

July 13, 1937.

J. T. McTARNAHAN

2,086,984

AIR REGISTER FOR FURNACE OR BOILER HEATING BURNERS

Filed June 5, 1934

5 Sheets-Sheet 1

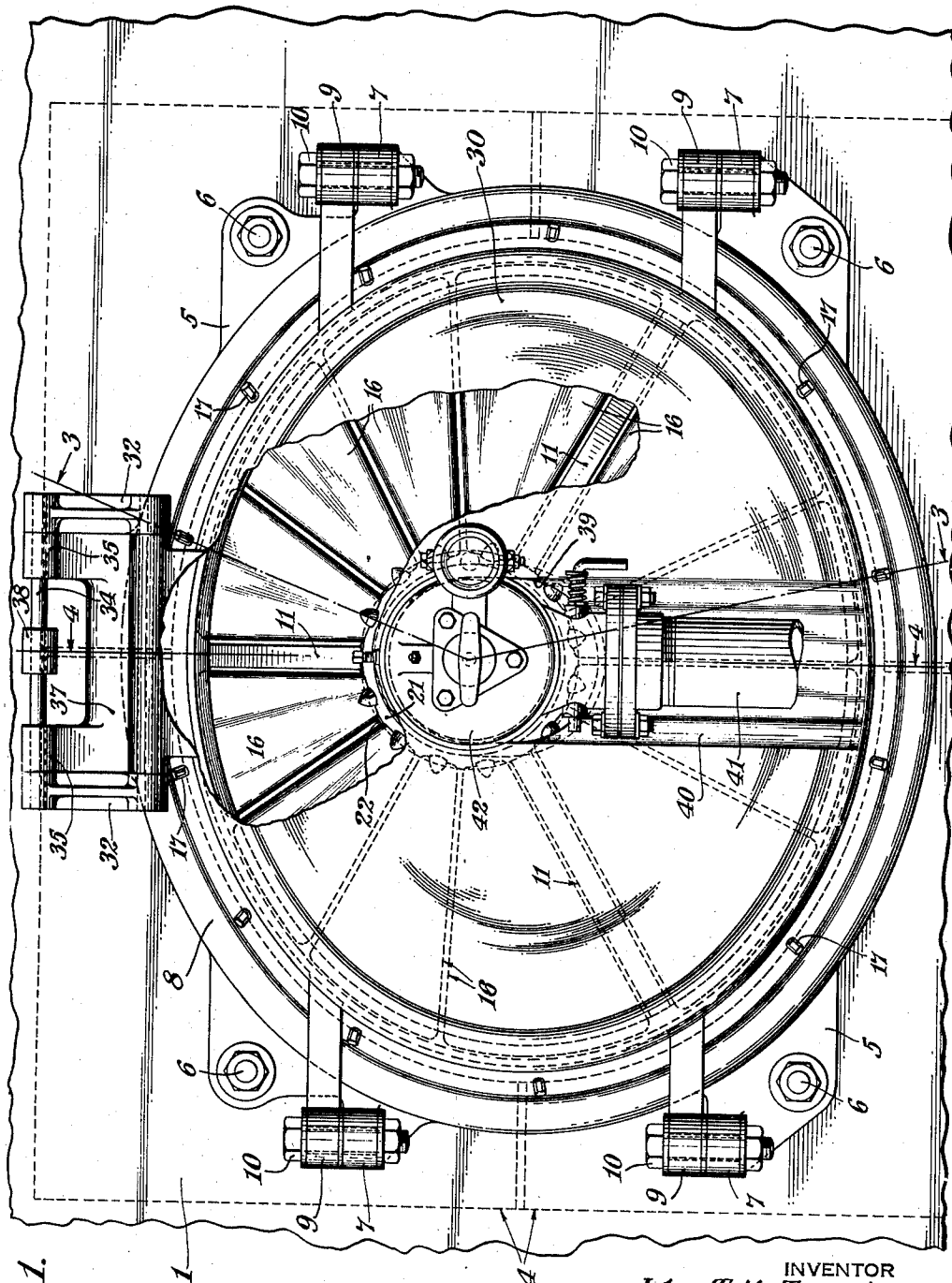


Fig. 1.

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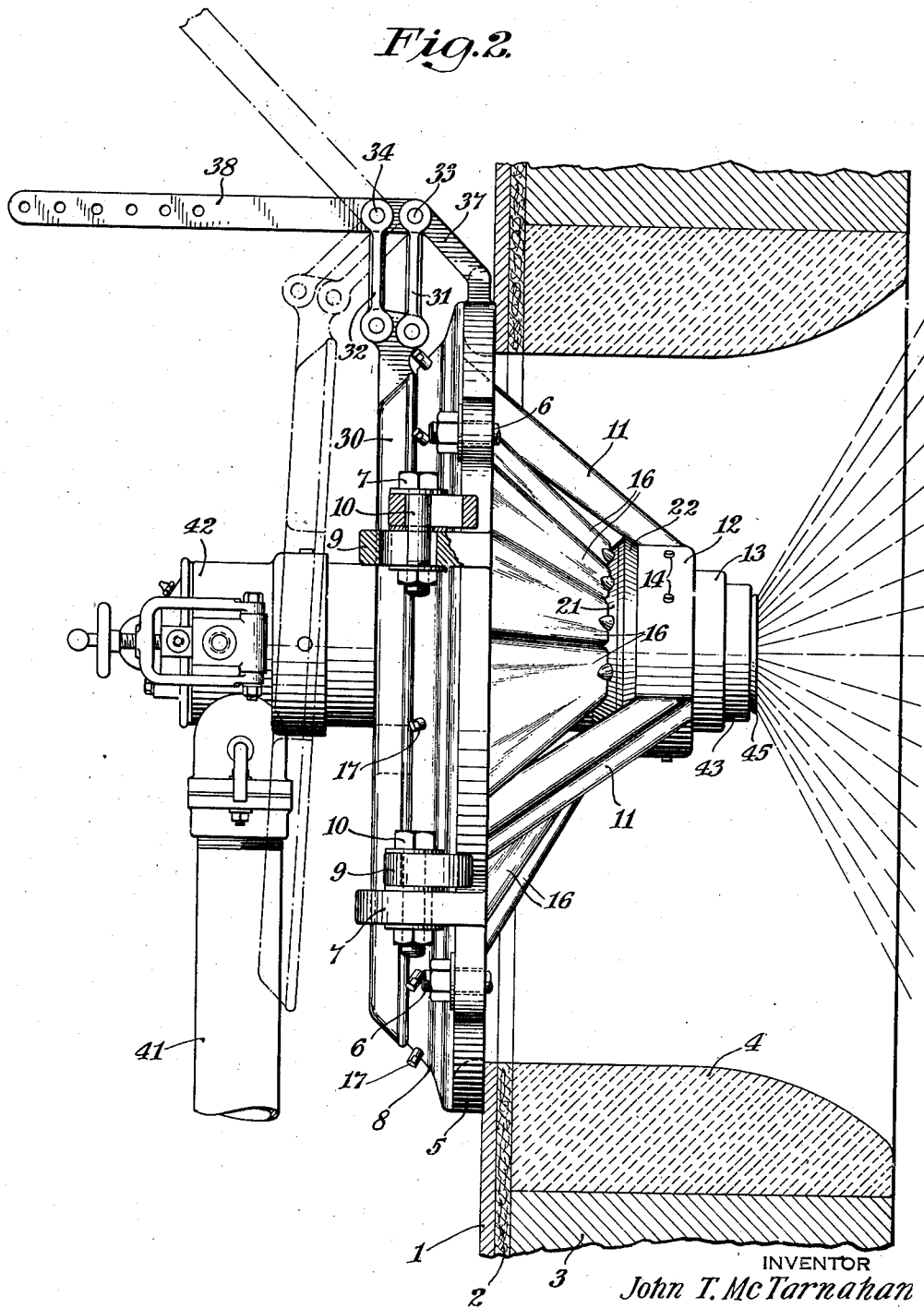
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Fig. 2.



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5 Sheets-Sheet 3

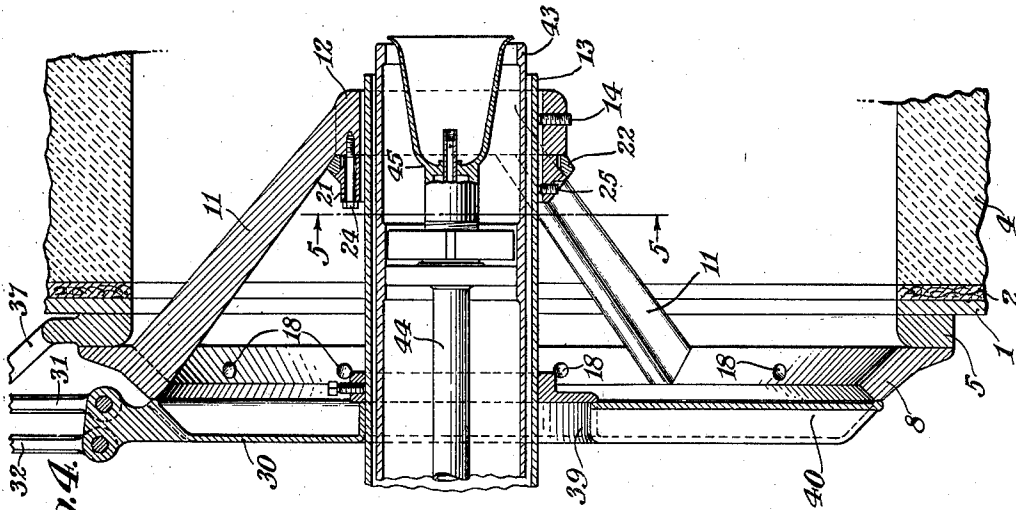


Fig. 4.

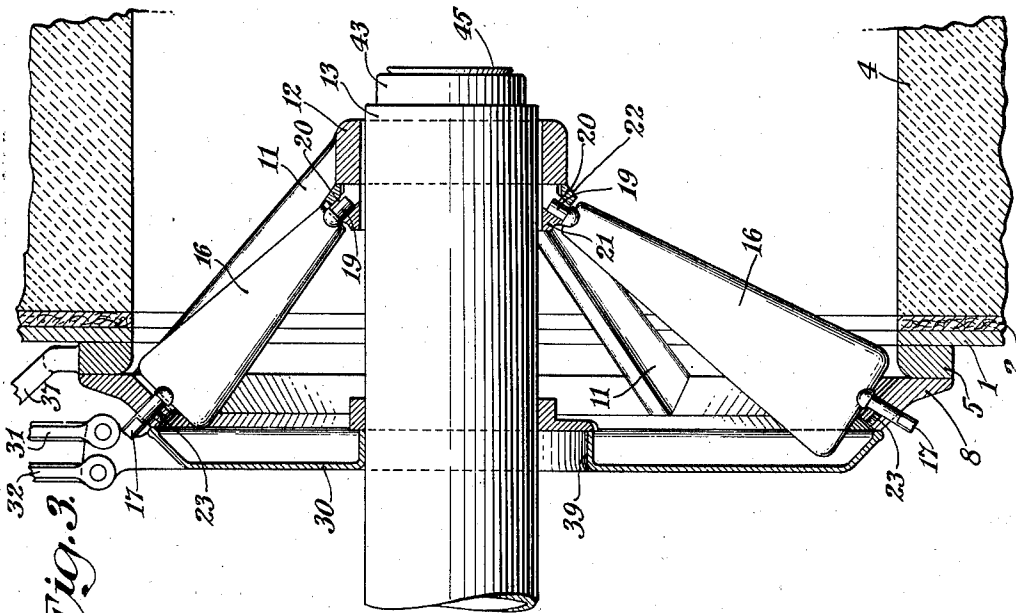


Fig. 3.

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Fig. 5.

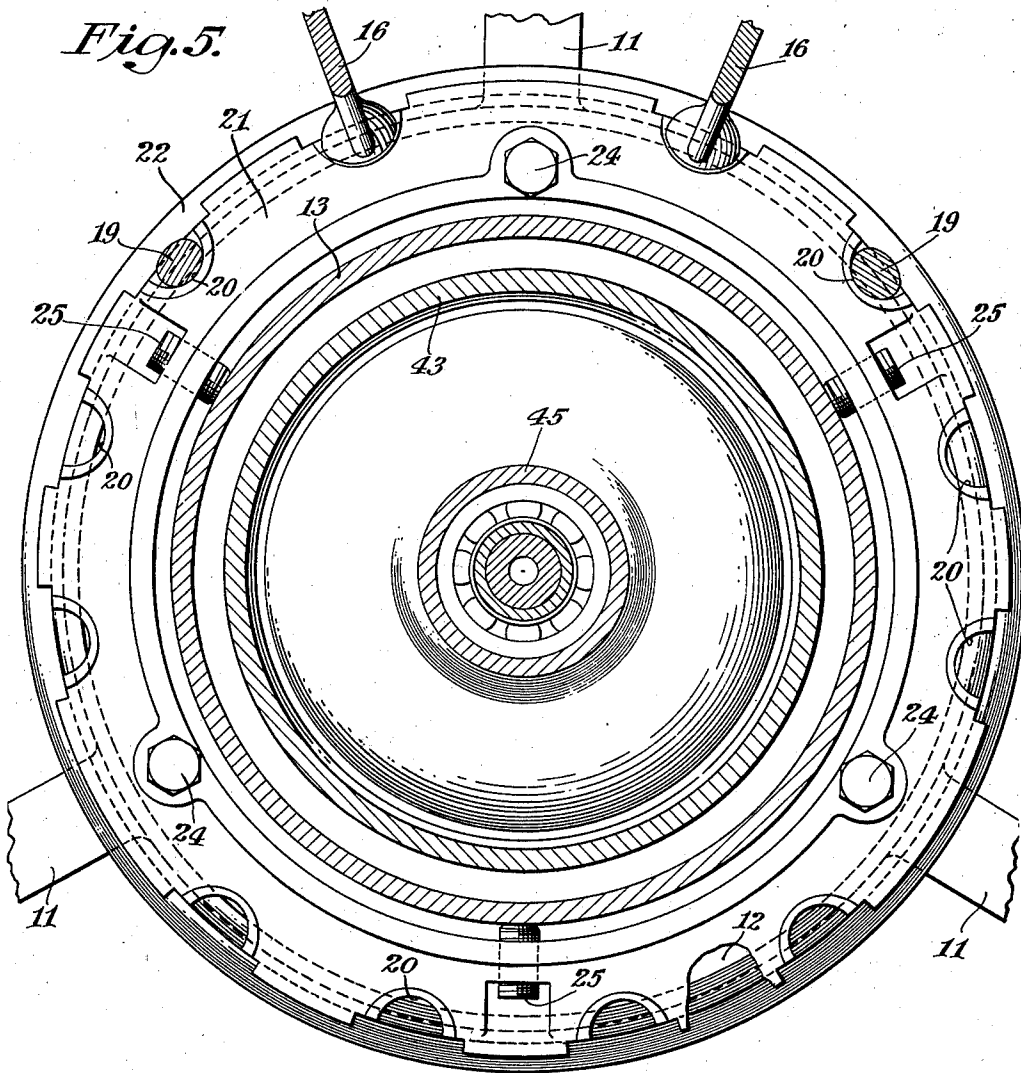
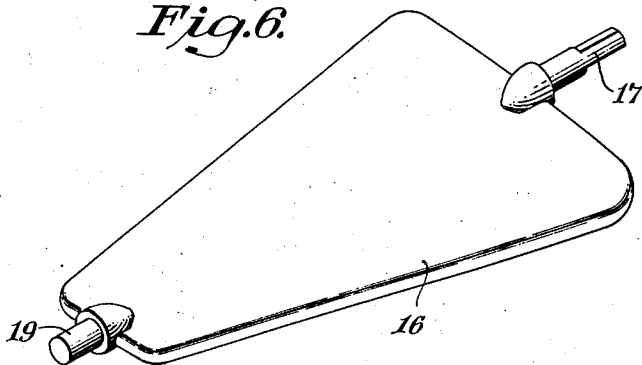


Fig.6.



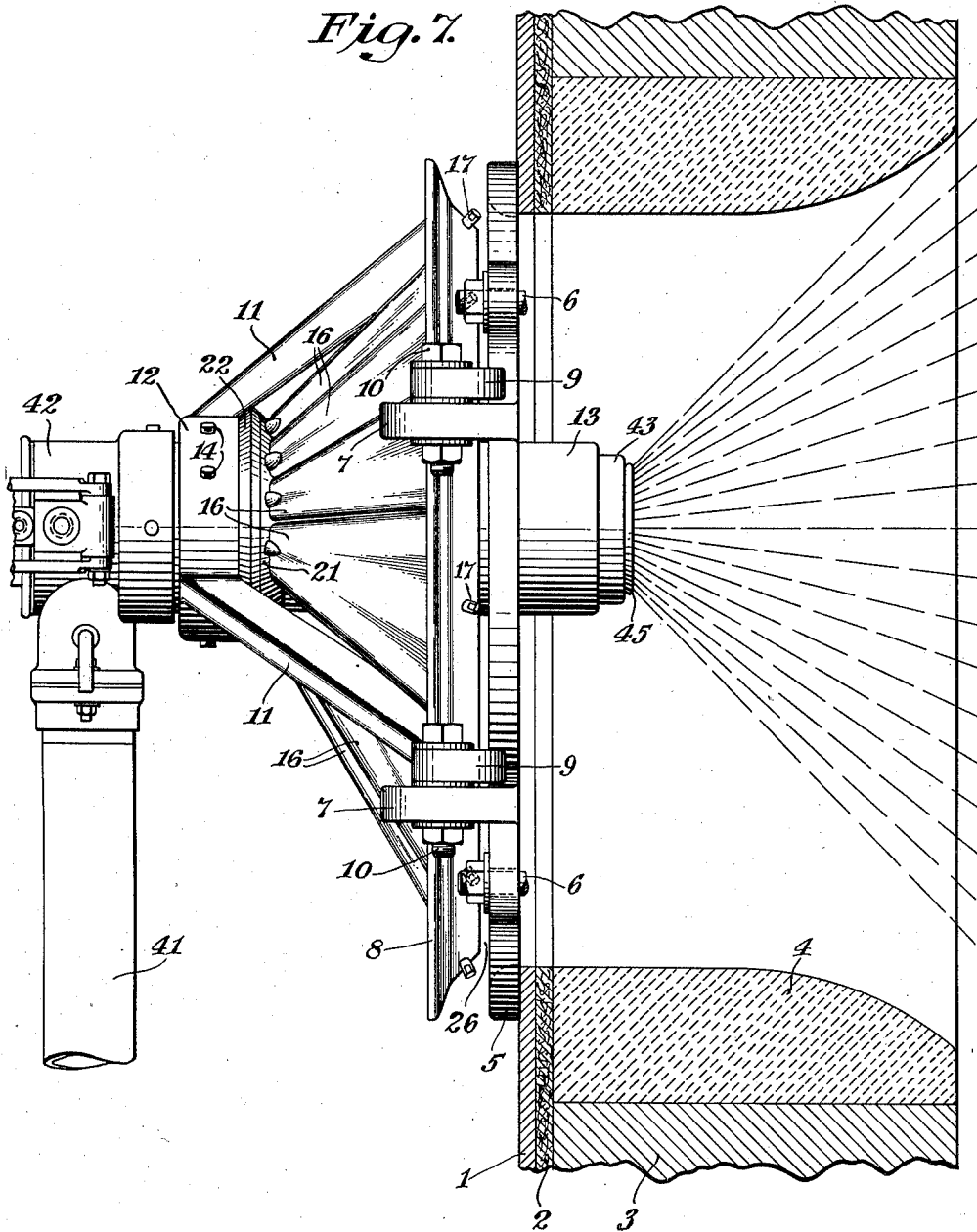
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AIR REGISTER FOR FURNACE OR BOILER HEATING BURNERS

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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

2,086,984

AIR REGISTER FOR FURNACE OR BOILER
HEATING BURNERS

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Application June 5, 1934, Serial No. 729,075

6 Claims. (Cl. 158—1.5)

This invention relates to air registers for fuel burners, and the like, and more particularly relates to an apparatus for directing and controlling the passage of air for combustion of oil fuel, or other fuel injected into a furnace in a finely divided state.

With burners using such type of fuel it is important that the air for combustion be admitted into the furnace in such proportion, direction and location with respect to the fuel injection as to create turbulence, and to evenly unite with the fuel to insure a thorough and even mixture, and one object of my invention is to provide an air register for such burners whereby such turbulence and thorough and even mixture of air and fuel may be obtained.

Another object of this invention is to provide an air register whereby the direction and amount of air for combustion at various points of its admission into the furnace and the mixing of the air with the fuel released from the burner may be regulated and controlled so as to produce efficient combustion and flame shape, suiting the particular burner characteristics and furnace dimensions and conditions with which the register is used; and to provide a register of the character described which has extensive flexibility of regulation and control, and allows adjustment of the burner nozzle relatively to the register and also relatively to the furnace or boiler fire box to suit individual furnace or boiler conditions; and to provide a register of the character described and in which the regulation, control and adjustments referred to may be accomplished readily and easily.

Another object of this invention is to provide a register of the character described which is suitable for use with either forced or natural draft operation; and a further object of this invention is to provide a register of the character described which may be so applied to a furnace or boiler as to occupy very little space outside of the furnace or burner, and a register that is exceptionally well suited for application to furnaces and boilers that are set low.

A further object of this invention is to provide an adjustable shutter for the register.

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

My invention accordingly consists in the features of construction, combinations of elements and arrangement of parts which will be exemplified in the constructions which will be described more fully hereinafter, and the scope of

the application of which will be indicated in the claims that follow.

In accordance with my invention, I have constructed an air register, elliptical in shape, with a plurality of individually adjustable air vanes, pivotally mounted around the fuel burner opening, which is located above the horizontal centerline of the register. The advantage and purpose of the elliptical shape of the register is to give the maximum controlled volume of air for combustion through one opening. This is especially desirable where low set furnaces or heating and power boilers are fired with an apparatus of this kind. Another advantage of this apparatus is the placing of the burner above the horizontal centerline of the register. This feature permits the admission of most of the air for combustion underneath the flame, and prevents short-circuiting of air and excessive air filtration over the fire.

Each air vane being individually adjustable, permits the admission of air for combustion to be diverted in a clockwise rotation on one side of the elliptical air register, and in a counterclockwise rotation on the other side, or in the same direction on both sides, as desired, and by varying the extent of vane opening a proper amount of air may be directed into any portion of the furnace to produce best results with a given set of boiler or furnace conditions.

There may also be means for tilting the longitudinal centerline of the burner, either up or down, or to left or right, with respect to the longitudinal centerline of the air register, and for moving the burner assembly either towards or away from the furnace, permitting simple and quick adjustment of the burner to suit furnace or boiler conditions.

The design of my elliptical air register permits the register frame and vane assembly to be mounted on the furnace so that the vanes extend slopingly from the frame either inwardly of the furnace or outwardly of the furnace. This feature allows still more flexibility in directing the air for combustion to suit individual furnace or boiler conditions, and permits greater clearance in front of a furnace where space is at a premium.

In order that a clearer understanding of this invention may be had, attention is hereby directed to the accompanying drawings, forming a part of this application, and illustrating certain possible embodiments of this invention, and in which:

Figure 1 shows a front view of an air register

and shutter therefor embodying my invention, associated with adjacent fragments of an oil burner and furnace, a part of the shutter being broken away;

5 Figure 2 is a side view of the register, shutter and burner fragment, and a sectional view of the adjacent furnace portion, the register vanes extending inwardly of the furnace;

Figure 3 is a sectional view thereof and is taken on the line 3—3 of Fig. 1, the burner nozzle housing being shown in elevation;

Figure 4 is a sectional view thereof and is taken on the line 4—4 of Fig. 1;

Figure 5 is a sectional view of a portion of the register assembly, and is taken on the line 5—5 of Fig. 4; and

Figure 6 is a perspective view of one of the vanes; and

Figure 7 is a side view of a register embodying my invention, shown associated with a portion of a burner and furnace and the vanes of the register extending outwardly of the furnace.

Similar reference characters refer to similar parts throughout the several views of the drawings.

Referring to the drawings, the portion of the furnace adjacent the register comprises the front plate 1, a layer 2 of asbestos mill-board, a fire-brick front wall 3, and a refractory Venturi block 4. The register ring 5 is fastened to the furnace front plate 1 by means of studs or bolts 6. The register ring has a large elliptical opening through which all the air for combustion passes in entering the furnace. Lugs 7 are a part of the register ring casting, and form the main support for the register frame assembly. Each lug is cast with an elongated cored bolt hole.

Register frame casting 8 is elliptical in shape, and is cast with lugs 9, each of which contains an elongated cored bolt hole. These lugs match up with lugs 7 on the register ring so that the register frame 8 is securely mounted in position by means of bolts 10 passing through both lugs 7 and 9. Also cast on frame 8 are spider arms 11 and ring or collar 12, at the ends of the spider arms, which loosely encircle the burner housing tube 13, and has set screws 14 engaging tube 13 whereby the burner housing tube 13 can be tilted up, down or sidewise and so held by adjusting the set screws 14. Ring 12 is located above the horizontal centerline of the register. Each vane 16 is cast with a pin at each end, and is pivotally mounted between the register frame 8 and the ring 12. The pin 17 on the wide end of the vane fits into a drilled hole 18 in the register frame, and the pin 19 on the small end of the vane is inserted in a cored opening 20 on a vane ring casting 21 and locked by a cooperating vane retainer ring 22. Each vane can then be rotated to any desired angle, and locked in position by means of a set screw 23, mounted on frame 8 and engaging vane pin 17. The vane ring 21 and vane retainer 22 are fastened to ring 12 by means of tap bolts 24 which penetrate ring 21 and engage ring 12. Rings 21 and 22 are adjusted radially of housing 13 by means of set screws 25.

The register frame and vane assembly is mountable on the register plate 5 either with the vanes 16 extending inwardly of the furnace, as shown in Figs. 1 to 4 inclusive, or with the vanes 16 extending outwardly of the furnace, as shown in Fig. 7.

It will be obvious that due to the elongated bolt holes in lugs 7 and 9, the register frame 8 and vane assembly, in either position, can be

drawn away from the register ring 5, permitting the admission of additional combustion air around the perimeter of the register frame, as shown at 26 in Fig. 7.

It will be evident from the drawings and from the above description that the apparatus provides exceptionally easy flow of air into the furnace when the vanes are open, and also that the angular setting of the vanes may be such that the air enters the furnace in a counterclockwise direction on one side, and clockwise on the other side of the vertical axis of the register, so that an upwardly moving turbulent body of air can be directed under the flame. Also that by controlling the setting of each vane, the air can be directed in a clockwise or counter-clockwise rotation through the entire air register, or in any volume or direction at any part of the air register.

If desired, a shutter plate 30 may be provided to completely close off the register air opening when the burner is shut down, thereby preventing infiltration of cold air into the furnace or boiler. Plate 30 is suspended by two similar pairs of parallel links 31, 32, fixed at their upper ends respectively to shafts 33, 34 rotatably carried in two pairs of bearing portions, such as 35, of a supporting member 37, secured to or cast integrally on the top of register plate 5, and a lever 38 is fixed to shaft 34, whereby shaft 34 may be rotated and the shutter plate 30 moved from or toward the air register frame 8. Shutter plate 30 has a central opening 39 to accommodate the burner housing tube 13 and has a recessed portion 40 to accommodate the burner tube 41.

A fragment of an oil burner 42, including burner tube 43, oil duct 44, and nozzle 45, is included in the drawings, the oil burner, however, forming no part of this invention, and it is to be understood that my register and shutter may be used with any suitable burner, whether burning oil or any other finely comminuted fuel, and in connection with any suitable furnace or boiler.

By having the register air aperture wider than it is high, the register is suited to lower set furnaces and boilers than would be possible otherwise with equal air aperture area. Since the register may be installed with the vanes extending inwardly of the furnace, and so as to require very little space outside of the furnace, the register may be utilized where the available space outside the furnace is very limited. Not only is there extremely wide and varied control and regulation of the air supply through the register as to volume and direction, by the possible individual adjustment of each vane and by the possible spacing of the register frame from the register plate, but also further control and regulation is possible by the mounting of the burner nozzle in such a way that it can be tilted in any direction and also moved inwardly and outwardly relatively to the register and to the furnace. The positioning of the burner tube aperture and supporting means of the register above the longitudinal center line causes the register to supply more air below the burner tube and flame than above it when all the vanes of the register are wide open and thus the full area of the register may be utilized and improved combustion and prevention of short circuiting of the air supply is secured. Other advantages and improvements obtained by my invention will be apparent to those skilled in the art.

As many changes could be made in the above construction and as many apparently widely dif-

ferent embodiments of this invention could be made without departing from the scope thereof, it is to be understood that all matter contained in the above description or shown in the accompanying drawings be interpreted as illustrative and not in a limiting sense.

What I claim is:

1. An air register of the character described including a frame having an air opening, a member adapted to receive a burner tube and disposed above the longitudinal center line of said opening and secured to said frame, a vane supporting member mounted on said frame and a vane supporting member secured to the burner tube receiving member, a plurality of individually adjustable vanes mounted between said vane supporting members and extending across the air opening, and means for locking each vane in adjusted position.

2. An air register of the character described including a frame member having an air opening, a burner tube supporting member spaced axially from said frame member, a member rigidly connecting the frame member and burner tube receiving member, a plurality of vanes, means mounting one end of said vanes on said frame member, means mounting the opposite vane ends on said burner tube supporting member, said vanes being individually adjustable, and means for locking each vane in adjusted position.

3. An air register of the character described including a register frame having an air aperture, a vane supporting frame having a corresponding aperture, means mounting said vane frame on the register frame and whereby the vane frame may be mounted close against the register frame or in adjustable spaced relation thereto, a plurality of vanes adjustably mounted at one end on said vane frame, means for adjustably supporting the vanes at their other ends, and means for locking each vane in adjusted position.

4. An air register of the character described including a register frame having an air aperture, a vane supporting frame having a corresponding aperture, means mounting said vane frame on the register frame and whereby the vane frame may be mounted against the register frame with either face of the vane frame disposed toward the register frame, a plurality of vanes adjustably mounted at one end on said vane frame, means for adjustably supporting the vanes at their other ends, and means for locking each vane in adjusted position.

5. In combination an air register of the character described, having an air aperture, a vane assembly including a frame having an opening corresponding to the air aperture of the register, a burner tube receiving and supporting collar adjacent said air aperture and frame opening and spaced from the plane of said air aperture and said frame opening, means for joining said frame and collar together, a plurality of vanes extending between and individually rotatably supported on said frame and collar for adjustment, and means for locking each vane in adjusted position on said frame and collar, a supporting ring for said vane assembly and having an aperture adapted to receive said vanes, and means whereby said vane assembly may be secured to one face of said ring and having the vanes extending either through the ring aperture or away from the ring aperture selectively.

6. The combination with a furnace and a duct for conducting fuel into the furnace, of an air register associated with said furnace and fuel duct, said register having an air pass portion above the duct and a more extensive air pass portion below the duct, and having a plurality of individually pivoted and adjustable closure vanes for said air pass portions whereby the volume and direction of air passing each vane may be regulated and controlled.

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