

April 10, 1928.

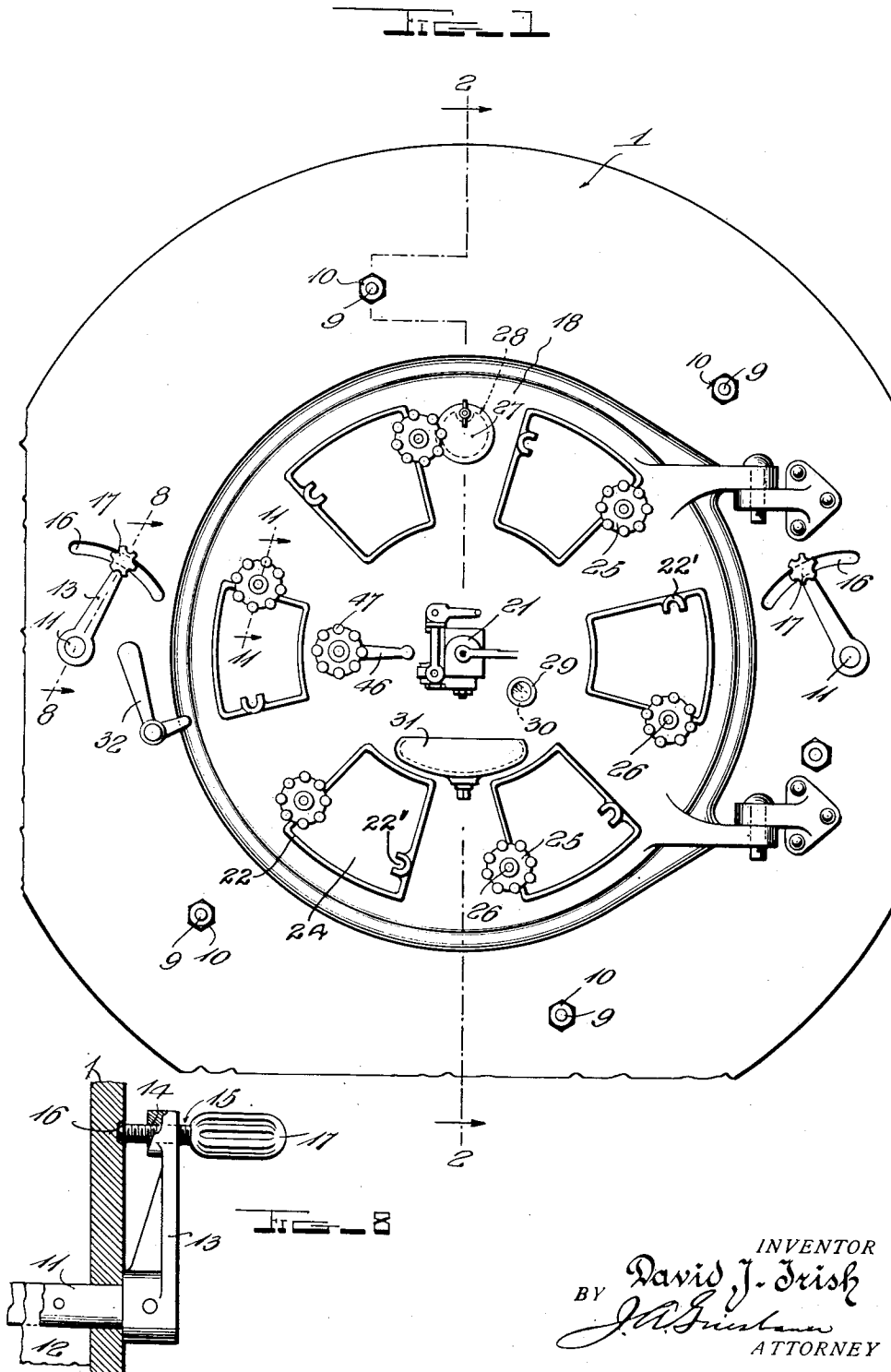
1,665,786

D. J. IRISH

FURNACE FRONT

Filed June 16, 1924

5 Sheets-Sheet 1



April 10, 1928.

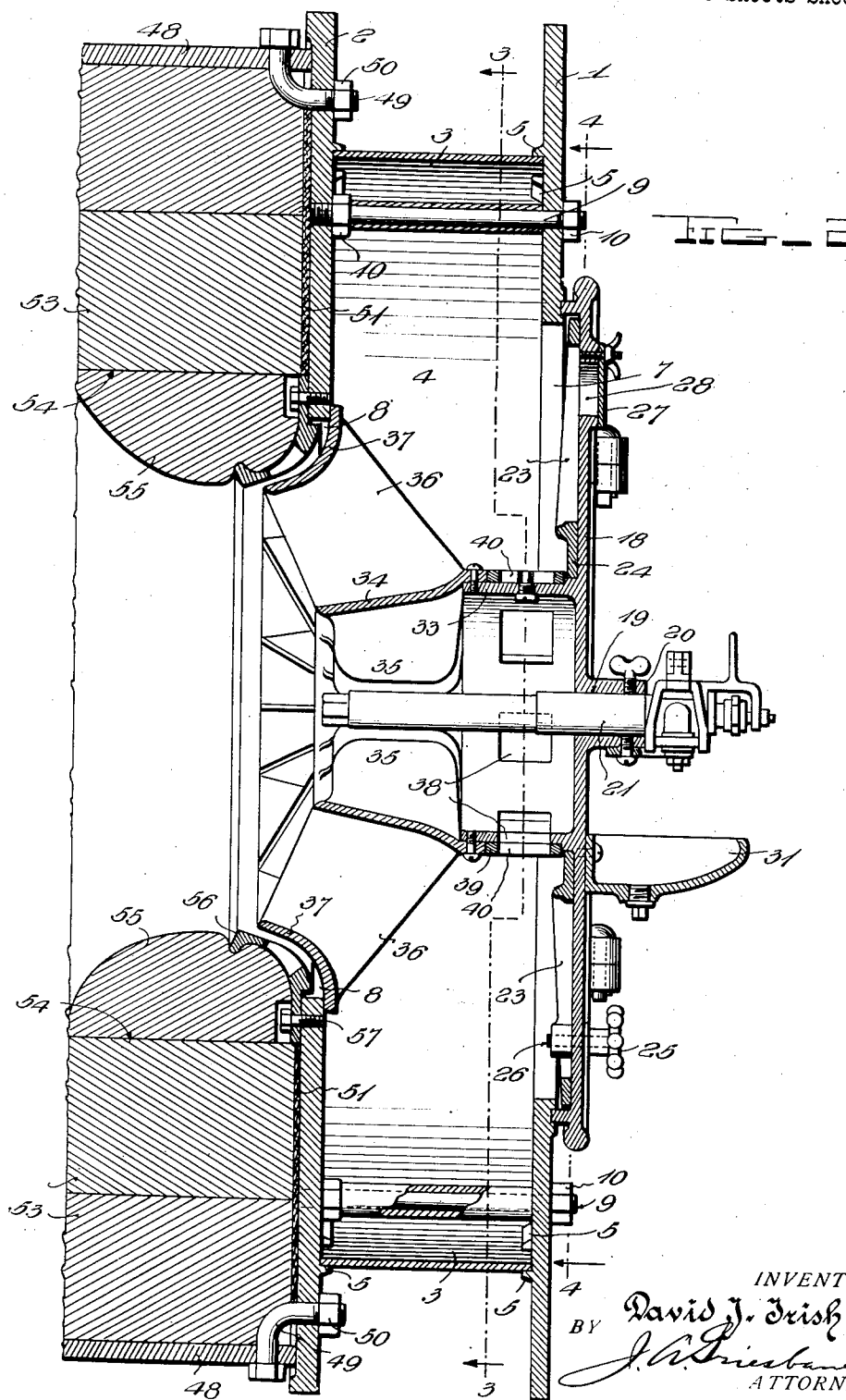
1,665,786

D. J. IRISH

FURNACE FRONT

Filed June 16, 1924

5 Sheets-Sheet 2



INVENTOR

David J. Irish

BY

J. A. Griebner

ATTORNEY

April 10, 1928.

1,665,786

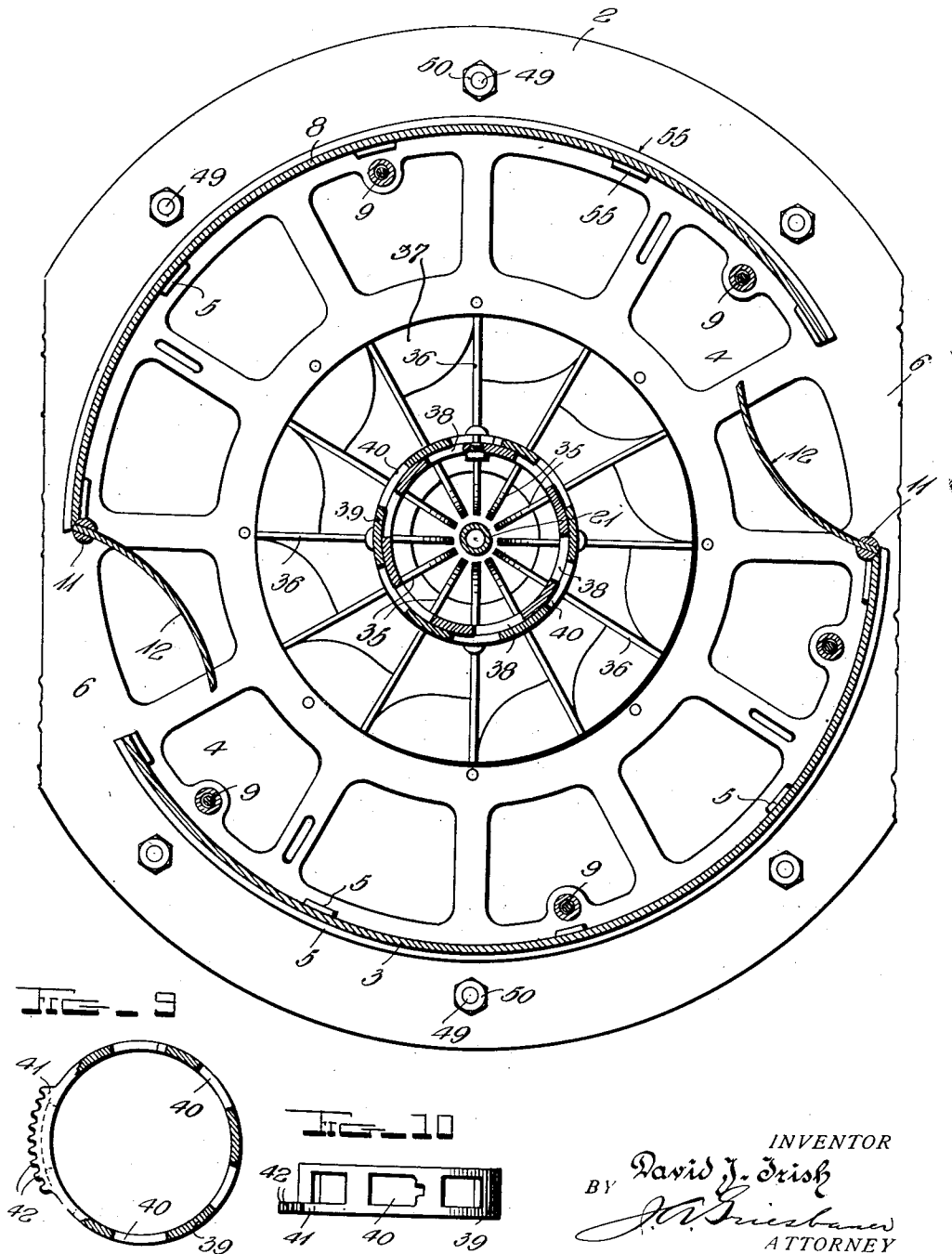
D. J. IRISH

FURNACE FRONT

Filed June 16, 1924

5 Sheets-Sheet 3

Fig. 3



INVENTOR
BY *David J. Irish*
J. W. Friesbawer
ATTORNEY

April 10, 1928.

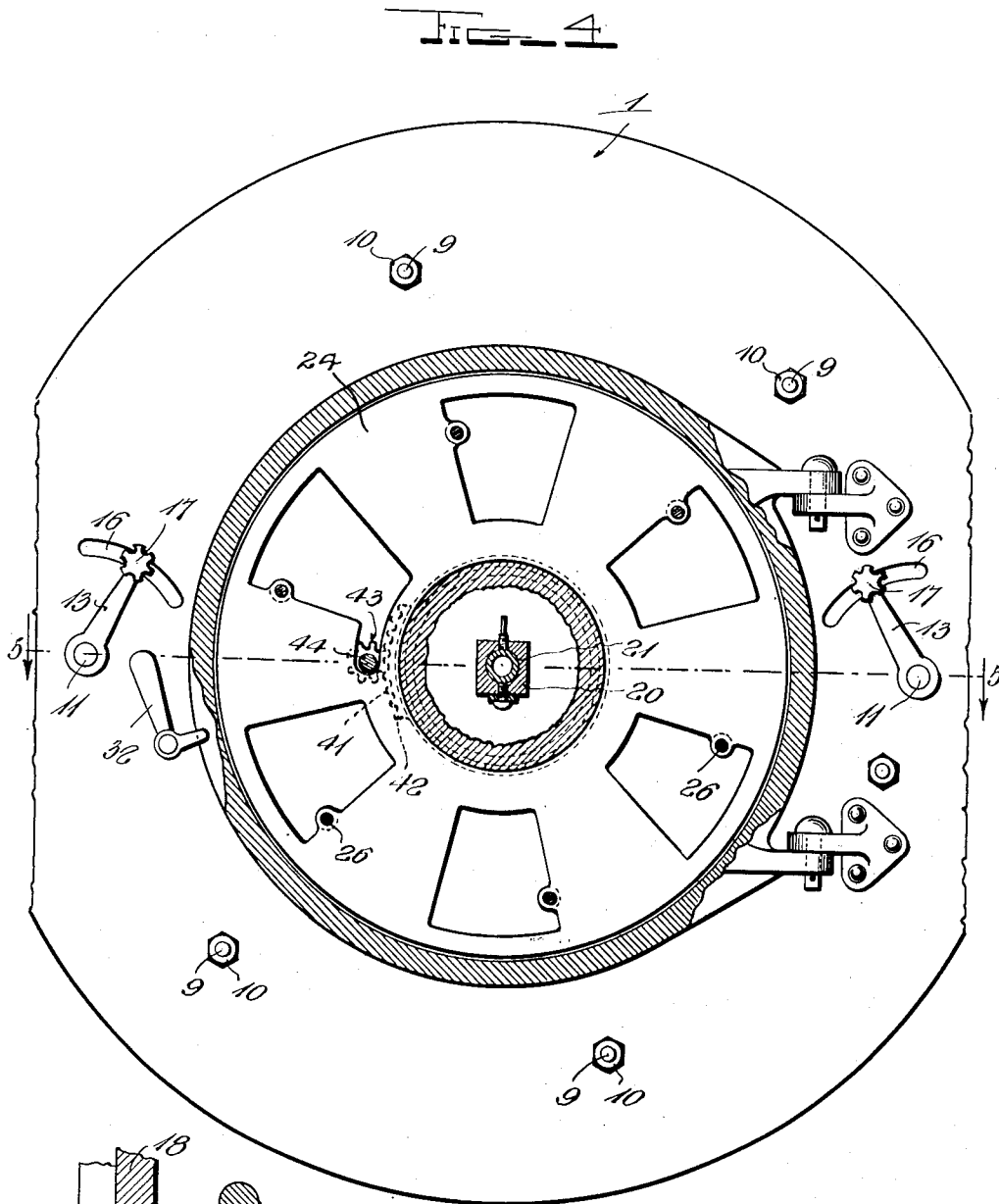
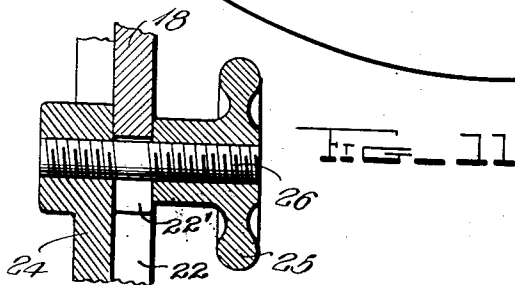
1,665,786

D. J. IRISH

FURNACE FRONT

Filed June 16, 1924

5 Sheets-Sheet 4



INVENTOR
BY *David J. Irish*
J. M. Irish
ATTORNEY

April 10, 1928.

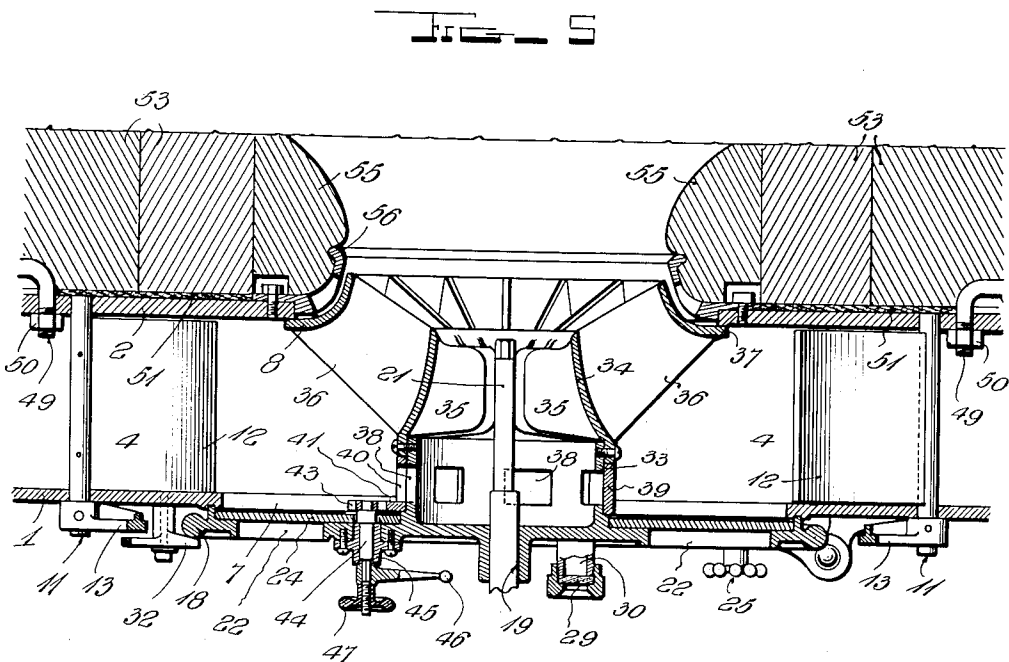
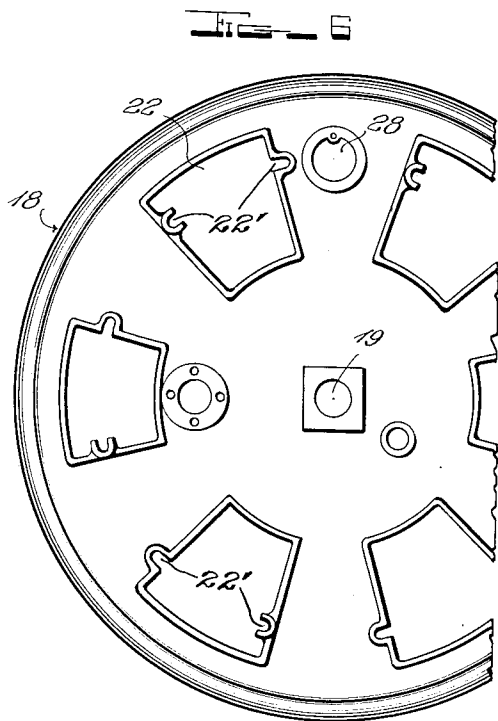
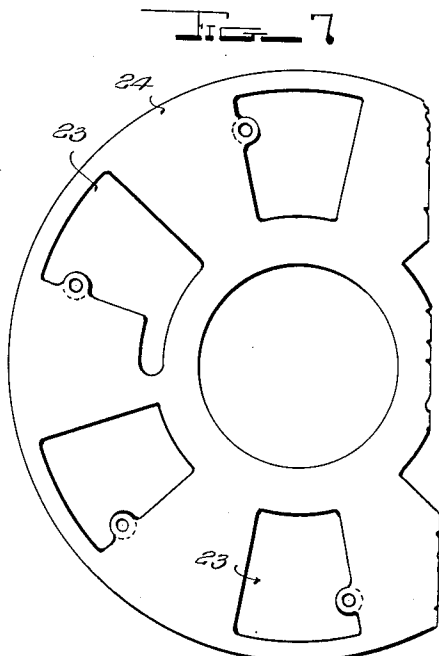
1,665,786

D. J. IRISH

FURNACE FRONT

Filed June 16, 1924

5 Sheets-Sheet 5



INVENTOR
David J. Irish
BY *J. A. Sweeney*
ATTORNEY

UNITED STATES PATENT OFFICE.

DAVID J. IRISH, OF WEST NEW BRIGHTON, NEW YORK, ASSIGNOR TO MORSE DRY DOCK & REPAIR CO., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

FURNACE FRONT.

Application filed June 16, 1924. Serial No. 720,401.

This invention relates to furnace fronts for directing and controlling the admission of combustion air to the burner of an oil or liquid fuel burning system for a Scotch or similar type of boiler.

The primary object of the invention is to provide a device of this character which is practical and highly efficient for use with either forced draft or natural draft to the burner.

In the device, novel provision has been made for controlling at will the amount of combustion air admitted through both the forced draft inlet and the natural draft inlet, and also for causing the air to be effectively distributed in a whirling cone around the entire circumference of the cone-shaped spray of oil which issues from the atomizer or burner.

In addition to designing the invention so as to operate effectively, it was also designed so as to be capable of being easily installed or attached to the front of a furnace or boiler, and furthermore, in designing it much attention was paid to making it of simple construction. In this connection, mention will be made of the fact that many of the parts of the device are made as castings, that the various parts are held together in assembled relation in a rather simple manner, and that the door with which the casing forming the air whirling chamber is provided, carries means for supporting not only the burner but also an air director. This air director, being connected or attached to the door, is withdrawn from the air whirling chamber through the door opening when the door is opened.

In further describing the invention, reference will be made to the accompanying drawings, which form a part of this specification and in which a practical embodiment of the invention is illustrated.

In the drawings:—

Fig. 1 is an elevational view of a portion of a furnace front constructed in accordance with the principles of the present invention;

Fig. 2 is a vertical sectional view of the furnace front, taken substantially on the plane indicated by the line 2—2 of Fig. 1, and showing the front in position at the front of a furnace;

Fig. 3 is a transverse sectional view of the front taken substantially on the plane indicated by the line 3—3 of Fig. 2;

Fig. 4 is a transverse sectional view taken substantially on the plane indicated by line 4—4 of Fig. 2;

Fig. 5 is a horizontal sectional view of the front, taken substantially on the plane indicated by the line 5—5 of Fig. 4;

Fig. 6 is a front elevation of a portion of the door of the device;

Fig. 7 is a similar view of a portion of the damper plate for the door;

Fig. 8 is a detail sectional view illustrating the operating means for one of the valve plates for controlling the admission of forced draft air into the air whirling chamber formed by the casing of the device, said view being taken substantially on the plane indicated by the line 8—8 of Fig. 1;

Fig. 9 is an end view, partly broken away and in section, of the damper ring for the air directing shell with which the door of the device is provided;

Fig. 10 is a side elevation of the damper ring shown in Fig. 9; and

Fig. 11 is a detail sectional view illustrating one of the means for clamping the damper plate of the door in place, said view being taken substantially on the plane indicated by the line 11—11 of Fig. 1.

The device is in the form of a casing which preferably consists of a front plate 1, a back plate 2, and an intermediate plate 3 forming an air whirling chamber 4 between the front and back plates. Both the front plate 1 and the back plate 2 may be constructed as castings and are preferably provided on their adjacent faces with ribs 5 forming seats for the front and rear edges of the intermediate plate 3. The intermediate plate or side wall 3 may be constructed of wrought metal and is preferably composed of an upper substantially semi-circular section and a lower section of the same shape. The ends of the two sections are spaced apart at the sides of the device so as to form air inlets 6. The front plate 1 is provided with a door opening 7, and in line with this, there is a flame opening 8 in the back plate 2.

The front, back and intermediate plates are maintained in relative assembled positions by means of suitable securing elements. Preferably, these elements consist of stay-bolts 9, which are provided wherever necessary with retaining nuts 10.

Pivoted at one of their ends upon pivots 11 extending between the front and back

plates and disposed at edges of the air inlet openings 6 which face circumferentially in one direction, are combination valve and air directing plates 12. These plates 12 open inwardly and when opened so as to permit air to enter the chamber 4, form continuations of the side wall 3 and serve to impart to the entering air, a whirling motion, as well as circumferentially directing such air in the air box or casing. By an inspection of Fig. 3, it will be seen that in the disclosed embodiment of the invention, there are two of the combination valve and air deflecting plates 12, and that these two plates have a curvature which is the reverse of the curvature of the side wall 3. By this formation, it will be understood that when both valve plates are opened, the air entering both openings 6 will be circumferentially directed by the plates in the same direction through the chamber 4, and that such air is directed along the inner side of the wall 3, insuring an even distribution around certain air-whirling means hereinafter described.

The valve plates 12 are preferably operated or adjusted independently, but both occupy either an open or closed position at one time. The particular operating means employed is illustrated in Figs. 1 and 8. From these, it will be seen that the pivots 11 of the valve plates 12 are provided upon the front side of the front plate 1 with operating arms 13, the free ends of which have threaded apertures 14, through which extend binding screws 15. These binding screws 15 seat in arcuate grooves 16 arranged in the front face of the front plate 1. The outer ends of the screws 15 are provided with suitable operating knobs 17, as shown.

Hingedly mounted on the front plate 1 is a door 18 for closing the door opening 7 in said plate. As shown, this door is mounted so as to swing outwardly to open position. The central portion of the door is provided with an opening 19 for receiving an oil or fluid fuel burner, and with means 20 for supporting the burner, the burner being represented by the numeral 21 in several of the views of the drawings. Arranged in a circular series adjacent the outer edge of the door 18 are openings 22, which are adapted to register with the openings 23 formed in a damper plate 24, which is disposed flat against the rear surface of the door. This damper plate 24 is adapted to be secured either in opened or closed position by means of an annular series of handled nuts 25 threaded upon threaded stems 26 projecting from the damper plate through the openings 22, the nuts 25 being adapted to bear against portions of the outer surface of the door 18, at the edges of notches 22' in edges of the openings 22, which notches receive the stems

26 when the damper is either open or closed. By loosening the nuts 25, the damper plate 24 may be turned to the desired position by engaging one of the nuts. When the damper plate 24 is closed, forced draft is admitted through the openings 6, and in order to prevent leakage of the air under pressure, from the interior of the furnace front, the clamping devices 25—26 are employed to tightly clamp the damper plate to the door 18, at each of the air inlet openings 22.

Accessories for the door consist of a small cover plate 27 to cover the lighting hole 28, a glass faced cap 29 for a sight hole 30, and a drip cup 31.

In order to hold the door closed, it is adapted to be engaged by a manually operated latch 32 which is pivotally mounted upon the front plate 1.

Projecting inwardly from the inner side of the door 18 is an air directing shell. This is in the present disclosure composed of two sections 33 and 34, the section 33 being of circular or cylindrical shape and being cast integrally with the door, from which it projects in the form of an annular flange while the section 34, which is of frusto-conical or substantially cylindrical shape is screwed or otherwise suitably secured around the inner edge portion of the section 33. The section 34 is provided both on the inside and the outside with air directing vanes or webs 35 and 36, the webs 35 being the inside webs and the webs 36 being the outside webs. The webs 36 are pitched spirally and extend to the flame opening 8 in the back plate 2 terminating adjacent the edge of the flame opening in an annular member 37. As shown, this member 37 is provided with a flat peripheral portion to seat against the back plate 2, and said member is transversely contracted from said peripheral portion to its inner edge to extend into the flame opening 8 when the door 18 is shut. By this means, all of the air passing through the casing around the air directing shell 33—34 will have to pass between the webs 36 and be given a whirling motion by said webs, and the shape of the ring or member 37 will deliver the whirling air to the fire box in the most advantageous manner.

The section 33 forming part of the air directing shell is surrounded by and forms a pivotal support for damper plate 24, which is of annular form. This section 33 is provided with a series of openings 38, which are adapted to be opened or closed by the adjustment of a ring damper 39 provided with corresponding openings 40, turnably mounted upon the section 33 between the door 18 and the section 34. One edge of this damper 39 is provided with a laterally extending curved rack 41 formed

with gear teeth 42 meshing with a pinion 43 mounted upon a spindle 44. The spindle 44 extends through a bearing 45 arranged in the door 18 and is provided with an operating handle 46. The free end of the spindle 44 is threaded to receive a lock or binding nut 47 to lock the spindle and therefore the damper ring in adjusted position. As clearly shown in Fig. 5, the hub of the handle 46 has a flat-faced bore to slide on a similar shaped part of spindle 44, and the latter is clamped within the bearing 45 by the hand nut 47 thrusting the hub of the handle against one end of the bearing, the spindle having an enlargement to thrust against the other end of the bearing.

As will be seen from Figs. 2 and 5 of the drawings, the burner 21 is disposed within the air directing shell 33-34, and the latter with the webs 36 and annular member 37 is small enough to permit all of these parts to be withdrawn through the door opening 7 in the front plate 1 when the door 18 is swung to open position. When, however, the door 18 is closed, the parts will be positioned as shown in the drawing with the annular member 37 engaging the back plate 2 at the edge of the flame opening 8.

As hereinbefore mentioned, the device is intended to be used as the front of the furnace of a Scotch or similar type of boiler, and in Figs. 2 and 5 of the drawings, it is shown in operative position upon the boiler. From Fig. 2, it will be seen that the back plate 2 rests against the front of the furnace box 48, being secured thereto by means of curved bolts 49 passing through the wall of the furnace box and back plate 2 and being provided with suitable retaining nuts 50. If desired, packing 51 may be disposed between the back plate 2 and the fire brick lining 53 with which the front end of the furnace box 48 is provided. The fire brick lining is provided with an opening 54 in which is received a fire brick ring 55 whose inner surface flares outwardly. This ring may be formed in a plurality of sections, which are held in place by appropriate clamping means 56 secured by bolts 57 or other suitable means to the back plate 2 adjacent the fire or flame opening 8.

In operation, when forced draft or air under pressure is employed the damper 24 is closed and the two dampers 12 are opened more or less depending upon the degree of heat desired. It will be understood that suitable forced draft conduits (not shown) are connected to the openings 6. Inasmuch as the combined dampers and deflectors 12 are pivoted at their ends to open inwardly and are curved as clearly shown in Fig. 3, the air in entering will be given a rotary or whirling motion around the chamber 4, and because they are arranged at opposite sides and so positioned that they deflect

the air from both openings 6 in the same circumferential or rotary direction there will be an effective and uniform distribution of air around the entire chamber 4. This rotary motion of the air is continued by the spirally pitched webs or blades 36 and the main volume of air to support combustion will be delivered to the cone-shaped oil spray of the atomizing burner 21 in a uniform whirling cone-shaped mass. For the purpose of controlling the shape of the cone-shaped oil spray, some air is admitted into the inside of the air directing shell 33-34, through the openings 38 when the damper ring 39 is adjusted to a more or less open position depending upon the amount of heat desired, the shape and size of the fire box, etc. During the use of forced draft, the damper plate 24 is held tightly closed by the clamping devices 25-26, as above explained, so that no pressure can escape through the openings 22. When the natural draft is used the dampers 12 will be closed and the damper 24 open to proper extent. This damper may be held fully open if desired, by the clamping devices 25-26. All air admitted when this damper is opened, is supplied evenly around the entire interior of the chamber 4, and, as in the case with forced draft, the main combustion air will enter between the cone-shaped members 35-37, but burner control air will enter through the openings 38 to the interior of the shell 34.

From the foregoing description, taken in connection with the accompanying drawings, the construction; use, operation and advantages of the invention will be readily understood.

It is obvious that numerous changes in form, proportion, and in the various details of construction, may be made without departing from the spirit or principle of the invention, and without sacrificing any of the advantages thereof, so that such changes come within the meaning and scope of the appended claims.

I claim:

1. In a furnace front, an air-receiving casing having a front plate provided with a door opening and a back plate formed with a flame opening, an outwardly-opening burner-carrying door for said door opening, and a substantially cylindrical burner-encircling and air-directing shell extending across said casing from front to back and having controllable air admission means, said shell being of considerably less diameter than said flame opening, being disposed in concentric relation with the latter and being provided with pitched air-whirling webs, said webs projecting outwardly from the shell to the edge of the flame opening for whirling all air passing around the shell through said flame opening, said shell being

rigidly mounted on said door and by opening movement of the latter being movable outwardly from the casing through the door opening.

2. In a furnace front, an air-receiving casing having a front plate provided with a door opening and a back plate formed with a flame opening, an outwardly-opening burner-carrying door for said door opening, a substantially cylindrical burner-encircling and air directing shell extending across said casing from front to back and having controllable air admission means, said shell being of considerably less diameter than said flame opening, being disposed in concentric relation with the latter and being provided with pitched air-whirling webs, said webs projecting outwardly from the shell to the edge of the flame opening for whirling all air passing around the shell through said flame opening, and an annular air-directing member secured to the outer ends of said webs and engaged with said flame opening, said shell being rigidly mounted on said door and by opening movement of the latter being movable outwardly from the casing through the door opening.

3. In a forced draught furnace front, a casing front having means for centrally mounting a burner, a casing back having a flame opening, means for whirling in one direction the air passing through said opening, a cylindrical casing side wall outwardly spaced from said air whirling means and of uniform diameter throughout its circumference, said side wall having a plurality of air inlet openings provided with edges facing circumferentially in the same direction, an equal plurality of valve plates for said openings each pivotally mounted directly at one end, the pivoted ends of said plates being disposed at the aforesaid edges of the openings, said plates when swung into the casing forming continuations of said side wall for circumferentially directing the ingoing air in the general direction in which it will be whirled by said air whirling means and for uniformly distributing the ingoing air around said air whirling means, and means for holding said valve plates either in closed position or in inwardly swung position.

4. A structure as specified in claim 3; each of said valve plates having a curvature which is the reverse of the curvature of said casing wall, whereby to effectively direct the ingoing air circumferentially along the inner side of said wall.

5. In a furnace front of the character described, a hollow casing forming an air whirling chamber and having a front plate provided with a door opening and a back plate provided with a flame opening, an outwardly opening door for the door opening

of said front plate, an annular air directing shell extending through said chamber from said door to the flame opening in said back plate and being provided with outwardly extending air directing vanes terminating in an annular member, said annular member having a flat peripheral portion lying against said back plate around said flame opening and also having a contracted portion extending into said opening, said shell with its vanes and annular member being rigidly mounted upon the inner side of said door and being removable from said chamber through the door opening in said front plate by the opening of said door, controllable means for admitting air into said shell, and means carried by said door for supporting a fluid fuel burner within said shell.

6. In a furnace front, an air-receiving casing having a front plate provided with burner-supporting means, and a back plate formed with a flame opening, a substantially cylindrical burner-surrounding shell rigidly connected with said front plate and projecting rearwardly to said flame opening, said shell being of considerably less diameter than and disposed in concentric relation with said flame opening, the rear end of said shell being provided with external webs for whirling the air passing through the flame opening around said shell, the front end of said shell having circumferentially spaced air-admission openings to conduct air into the shell from the casing, and a controlling damper for said air admission openings, said damper slidably surrounding said shell.

7. In a furnace front, an air receiving box whose front wall is provided with a burner-receiving opening and is formed also with an annular inwardly projecting flange surrounding said opening in outwardly spaced relation with the latter, said flange having circumferentially spaced air-conducting openings, a substantially cylindrical open-ended air directing member having one of its ends secured around the inner portion of said flange, and an annular controlling damper for the aforesaid openings, said damper rotatably surrounding said flange between said air-directing member and said front wall.

8. In a convertible forced and natural draught furnace front, an air box having forced draught inlet means and formed in its front wall with an annular series of natural draught inlet openings, a damper plate mounted against the inner side of said front wall and having portions to close said natural draught inlet openings when forced draught is used, and an annular series of clamping devices for tightly clamping said damper plate against said front wall at each of said natural draught inlet openings when

said damper plate is closed for the use of forced draught.

9. A structure as specified in claim 8; said clamping devices comprising screw-threaded fasteners projecting outwardly from the damper plate through the natural draught openings, the edges of these openings having notches to receive said fasteners.

10. In a furnace front having an air box, a substantially cylindrical air-directing wall projecting inwardly from the front wall of said box in inwardly spaced relation with

the peripheral edge of said front wall, said front wall having circumferentially spaced air inlet openings between said peripheral edge and said cylindrical wall, and an annular damper plate at the inner side of said front wall, surrounding and rotatably supported by said cylindrical wall, said damper plate controlling said openings.

In testimony whereof I affix my signature.

DAVID J. IRISH.