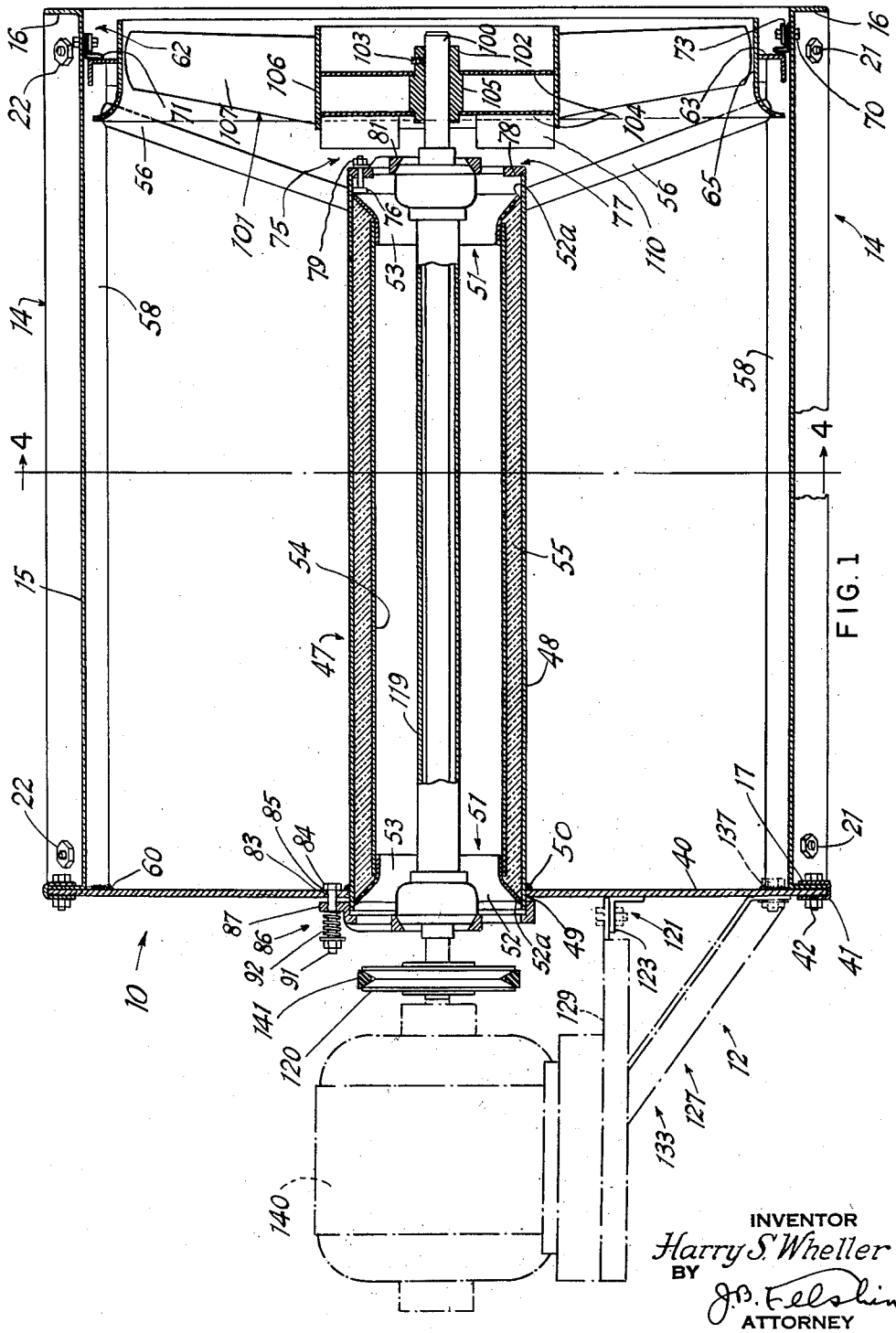


FIG. 1

INVENTOR
Harry S. Wheller
BY
J. B. Felshin
ATTORNEY

Dec. 11, 1956 H. S. WHELLER 2,773,639

DRAFT INDUCERS

Filed Sept. 1, 1953 4 Sheets-Sheet 2

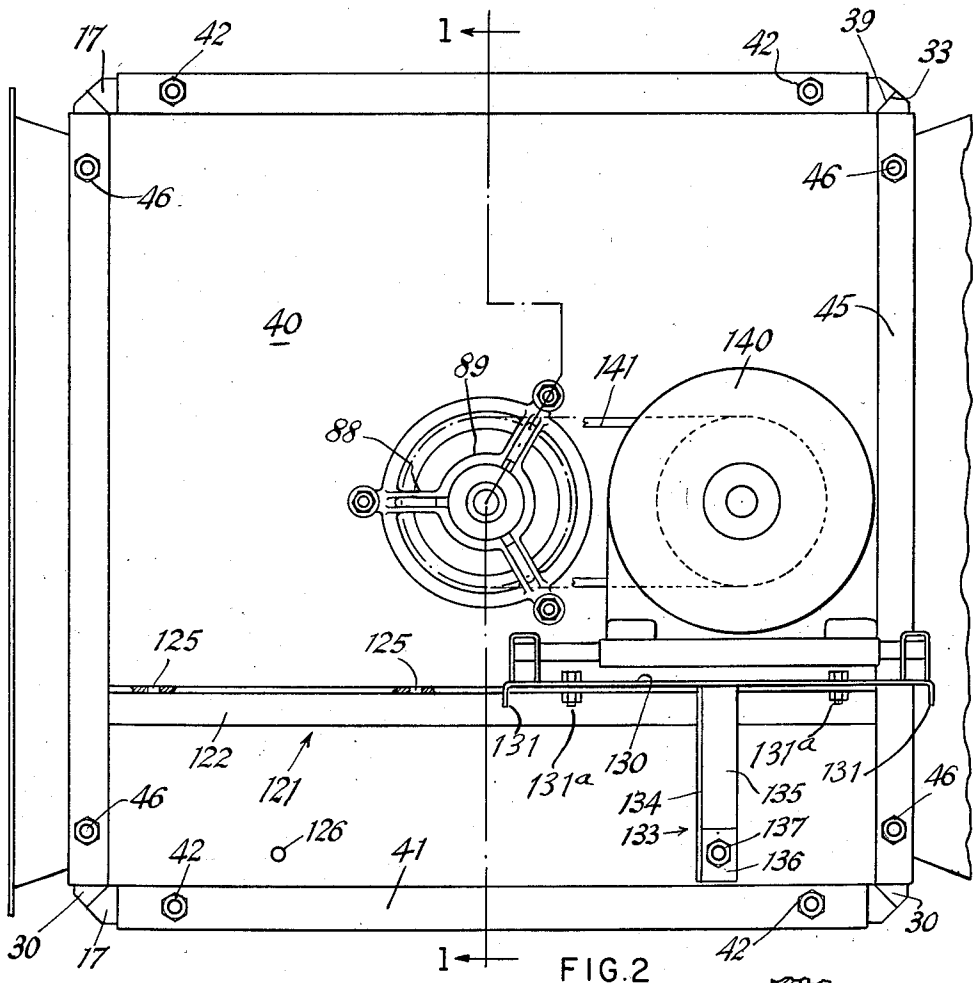


FIG. 2

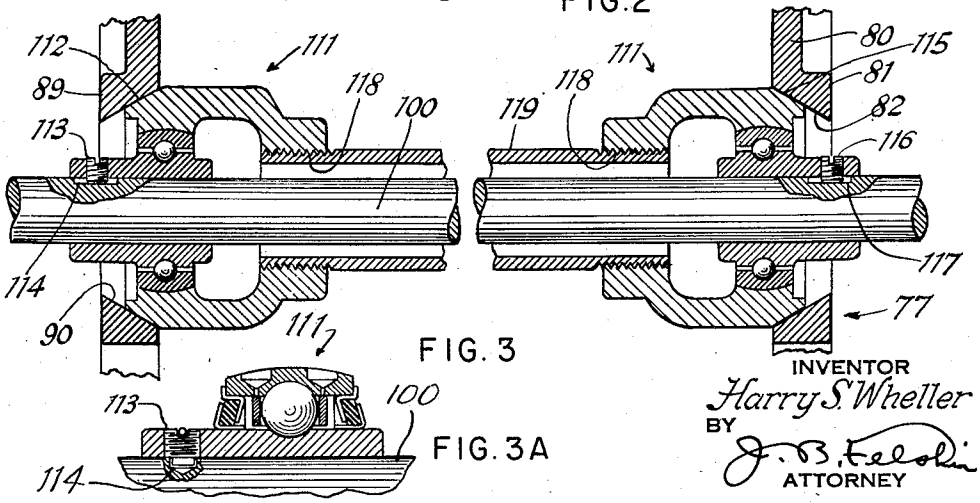


FIG. 3

FIG. 3A

INVENTOR
Harry S. Wheller
BY
J. B. Fellows
ATTORNEY

Dec. 11, 1956 H. S. WHELLER 2,773,639

DRAFT INDUCERS

Filed Sept. 1, 1953 4 Sheets-Sheet 3

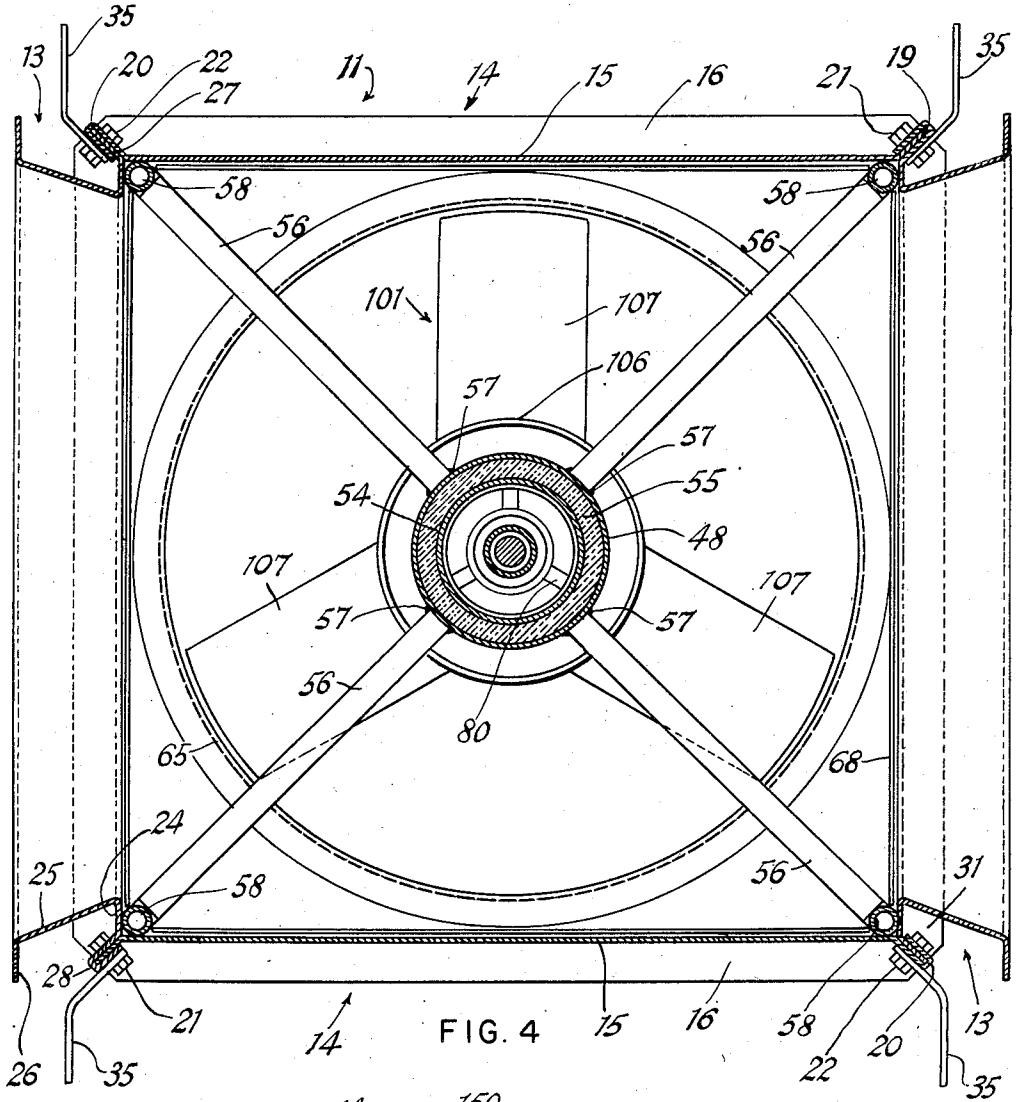


FIG. 4

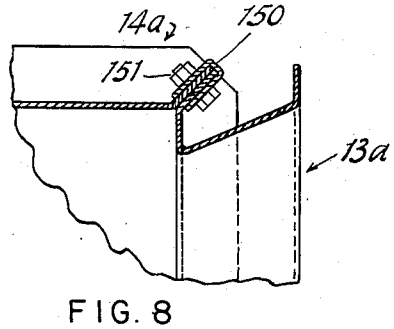


FIG. 8

INVENTOR
Harry S. Wheller
BY
J. B. Feeslin
ATTORNEY

Dec. 11, 1956 H. S. WHELLER 2,773,639

DRAFT INDUCERS

Filed Sept. 1, 1953 4 Sheets-Sheet 4

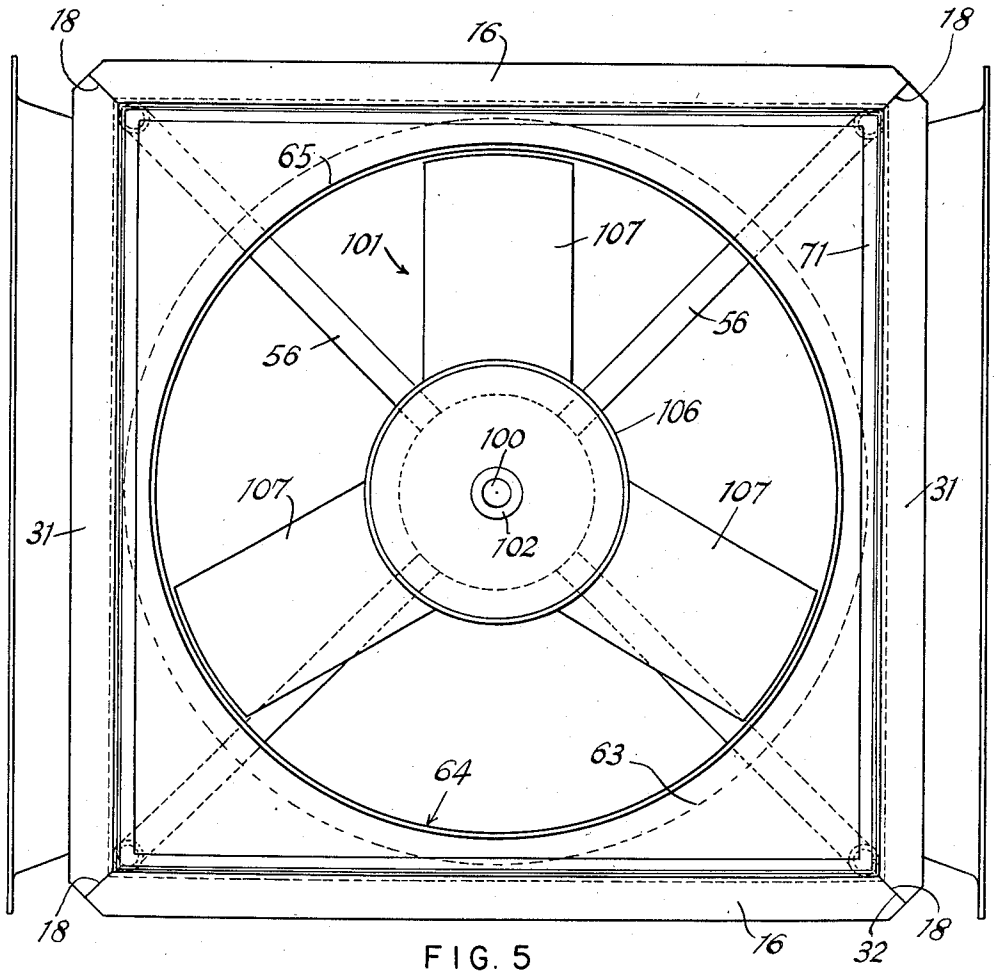


FIG. 5

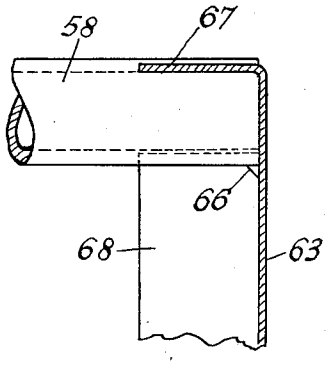


FIG. 7

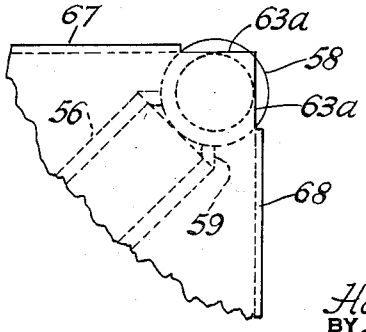


FIG. 6

INVENTOR
Harry S. Wheller
BY
J. B. Fellin
ATTORNEY

United States Patent Office

2,773,639

Patented Dec. 11, 1956

2,773,639

DRAFT INDUCERS

Harry S. Wheller, Elizabeth, N. J., assignor to L. J. Wing Mfg. Co., Linden, N. J., a corporation of New Jersey

Application September 1, 1953, Serial No. 377,857

28 Claims. (Cl. 230—117)

This invention relates to draft inducers.

An object of this invention is to provide a draft inducer so constructed as to assure the maintaining of fan shaft bearing temperatures at or on very few degrees above the ambient temperature of the room in which the unit is located; to insure furthermore, perfect, positive and permanent centering of the fan wheel within the shroud in which it turns, and positive alignment of bearings; and to also assure quick and easy removal of the working parts from the housing without damage.

A further object of this invention is to provide a draft inducer of the character described, comprising a heat insulating tube through which a fan shaft is carried and within which the bearings for the shaft are secured; the construction furthermore including a secondary fan on the hub of the main fan wheel, or separately mounted and located to draw air through the insulating tube and over the bearings for cooling the latter.

Yet another object of this invention is to provide a draft inducer of the character described, in which the insulating tube is secured at one end to a back plate, the opposite end of the insulating tube being secured to four radiating brace members, the outer ends of said brace tubular members being connected to the back plate by four parallel runners which also carry a fan wheel shroud, said runners serving to guide the assembly into and out of a housing, said shroud being accurately located with respect to the center of the shaft by reason of being carried by the four parallel runners, thereby further assuring permanent centering of the shaft and, therefore, of the fan wheel in the shroud and uniform clearance between the tips of the fan blade and the shroud.

Yet a further object of this invention is to provide a fan shaft with a pair of spaced bearings, one located at the front plate, and the other inside and close to the fan wheel, said bearings being interconnected by a tube surrounding the fan shaft and screw threaded or otherwise secured to the bearing housings, one end of the shaft extending beyond the front plate to receive a driving pulley or a motor coupling, and the other end carrying the fan wheel, whereby the bearings and the shaft comprise one permanently aligned assembly.

In accordance with the invention, the bearing assembly is secured and definitely centered in the insulating tube by means of a spider attached to the inboard or fan end of the insulating tube, which spider has a central conical bore engaging a machined conical surface of the adjacent bearing housing, whereas the opposite end of the insulating tube is provided with a similar spider also formed with a conical bore engaging a conical outer surface on the outboard bearing housing which is mechined to fit said bore. The outboard spider in accordance with the invention is carried by accurately located studs fixed to the front plate and holding the bearing assembly in place. In accordance with the invention there is allowance for expansion or contraction of the insulating tube and/or bearing assembly under temperature changes by means of springs on the studs, which springs are controlled by lock nuts on said studs. With such an assembly, bearing misalignment is impossible, fan misalignment is impossible, and all parts subject to expansion or contraction under temperature changes are free to expand or contract without binding.

Yet another object of this invention is to provide a driving motor mounted on the front plate and belted to a sheave on the fan shaft, the construction being such that the motor can be mounted either on the left or right side of the center of the front plate as desired.

Still a further object of this invention is to provide a draft inducer of the character described comprising a casing into which said fan and motor assembly is fitted, said casing being provided with flexible sealing strips which engage the fan shroud when the unit is completely assembled, for firmly sealing between the shroud plate of said assembly and the outer end of the casing.

Yet a further object of this invention is to provide in a draft inducer of the character described, a casing consisting of four assembled panels. The panels are of two different designs, one in the form of a plate with an opening, and one which is a plate without an opening. Four of these panels are fitted together to form a box, either by locking their angular flanges together by locking joints or by heavy U-shaped strips which draw the angular flanges together, each held in place by only two bolts.

These assembly bolts may also be used to hold four angular mounting brackets, one at each corner from which the unit could be suspended, or the same brackets may be so placed as to be used for supporting the unit if it should be desired to mount it on a base instead of suspending it. The housing may be made of any combination of the two panels. Thus, there may be three panels without openings and one with an opening, or there may be two of each, thus providing two openings, or three panels with openings may be used while the fourth has no opening, or, if desired, four of the panels formed with openings may be used.

In accordance with the invention these panels are provided with right angle flanges at each end, which when assembled in box form, provides means for securing a discharge duct at one end, and the front plate of the removable assembly at the opposite end. The removable assembly may be secured to the front flanges of the housing by the use of four U-shaped clips which clamp said front flanges to the front plate, each clip being held in place by a pair of bolts, one at each end.

The unit embodying the invention will thus have one flanged outlet for connecting to a discharge unit and either 1, 2, 3, or 4 inlets to which may be connected 1, 2, 3, or 4 inlet ducts or 1, 2 or 3 inlet ducts and one barometric damper.

Some of the advantages of the described construction are as follows:

All working parts may be removed and reassembled without danger of misalignment and without necessity for re-alignment. Furthermore, the fan wheel and blade bearing assembly may be removed from and placed in the casing assembly without danger of misalignment and without need for re-alignment when reassembling.

The present construction overcomes the difficulty previously had because proper alignment of numerous separate parts in the field is prctically impossible, and the slightest misalignment has been found to result in endless trouble and destruction of parts.

With prior devices there was a great need for careful alignment which ordinarily requires a great degree of skill, generally not found or required where equipment of this type is generally used.

Another advantage of the present construction is that the complete unit with its driving motor mounted on the front plate, is constructed in such a manner as to permit installation with fan shaft in a vertical or horizontal plane as may best be suited to the particular installation.

The panels may be so arranged and positioned as to let the flue gases into the housing either from top, bottom and/or either side. Draft inducer parts may be kept in stock and used as desired to accommodate conditions in the boiler room.

Furthermore, the present construction permits the shaft to be removed for the purpose of replacing bearings if such become necessary. This may be accomplished by first removing the fan wheel, then taking off the spider at the front plate, and removing the complete shaft and bearing assembly, which may be replaced in complete unit or the assembly may be disassembled and new bearing inserted.

The advantage is that if new bearings are to be inserted in the assembly, to replace worn bearings, the work can be done immediately in a clean place—at a workbench—rather than attempting to struggle around inside of the dirty inducer where it is difficult to work, and, therefore, difficult to do a good job.

Another advantage of the described construction is that the springs on the spider bolts give constant tension to press the cone surfaces of the bearing housing assembly against the spider cone seats and, therefore, in the case of expansion or contraction of the shaft and/or bearing housing assembly the bearings will not be subjected to destructive pressure which may otherwise result.

Furthermore if the panels are assembled to form a casing, the motor and fan assembly may be inserted in either of four positions 90° apart to accommodate desired positioning of the motor. The bearings are preferably self aligning bearings, the front bearing preferably being floating while the rear bearing is fixed. The insulating tube may comprise a double tube with insulation therebetween, said tube being fixed to the front plate by welding or otherwise, and at the back by four diagonal tubes or rods welded thereto, and also welded to the corner runner tubes, which in turn are welded at the front to the front plate, and at the rear to the fan shroud plate. The bearings are air cooled by a small fan mounted separately or integral with the large fan which removes the flue gases. The springs on the studs which support the front spider permit slight variations in the length of the outer insulating tube and also in the length of the bearing assembly, since these springs press the front spider against the cone on the front bearing. The air which cools the bearings is thrown out by the small fan and mixes with the flue gases and goes out of the unit with the flue gases. Hangers or lug attachments on the bolts which attach the top or bottom clips or joints can be rotated on the bolts to accommodate various supports.

Other objects of this invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly consists in the features of construction, combinations of elements, and arrangement of parts, which will be exemplified in the construction hereinafter described, and of which the scope of invention will be indicated in the following claims:

In the drawing forming part of this specification and accompanying the same:

Fig. 1 is a cross-sectional view taken on the line 1—1 of Fig. 2;

Fig. 2 is a front end view thereof;

Fig. 3 is an enlarged cross-sectional view of the fan shaft and bearing assembly;

Fig. 3A is a detail of one bearing in cross-section;

Fig. 4 is a cross-sectional view taken on line 4—4 of Fig. 1;

Fig. 5 is an elevational view of the outlet end of the unit;

Fig. 6 is a detailed view showing the connection of a corner tube to the shroud plate and to one of the diagonal tubes;

Fig. 7 is a vertical cross-sectional view illustrating the connection of one of the corner tubes to the shroud plate; and

Fig. 8 is a detailed view illustrating a modified connection between two of the panels of the casing.

Referring now in detail to the drawing, **10** designates a draft inducer embodying the invention. The same comprises a casing **11**, to which is removably attached a motor operated fan unit **12**. The casing **11** comprises four panels. These panels may be of two types, to wit, the panels **13** formed with openings and panels **14** which are closed. For the purpose of illustration the casing **11** herein is shown to comprise a pair of vertical panels **13** interconnected by a pair of panels **14**, it being understood, however, that the casing may also comprise either one open panel **13** and three closed panels **14**, or three open panels **13** and one closed panel **14**, or four open panels **13**.

Each panel **14** is made of sheet metal and comprises a flat rectangular wall or section **15** from one end of which extends at right angles thereto, a flange **16**, and from the other end of which extends at right angles thereto, a flange **17**. Flanges **16** extend beyond the sides of section **15** and have 45° inclined end edges **18**. Extending from one longitudinal side of section **15** is an outwardly inclined flange **19**. Extending from the opposite side of section **15** is a 45° outwardly inclined U-shaped clip **20**. It will be noted that the top and bottom panels **14** are similar and symmetrically disposed with respect to one another. Flanges **19** are formed adjacent the ends thereof with bolt holes to receive bolts **21**. The clips **20** are formed adjacent the ends thereof with bolt holes to receive bolts **22**. The bolts **21** and **22** are for the purpose hereinafter appearing.

The panels **13** are similar and symmetrically disposed with respect to one another. Each panel **13** comprises a rectangular frame portion **24** in a vertical plane, from the inner sides of which extend outwardly inclined walls **25**. Extending from the outwardly inclined walls **25** are flanges **26** forming a frame parallel to and of larger dimension than the frame **24**. Extending from one outer side of frame **24** is a 45° outwardly inclined flange **27**. The flanges **27** of the two panels are received in the U-shaped clips **20** of the panels **14** and are bolted thereto by the bolts **22**. Extending from the opposite outer side of frame **24** is a 45° angle U-shaped clip **28**. The U-shaped clips **28** of the panels **13** receive the flanges **19** of the panels **14** and are bolted thereto by said bolts **21**. The flanges **27** of the panels **13** and the clips **28** thereof are formed with suitable bolt holes to receive said bolts **21** and **22**.

Extending from the two opposite outer sides of the frame **24** are flanges **30** and **31**, respectively. The flanges **31** are in the same plane as flanges **16**, whereas the flanges **30** are in the same plane as flanges **17**. The flanges **31** have 45° inclined end edges **32** contacting the inclined end edges **18** of flanges **16**.

The flanges **17** have 45° outwardly inclined edges **33** contacting the outwardly inclined edges **34** of the flanges **30**. Angular brackets **35** may be mounted on the bolts **21** and **22** for attaching the casing to a base or for suspending the same from any suitable hanger or support. The brackets **35** can be inverted on the bolts **21** and **22** to be in a vertical position as hangers, or in a horizontal position as mounting bracket.

It will be noted that the four assembled panels form the casing. The flanges **16, 31** define the outlet end of the casing. either one of the panels **13** may constitute an inlet for flue gases or both may constitute inlets for flue gases. A barometric damper may be installed within one of the panels **13**. Should three panels **13** be employed,

all three may constitute inlets for flue gases, and if four panels are used they may all constitute inlets. However a barometric damper may be installed in any one of the panels 13.

The unit 12 which may be removably assembled as a unit with casing, may be of heavier or thicker metal than the sheet metal of which the panels 13, 14 are made. The flanges 17 and 30 of the panels 14 and 13 contact the inner surface of the plate 40 adjacent the outer ends thereof. Flanges 17 are united to the plate 40 by means of U-shaped clips 41 receiving said flanges and the adjacent outer ends of the plate 40. Said clips are each united with said flanges and plate by means of a pair of bolts 42 passing through registering openings in said clips, plate and flanges.

The flanges 30 of the panels 13 are united with the front plate 40 by U-shaped clips 45, each receiving said flanges and the side edges of the front plate and bolted thereto by a pair of bolts 46 passing through registering openings in said clips, flanges and front plate. It will be noted that the flanges 30 extend beyond the clips 45 and the flanges 17 extend beyond the clips 41, as shown in Fig. 2 of the drawing.

Fixed to the front plate 40 is a horizontal, central, large insulating tube 47. Said insulating tube 47 comprises an outer metal tube 48, the front end of which passes through a central opening 49 formed in front plate 40, and is welded thereto as at 50. The outer tube 48 projects slightly forwardly of the front plate 40 and extends substantially through the casing terminating short however of the rear or outlet end of the latter. Welded to the inner surface of the outer tube 49 adjacent the ends thereof are a pair of similar symmetrically disposed end members 51. Each member 51 comprises an outwardly flaring portion 52 from which extends a tubular portion 53. The outer edges of the flaring portions 52 are seamed to the inner surface of the tube 47 as at 52*a*. The tubular portions 53 of said members 50 are of smaller diameter and are disposed concentric to the tube 48 and project toward each other.

Centered on the inwardly projecting aligned tubular portion 53 is an inner tube 54 concentric with tube 48 and spaced therefrom and forming a tubular chamber therewith filled with insulating material 55. Attached to the front end of the outer tube 47 as by welding or in any other suitable manner, are four diagonal, radiating, rearwardly inclined tubular braces or struts 56. The inner ends of the tubular struts 56 are welded or otherwise secured to the outer tube 48 as at 57. Welded or otherwise secured to the outer ends of the tubes 56 are parallel longitudinal tubular runner or guide members 58. The welding of tubes 56 to tubes 58 is indicated at 59. The tubes 58 extend rearwardly beyond the tubes 56. The forward ends of the tubes 58 are welded or otherwise secured to the inner surface of the front plate 40 as at 60. The tubes 58 are parallel to one another and equally spaced from the axis of the insulating tube 47. Said tubes 58 are so located as to contact the corners formed by sections 15 of panels 14 with frame portions 24 of panels 13. Thus the tubes 58 act as runners to guide the unit 12 into the casing when said unit is assembled with the casing.

Fixed to the front ends of the tubes 58 is a fan shroud 62. Said shroud 62 comprises a flat plate portion 63 formed with a central opening 64 in which is mounted a cylindrical member 65 of a diameter somewhat less than the vertical distance between a pair of vertically aligned tubes 58. The front ends of tubes 58 are welded to wall 63 as at 66. Extending from the top and bottom ends of wall 63 are parallel horizontal flanges 67 terminating short of the tubes 58.

Extending from the sides of wall 63 are parallel vertical flanges 68 likewise terminating short of the tubes 58. It will thus be seen that the ends of tubes 58 extend beyond the side edges 63*a* of the corner portions of wall 63, and in fact, project beyond the planes of flanges 67 and 68 so that the tubes 58 contact the inner surfaces of sections 15 and frame portions 24 while the flanges 67 and 68 are somewhat inwardly spaced therefrom. The cylindrical wall 65 is fixed to the inner curved edge of the opening 64 by welding or in any other suitable manner.

Fixed to the inner surfaces of sections 15 and to the inner surfaces of said frame portions 24 as by bolts 70 are sealing strips 71 contacting the outer surfaces of wall 63 so as to create a seal between the forward end of the periphery of the unit 11 and the casing. The sealing strip 71 may be made of a double folded strip of asbestos and the bolts 70 may serve to press metal strips 73 against the portion of the sealing strips which contacts the panels, whereas a folded portion of the sealing strip is pressed by the inner edges of the strips 73 against plate 63.

The unit 12 further comprises a motor operated fan supported on the plate 40 and insulating unit 47 as will appear hereinafter. To effect such support, there is fixed to the inner surface of the outlet end of the outer tube 48 a plurality of studs 75. The heads 76 of said studs are welded to the inner surface of the tube 47 whereas the shanks of said studs extend rearwardly beyond the tube in spaced relation thereto, parallel to the axis thereof.

Mounted on said shanks of said studs is a spider 77. The spider 77 comprises an outer ring 78 contacting the rear edge of said tube 48. Said ring being formed with openings through which the shanks of the studs 76 pass. Nuts 79 screwed to said shanks serve to press the ring 78 against the outlet end of the tube 48. Said spider 77 further comprises radial spokes 80 carrying a center hub 81 formed with an internal machined conical surface 82 for the purpose hereinafter appearing.

Plate 40 is formed with a circle of openings 83 surrounding the center opening 49 and passing therethrough are the shanks of studs 84 projecting forwardly of the plate 40. The heads of the studs are welded to plate 40 as at 85. Slidably mounted on the shanks of the studs 84 is a front spider 86. Said spider 86 comprises an outer ring 87 formed with openings through which the shanks of the studs 84 pass. Said spider comprises radial spokes 88 supporting a central hub 89 formed with an internal machined concial surface 90 opposed to conical surface 82 of spider 77. Screwed to the outer ends of said shanks or bolts 84 are nuts 91. Coil compression springs 92 are interposed between said nuts 91 and the outer ring 87 of the spider 86. The ring 87 surrounds the forward end of the tube 48 and slidably receives the forward end of said tube.

Extending through the axis of the insulating tube 47 is a fan shaft 100. Fixed to the rear end of the fan shaft is a fan 101 located within the cylindrical portion 65 of the fan shroud 62. The fan 101 comprises a center hub 102 attached to the shaft 100 by means of set screws 103. Mounted on the hub 102 are a pair of spaced circular discs 104 spaced apart by a collar portion 105 on said hub. Fixed to the peripheries of the spaced discs 104 is a cylindrical member 106 to which are attached the radiating fan blades 107. The fan blades 107 are located within the cylindrical ring 65. Fixed to the inner disc 104 and projecting inwardly toward the outlet end of the insulating tube 47 are a plurality of smaller radial fan blades 110 for the purpose hereinafter appearing.

Mounted on the shaft 100 are a pair of similar symmetrically disposed bearings 111. These bearings may be of the self aligning type. The front bearing is preferably floating, while the rear bearing is fixed. The front bearing comprises a bearing housing formed with a front outer conical surface 112 engaging the machined complementary conical surface 90 of the front spider. The inner race of the bearing 111 has a set screw 113 con-

tacting but not fixed to a flat surface 114 on the shaft 100.

The rear bearing 111 comprises a bearing housing which has an outer conical machined surface 115 complementary to and contacting the inner machined conical surface 82 of the rear spider. The inner race of rear bearing has a set screw 116 fixedly contacting or tightening against a conical surface 117 of said shaft. The housing for the bearings 111 are formed with inwardly extending internally screw threaded tubular portions 118 interconnected by a tube 119 surrounding and spaced from the shaft 100 and having threaded portions at the ends thereon engaging said internally screw threaded portion 118. Other types of bearings may be used besides the type illustrated in the drawing.

Mounted on the front end of the shaft 100 or on the motor shaft is a variable speed sheave 120. Means is provided to rotate the sheave 120. To this end there is welded to the front plate 40 a horizontal transverse angle bar 121. The angle bar 121 comprises a downwardly extending vertical flange 122 welded to the front surface of the plate 40 below the front spider. Extending forwardly from the vertical flange 122 is a horizontal flange 123. Said horizontal flange 123 is formed on opposite sides of the center thereof with a pair of spaced through openings 125. The front plate 40 is formed with through openings 126 spaced below and substantially midway between the spaced openings 125 on each side of the vertical mid-section of said plate.

Removably attached to the front plate 40 and to the angle shaped member 121 is a motor supporting bracket 127. Said bracket 127 comprises a plate 129 having a horizontal portion 130 from which extends downwardly side flanges 131. The rear end of the plate 130 overlies the flange 123 and is formed with openings registering with a pair of openings 125 to receive therethrough a pair of bolts 131*a*.

It will be noted that plate 129 may be attached to the angle member 121 either on the left or right side thereof. Welded to the underside of horizontal wall 130 is the upper end of an inclined brace or strut 133 of angle cross section. Said strut or brace 133 comprises a vertical flange 134 from which extends at right angles thereto a flange 135. Flange 135 is inclined downwardly and rearwardly and has at its rear end a vertical portion 136 contacting wall 40 and formed with an opening which may register with either one of the openings 126 to receive therethrough a bolt 137. Thus, the motor support may be attached to either the left or right side of the front plate 40 by means of bolts 131*a*, 137.

Mounted on motor bracket 129 is an electric motor 140 which may be belted by belt 141 to the sheave 120.

It will now be understood that when the motor is energized and the fan is turning, flue gases will enter the casing through one of the panels 13 and will be passed out through the fan shroud 62. At the same time cool air will enter the insulating tube 47 to cool the bearings and will mix with the flue gases at the exit end of the insulating tube and pass out of the casing therewith. The smaller fan 110 serves to draw air through the tube 47.

There is thus provided a construction which will assure bearing temperatures at or very few degrees above the ambient temperature of the room in which the unit is located. This construction and design will insure positive and permanent centering of the fan wheel within the shroud and positive alignment of the bearing, and will permit quick and easy removal of the working parts from the housing. Carrying of the fan shroud on the tubular supports 56, 58 assures accurate location of the shroud with respect to the motor shaft 100, and therefore assures uniform clearance between the tips of the fan blades and the shroud.

The fan shaft bearings may be of the open type lubricated by grease cups mounted outside on the end plate, one cup serving each bearing with flexible copper tube connections thereto (not shown). These bearings may also be of the type that are lubricated for life and need no grease cups and further attention. The bearing assembly is secured and definitely centered in the insulating tube as described above. Expansion or contraction of the insulating tube and/or bearing assembly under temperature changes is permitted by the connection of the front spider on the studs 84 and the provision of the compression springs 92. Bearing misalignment is impossible, fan misalignment is impossible and all parts subject to expansion or contraction of temperature changes are free to expand without binding.

The entire motor and fan unit may be removed as a whole from the casing by removing the U-shaped clips 41, 43. The panels which comprise the casing may also be built up and various combinations of panels may be used as described above.

All working parts may be removed and reassembled without danger of misalignment and without necessitating realignment. The fan wheel and bearing assembly may be removed from the complete working parts assembly without danger of misalignment and without necessity of realignment and reassembling. By unscrewing the set screw 103 the fan may be removed. By removing the nuts 79, the rear spider may be removed. By unscrewing the nuts 91 the front spider and the center shaft together with bearings and the connecting tube 119 may also be removed.

The complete unit with its driving motor mounted on the end of front plate is constructed in such a manner as to permit installation of the unit with the shaft 100 in a vertical or horizontal plane as may be best suited to the particular installation.

It will now be understood that with the present construction changes may be made in the field by changing the panels around to suit any mounting condition so as to let flue gases in from top, bottom or either side or from 1, 2, 3 or 4 open panels. Also one open panel can have a barometric damper installed therein for air intake to create suction to vary the delivery of the flue gases.

The distributor or contractor of these draft inducers can keep these parts in stock and can assemble a draft inducer to accommodate any conditions in the boiler room. The springs 92 on the front spider bolts give constant tension to press the cone face of the bearing housing in the cone seat and regardless of expansion will always have pressure against the bearing housing assembly. The springs 92 furthermore permit variation in the length of the outer air tube since the springs press the front spider against the cone on the front bearing.

The whole unit 12 can furthermore be inserted in four positions 90° apart to accommodate desired positioning of the motor. The double tube 47 with insulation is fixed to the front plate and serves as a good insulator to keep the hot flue gases away from the bearings. The bearings are air cooled and the cooling of these bearings takes place whenever the fan is operating.

In Fig. 8 there is shown a modified construction. In said figure there are shown panels 13*a* and 14*a* replacing the panels 13 and 14. The panels 13*a* and 14*a* are the same as panels 13, 14 except that both have meeting flanges held together by clips 150 receiving said flanges, such construction replacing the integral U-shaped clips on said panels. These clips 150 are located at the four corners of the casing. The clips together with contacting flanges are formed with registering openings to receive attaching bolts 151 located at the ends of the clips.

It will thus be seen that there is provided a device in which the several objects of this invention are achieved and which is well adapted to meet the conditions of practical use.

As possible embodiments might be made of the above invention, and as various changes might be made in the embodiment above set forth, it is to be understood that

all matter herein set forth or shown in the accompanying drawing, is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim as new and desire to protect by Letters Patent of the United States:

1. A draft inducer comprising a casing, said casing comprising top, bottom and side panels, at least one of said panels having a flue gas inlet opening therein, means to detachably attach the adjacent corners of the panels to form a casing of rectangular cross section, a front wall, means to detachably attach said front wall to the front end of the casing, and insulating tube axially attached to the front wall and projecting therefrom into the casing, diagonal struts attached to the rear end of the insulating tube, parallel corner members attached at their rear ends to the struts and at their front ends to the front plate and constituting runners contacting the corners of the casing formed by said panels, a fan shroud fixed to the forward ends of said parallel members, spiders at the front and rear ends of said insulating tube, bearings supported by said spiders, a shaft passing through said insulating tube and bearings, and a fan at one end of said shaft and located within the fan shroud to remove flue gases through the rear end of the casing.

2. The combination of claim 1, a motor mounted on the front plate and means to couple the motor to said shaft for rotating the latter.

3. The combination of claim 2, and auxiliary fan means on said fan to draw air through said insulating tube.

4. A draft inducer comprising a casing, a fan and motor assembly comprising a front wall, means to attach the front wall to the front end of the casing, an insulating tube fixed to the front wall and extending therethrough and projecting into the casing, a plurality of parallel members fixed to the front wall, means to interconnect the rear end of the insulating tube with said parallel members, said casing having longitudinal inner corners engaged by said parallel members, a fan shroud supported by the front end of said parallel members, spiders at the front and rear ends of the insulating tube, a shaft passing through the axis of said insulating tube, a fan attached to the shaft and disposed within the fan shroud, a pair of bearings on said shaft and means on said spiders to support said bearings.

5. The combination of claim 4, said fan comprising a main fan to draw flue gases through the casing, and a smaller auxiliary fan to draw fresh air through said insulating tube for cooling the bearings.

6. In a draft inducer, an assembly comprising a front wall formed with a central opening, an insulating tube having its front end fixed within said central opening, a spider slidably mounted relative to the front wall at the front end of the insulating tube, spring means to press said spider toward said front wall, a spider fixed to the rear end of the insulating tube, said spiders being formed with opposed internal conical surfaces, bearings having opposed outer conical surfaces engaging the internal conical surfaces of said spiders, a shaft passing through said bearings, and a fan on said shaft.

7. The combination of claim 6, diagonal struts fixed to said insulating tube and parallel runners connected at their front ends to the front wall and at their rear ends to said struts, and a fan shroud attached to the rear ends of said runners and surrounding the fan.

8. The combination of claim 6, said fan comprising a main larger fan portion extending radially outwardly of the insulating tube, and an auxiliary smaller fan at the end of the insulating tube to draw air therethrough for cooling the bearings.

9. The combination of claim 7, in combination with a casing having internal corners engaged by said parallel runners, and means to removably attach the front plate to the front end of the casing.

10. In a draft inducer, an assembly comprising a front wall formed with a central opening, an insulating tube having its front end fixed within said central opening, a spider slidably mounted relative to the front wall at the front end of the insulating tube, spring means to press said spider toward said front wall, a spider fixed to the rear end of the insulating tube, said spiders being formed with opposed internal conical surfaces, bearings having opposed outer conical surfaces engaging the internal conical surfaces of said spiders, a shaft passing through said bearings, and a fan on said shaft, diagonal struts fixed to said insulating tube and parallel runners connected at their front ends to the front wall and at their rear ends to said struts, and a fan shroud attached to the rear ends of said runners and surrounding the fan, a casing having internal corners engaged by said parallel runners, and means to removably attach the front plate to the front end of the casing, and a sealing strip on the rear end of said casing engaging the fan shroud.

11. The combination of claim 10, in combination with a motor support attached to the front plate, a motor on the motor support, and means to belt the motor to said fan shaft.

12. In a draft inducer, a casing comprising a plurality of panels, said panels having at the sides thereof mutually contacting angular flanges, means to interlock said flanges, at least one of said panels being formed with an opening to admit flue gases to said casing, said panels being formed at their front ends with outwardly extending flanges, an assembly unit detachably mounted on said casing, said unit comprising a front plate contacting said outwardly extending flanges at the front ends of said panels,U-shaped clips engaging said outwardly extending flanges and end edges of said front plate, bolts passing through said clips and contacting flanges and front plate, said front plate being formed with a central opening, an insulating tube passing through said opening and fixed to said front plate and projecting into said casing, diagonal struts attached to the front end of the insulating tube, and runners interconnecting the front plate with said struts and contacting the corners formed by said panels, a fan shaft passing through said insulating tube, bearings for said shaft, means on said insulating tube to support said beairngs, a fan shroud supported by said runners, and a fan on said shaft and located within said fan shroud.

13. The combination of claim 12, in combination with means for sealing the fan shroud to the casing.

14. The combination of claim 12, a motor support mounted on the front of the front plate, an electric motor on said support, and means to connect said motor to the shaft for rotating the latter.

15. A draft inducer comprising a casing, said casing comprising a plurality of panels, means to detachably attach the sides of each panel to sides of adjacent panels, at least one of said panels having a flue gas inlet opening, a fan unit, comprising a front plate, means to detachably attach the front plate to the front end of the casing, guide means fixed to the front plate and adapted to slidably engage the internal corners of the casing formed by said panels, an insulating tube fixed to said front plate and projecting into the casing, a pair of bearings, means on the insulating tube to support said bearings, a fan shaft, supported by said bearings and passing through said insulating tube and front wall, and a fan on said shaft and adjacent the rear of said casing.

16. The comibnation of claim 15, in combination with a fan shroud fixed relative to the front plate and located at the rear end of the casing and surrounding said fan, said shroud forming an outlet for flue gases at the rear end of the casing.

17. The combination of claim 15, in combination with a tube surrounding said shaft and interconnecting said bearings, said means to support said bearings including

means to exert spring tension inwardly against said bearings.

18. A draft inducer comprising a casing, said casing comprising a plurality of panels, means to detachably attach the sides of each panel to sides of adjacent panels, at least one of said panels having a flue gas inlet opening, a fan unit, comprising a front plate, means to detachably attach the front plate to the front end of the casing, guide means fixed to the front plate and adapted to slidably engage the internal corners of the casing formed by said panels, an insulating tube fixed to said front plate and projecting into the casing, a pair of bearings, means on the insulating tube to support said bearings, a fan shaft, supported by said bearings and passing through said insulating tube and front wall, and a fan on said shaft and adjacent the rear of said casing, a fan shroud fixed relative to the front plate and located at the rear end of the casing and surrounding said fan, said shroud forming an outlet for flue gases at the rear end of the casing, said insulating tube being open at opposite ends to allow air to pass therethrough, and an auxiliary fan means on said fan to draw air through said insulating tube to cool said bearings.

19. A draft inducer comprising a casing, said casing comprising a plurality of panels, means to detachably attach the sides of each panel to sides of adjacent panels, at least one of said panels having a flue gas inlet opening, a fan unit, comprising a front plate, means to detachably attach the front plate to the front end of the casing, guide means fixed to the front plate and adapted to slidably engage the internal corners of the casing formed by said panels, an insulating tube fixed to said front plate and projecting into the casing, a pair of bearings, means on the insulating tube to support said bearings, a fan shaft, supported by said bearings and passing through said insulating tube and front wall. and a fan on said shaft and adjacent the rear of said casing, the means for supporting said bearings comprising a spider attached to the rear end of said insulating tube, a spider slidably and non-rotatably mounted on the front end of said insulating tube, spring means to press said front spider toward the front end of said tube, said spiders being formed with internal opposed conical surfaces, and said bearings having external conical surfaces engaged by said internal conical surfaces.

20. A draft inducer comprising a casing open at its front and rear ends and having a side inlet for flue gases, a fan unit assembly, means to detachably attach said assembly to said casing, said assembly comprising a front plate to close the front end of the casing, said front plate being formed with an opening, a tube fixed to said front plate at said opening therein and projecting into said casing to permit air to pass through the tube to the rear end of the casing, a fan shaft passing axially through the tube, bearings for said shaft supported by said tube, said unit including a fan shroud located adjacent the rear end of the casing and fixed relative to said front plate, and fan means on said shaft and within said fan shroud to blow flue gas entering the casing by means of the inlet, through the rear end of the casing and to draw air through the tube for cooling said bearings.

21. A draft inducer comprising a casing open at its front and rear ends and having a side inlet for flue gases, a fan unit assembly, means to detachably attach said assembly to said casing, said assembly comprising a front plate to close the front end of the casing, said front plate being formed with an opening, a tube fixed to said front plate at said opening therein and projecting into said casing to permit air to pass through the tube to the rear end of the casing, a fan shaft passing axially through the tube, bearings for said shaft supported by said tube, said unit including a fan shroud located adjacent the rear end of the casing, and fixed relative to said front plate, and fan means on said shaft and within said fan shroud to blow flue gas through the rear of the casing and to draw air through the tube from the outside of the casing for cooling the bearings, and guide means fixed relative to said front plate and adapted to slidably engage the interior of said casing to facilitate insertion of said unit into said casing.

22. A draft inducer comprising a casing open at its front and rear ends and having a side inlet for flue gases, a fan unit assembly, said assembly comprising a front plate, means to detachably attach said front plate to the front end of the casing, an insulating tube fixed to the front plate and projecting into said casing and being open through the length thereof so that air may pass therethrough, spiders removably attached to the ends of said tube, bearings supported and centered by said spiders, a fan shaft passing through said bearings, a fan shroud, means to fix said shroud to said front plate, said shroud being located at the rear end of the casing, and a fan removably mounted on said fan shaft and located in said fan shroud for flowing flue gases out of said casing.

23. The combination of claim 22, in combination with means to interconnect said bearings, and means to resiliently press said spiders against said bearings.

24. The combination of claim 23, in combination with runner means fixed to said front plate and engageably with the casing to guide said unit assembly into said casing.

25. A draft inducer comprising, in combination, a casing having an inlet and an outlet for flue gases, a fan unit assembly adapted to be assembled with the casing and removed therefrom as a whole, and comprising a member, means to detachably attach said member to said casing, a fan shaft, means on said member to support said shaft for rotation, a fan on said shaft, and a fan shroud fixed to said member at said outlet and surrounding said fan whereby said fan will blow flue gases entering the inlet out through said outlet, a motor support on said member, a motor on said support, means to couple said motor to said shaft, and means to seal said casing to said shroud, and tubular means on said member and surrounding said shaft to insulate said shaft from the flue gases passing through said casing.

26. The combination of claim 25 in combination with auxiliary means on said fan shaft to blow air over said shaft.

27. In combination, a plurality of panels, each panel being formed at one side with an outwardly extending angular flange, and at its opposite side with an outwardly inclined U-shaped clip portion, the U-shaped clip portion of each panel engaging the flange of an adjacent panel, said flanges and U-shaped portions being formed with registering openings, bolts passing through said registering openings for fixing said panels together, at least one of said panels being formed with an opening to admit flue gases to the casing, and a fan unit removably mounted in said casing, said unit comprising a front plate, said panels being formed at their front ends with outwardly extending flanges contacting the front plate, U-shaped clips engaging said flanges and adjacent edges of said front plate, and means to bolt said clips to said contacting flanges and front plate, said unit further comprising runners fixed to the front plate and contacting the internal corners formed by said panels, an insulating tube supported by the front plate and runners, and projecting into said casing, a fan shroud supported by said runners, a fan shaft passing through the insulating tube, bearing means in the tube supporting said shaft, and a fan on said shaft within said fan shroud.

28. A draft inducer comprising a casing open at its front and rear ends and having a side inlet for flue gases, a fan unit assembly, means to detachably attach said assembly to said casing, said assembly comprising a front plate to close the front end of the casing, said front plate being formed with an opening, a tube fixed to said front plate, at said opening therein and projecting into said casing to permit air to pass through the tube to the rear end

of the casing, a fan shaft passing axially through the tube, bearings for said shaft supported by said tube, said unit including a fan shroud located adjacent the rear end of the casing and fixed relative to said front plate, and fan means on said shaft and within said fan shroud to blow flue gas entering the casing by means of the inlet, through the rear end of the casing, and to draw air through the tube for cooling said bearings, said fan means comprising a main fan on said shaft and surrounding the tube for drawing said flue gases through the casing, and an

auxiliary fan on the shaft and aligned with the tube for drawing the air through the tube.

References Cited in the file of this patent

UNITED STATES PATENTS

1,391,645	Wheller	Sept. 20, 1921
1,462,151	Seymour	July 17, 1923
2,276,614	Grapp	Mar. 17, 1942
2,325,154	Walters	July 27, 1943
2,502,204	Cole	Mar. 28, 1950