July 8, 1924. 1,500,581

C. I. FILSON

FUEL FEEDING MECHANISM FOR FURNACES

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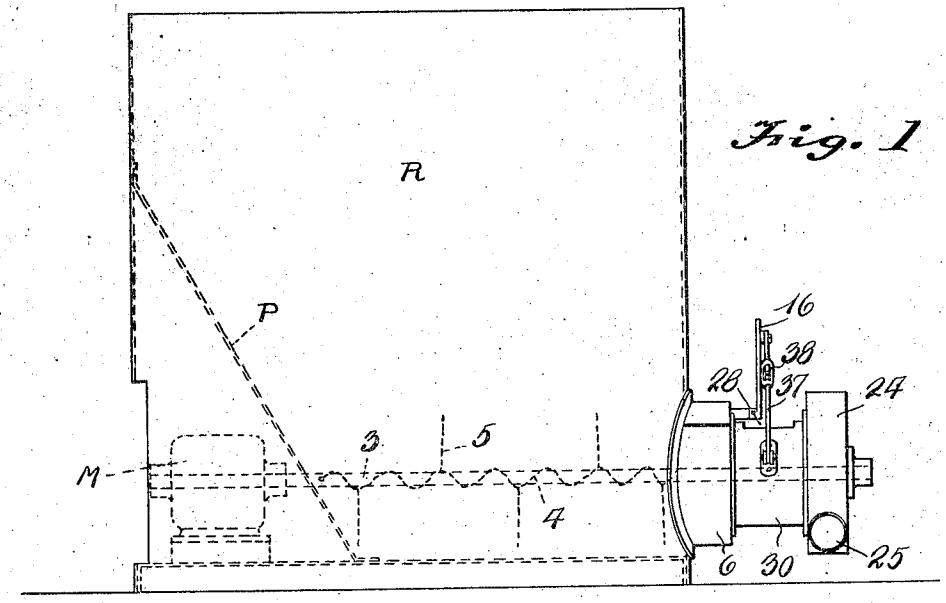


Fig. 1

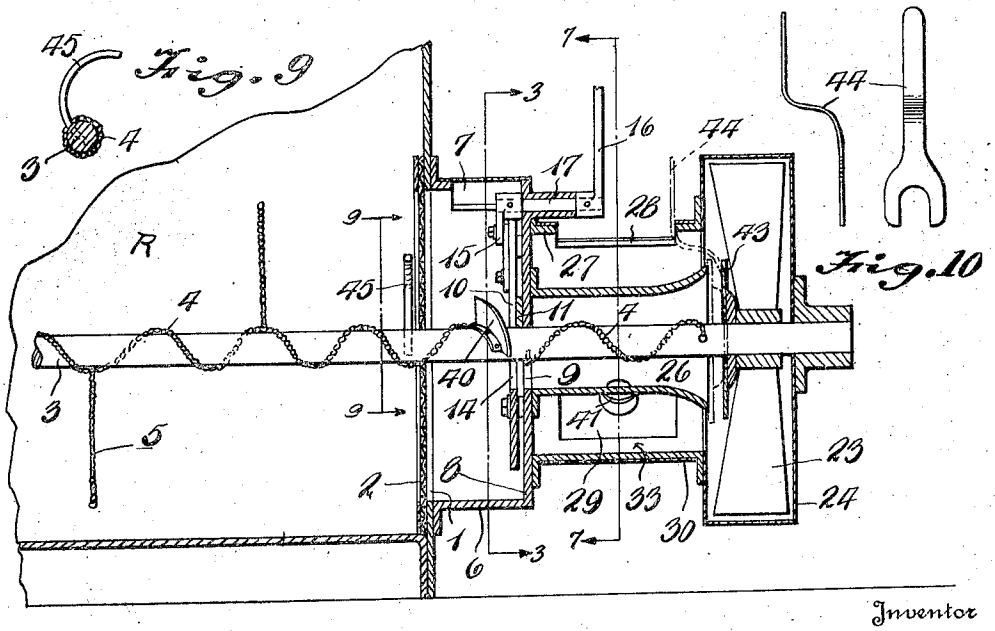


Fig. 9

Fig. 10

Fig. 2

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FUEL FEEDING MECHANISM FOR FURNACES

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Fig. 3

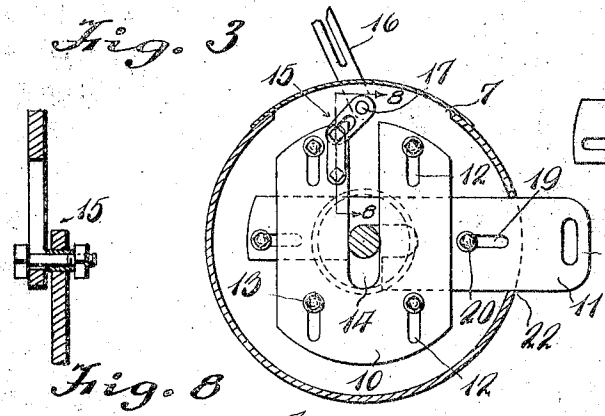


Fig. 5

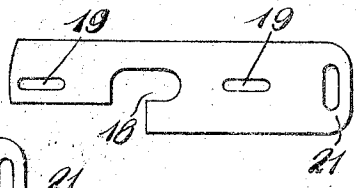


Fig. 6

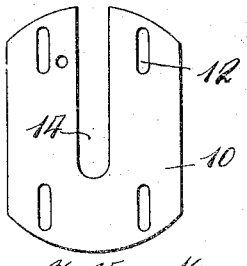


Fig. 8

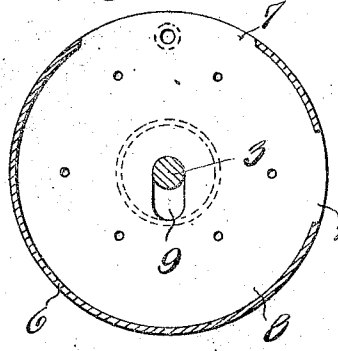


Fig. 4

Fig. 7

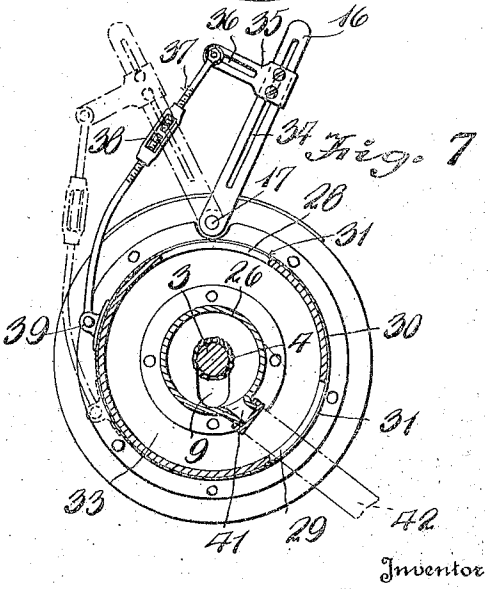
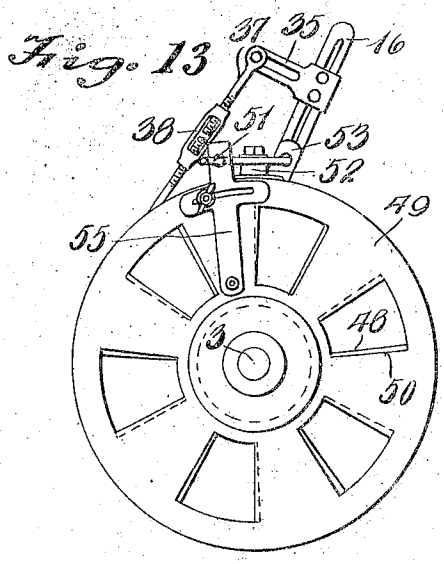


Fig. 13



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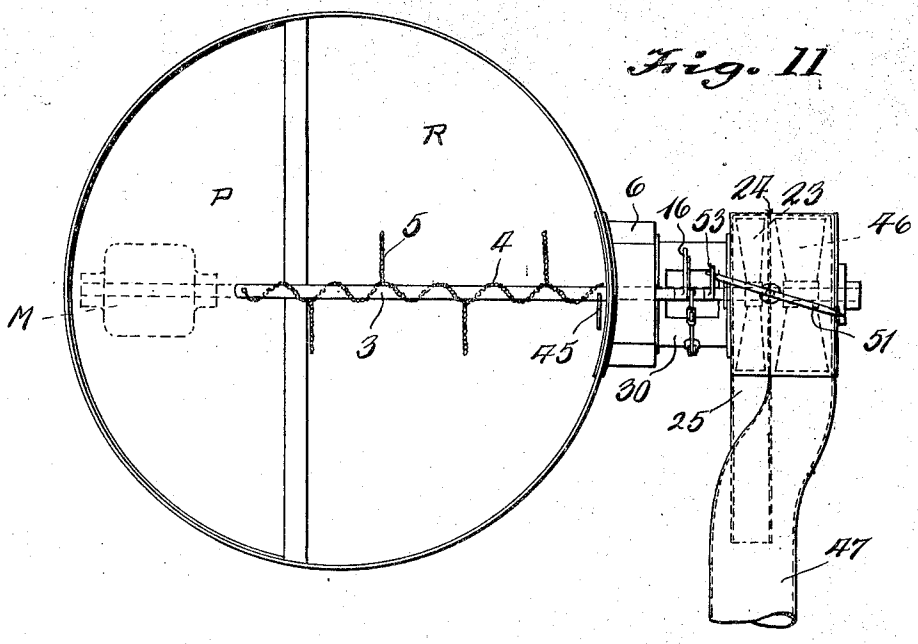
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FUEL FEEDING MECHANISM FOR FURNACES

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Fig. 11



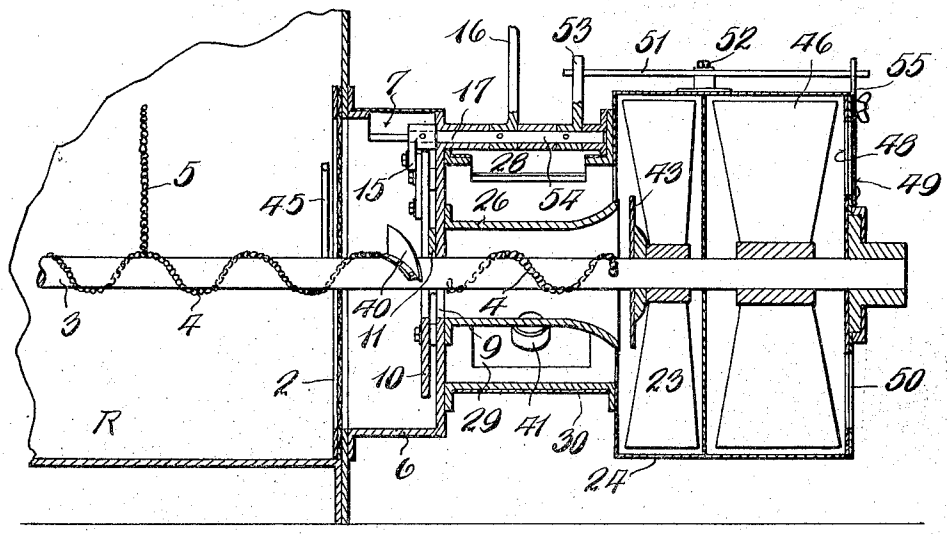


Fig. 12

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UNITED STATES PATENT OFFICE.

CHARLES I. FILSON, OF CLEVELAND, OHIO.

FUEL-FEEDING MECHANISM FOR FURNACES.

Application filed September 1, 1923. Serial No. 660,550.

To all whom it may concern:

Be it known that I, CHARLES I. FILSON, citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Fuel-Feeding Mechanism for Furnaces, of which the following is a specification.

This invention relates to improvements in fuel feeding mechanism for furnaces, having for an object the provision of a mechanism of this character wherein the operation is facilitated through arranging simple but positive regulating means and by an unusually compact assembly.

Another object is to provide a fuel feeding mechanism in which the fuel feed control valves and suction fan or fans are arranged in substantially longitudinal alinement upon a single shaft.

Another object is to provide a mechanism of this character in which there is a minimum amount of lost motion, this being accomplished by employing a single drive shaft and eliminating the necessity for the usual auxiliary drives, etc.

A further object is to provide a fuel feeder of this character, wherein the fuel inlet and the air inlet may be individually adjusted and then be regulated by a common control.

A still further object is to provide a mechanism of this character wherein the supply of air and fuel may be so controlled as to form a highly satisfactory mixture to be directed into a furnace.

It is likewise an object to provide a feeder including a pair of separately housed fans, one of which is a fuel conveying and combustion fan and the other a combustion fan, that is, the first fan assists in conveying the fuel from the reservoir and mixes it with air, where as the secondary or combustion fan is employed when the mixture is too heavy or rich; the air supply to both fans being controllable with and by means for regulating the fuel feed.

It is also an object to provide means whereby the quantity of fuel being fed at any time may be determined.

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

In order that the invention and its mode of operation may be understood by those skilled in the art, I have in the accompanying drawings and the following detailed description set forth the preferred and one modified embodiment of the same.

In these drawings:

Fig. 1 is a side elevation of the mechanism;

Fig. 2 is a vertical longitudinal section of the conveying and mixing units;

Fig. 3 is a section taken on the line 3—3 of Fig. 2;

Fig. 4 is a detail view of the plate upon which the fuel feed valve is mounted;

Fig. 5 is an elevation of the horizontally movable valve slide;

Fig. 6 is a similar view of the vertically movable valve-slide;

Fig. 7 is a sectional view taken on the line 7—7 of Fig. 2;

Fig. 8 is a detail of the means for adjusting the vertical slide;

Fig. 9 is a sectional view taken on the line 9—9 of Fig. 2;

Fig. 10 shows the tool employed when a determination of the amount of fuel being fed is desired;

Fig. 11 is a plan view of a modification;

Fig. 12 is a vertical longitudinal section of the modification; and

Fig. 13 is an end view thereof.

Having more particular reference to the drawings in connection with which like characters of reference will designate corresponding parts throughout, the invention may be stated as comprising a fuel reservoir R, which may be of any desired configuration, and as shown, is preferably formed from sheet metal and provided at one side with a partition P, whereby a separate compartment is provided for receiving a driving motor M. It is of course understood that the reservoir is provided with an inlet whereby fuel may be placed within the receptacle, and it is also provided in its vertical wall at a point near its bottom with an outlet opening 1, said outlet opening being preferably provided with a screen 2 for obvious reasons.

Arranged in the lower portion of the reservoir, is a substantially horizontal shaft 3, said shaft as shown, being driven by the aforementioned motor and having one end extending through the outlet opening 1. While any of the different forms of spiral flight conveyors may be employed it has been found desirable to use a spiral conveyor consisting of lengths of chain 4 arranged upon the shaft as shown in Fig. 2 of the

drawings and carrying at spaced points, relatively short lengths of chain 5, it being quite apparent that before rotation of the shaft 3 these short lengths of chain will wrap around the shaft but will as a result of the centrifugal force form arms which will sufficiently agitate the fuel contained in the reservoir to permit it to be readily conveyed to the desired point.

Arranged about and enclosing the outlet opening 1, is a substantially circular housing 6, which is normally full of fuel and is provided in its upper face with a suitable opening 7 whereby access may be had for adjustment of certain mechanism to be hereinafter referred to. The outer wall 8 of this housing is provided with an elongated opening or passage-way 9, said passage-way serving to permit outward extension of the shaft 3 and to further serve as a fuel passage-way, the shaft as shown in Fig. 4 being preferably arranged in the upper end of said passage-way.

Obviously it is necessary to control or regulate the size of the opening in order that the flow of fuel there-through may be accurately controlled, and in order to accomplish this I have provided, as clearly shown in Figs. 2 and 3 of the accompanying drawings, a pair of slides 10 and 11, said slides being preferably arranged substantially at right angles to each other. The vertical slide 10 as shown is slidably mounted upon the housing wall 8 by providing a set of slots 12, through which are extended bolts 13, it being understood that these bolts are so arranged as to permit free movement of said slide. Preferably this slide 10 is provided with a slot or recess 14 opening through the upper edge thereof and adapted when in its lowermost position, to aline with the passage-way 9, this relative positioning being shown in Fig. 3. In order that the size of the passage-way through which the fuel is conveyed may be regulated, it is essential that means for readily moving the slide 10 be provided, and in consequence I have arranged upon the upper end of said slide, a link adjustment 15, through which movement of the slide is accomplished by rocking the lever 16, upon its supporting shaft 17. The link 15, is provided with means whereby it may be adjusted to a nicety.

In order that the size of the opening 9 may be further regulated the substantially horizontally disposed slide 11, is provided, said slide having as shown in Figs. 3 and 5, a substantially inverted L-shaped way or notch which is adapted to receive or straddle the shaft 3. This slide 11, as shown is also provided with slots 19 through which are extended attaching bolts 20 by means of which slidable connection is effected as between said slide and housing wall 8, it being understood that this slide is arranged between the vertical slide 10, and wall 8. A handle portion 21 is carried by a slide 11, and projects outwardly beyond the periphery of the walls 8 through an opening 22 as shown in Figs. 3 and 4.

Carried by the outer portion of the shaft 3 and rotatable therewith is a suction fan 23 which is enclosed by a housing 24 having at one side an outlet opening 25 through which the mixed fuel and air is directed to the furnaces. It has been found quite desirable to convey the fuel direct to the inner portion of the fan blades, this being accomplished by providing a shell or a guide tube 26, said shell completely encircling the shaft 3 between the housing 6 and the fan 23, having one end secured to the housing wall 8 and its other end flared and terminating adjacent to the said fan inlet.

Spaced from the aforementioned shell 26 is a substantially cylindrical housing 27 which connects the first named housing 6 and the fan housing 24, and is provided with an air inlet opening 28 in its upper side and with the second air inlet opening 29 at a point near its lower side. Through these openings the suction fan draws the supply of air for mixture with the fuel, and in order that the quantity of air passing through these openings may be accurately controlled I have provided about the housing 27 a sleeve 30 slidable on said housing and having a pair of spaced openings 31 which may be alined with the aforesaid openings and through rotation of the sleeve 30 may entirely close the air inlet openings. From a study of Figs. 2 and 7 it will be seen that an air space 33 is provided between the shell 26 and the housing 30, as a result of which the fuel and air do not come in contact with each other for mixture until they have entered the fan housing or mixing chamber 24, where as it is understood, the mixing force is at a maximum.

As will be apparent from Fig. 1 of the drawings the lever 16 by means of which the fuel feeding valves are controlled, shifts or adjusts the sleeve 30. It is often necessary to adjust the sleeve for the inlet of air, independently of the fuel feed valve, in consequence of which I have provided the lever 16, with a longitudinal way or slot 34 in which is adjustable longitudinally a bracket 35, having a slot 36 in which is movably mounted one end of a connecting rod 37 whose length is adjustable through interpositioning of a turn buckle 38. The lower or outer end of the element 37 is pivotally secured as at 39 to the sleeve 30, it being apparent that upon movement of the lever 16, to the dotted line position as indicated in Figs. 3 and 7 of the drawings, the air inlet openings 28 will be closed,

It is quite obvious that after adjusting the link 15 which connects the slide 10 and the lever 16, that the resultant movement of the sleeve 30 about the housing 27 might be proportionately too great or too small to permit a satisfactory combustion. To over-come this objection, the turn buckle 38 and the bracket 35 may be properly adjusted so that the relative movement of the sleeve 30 and the slides 10 and 11 will be such as to permit to the introduction into the furnace of the highly efficient fuel.

It is quite possible that the feeding of the fuel thru the passage-way 9 would ordinarily be insufficient in quantity due to the slow conveying of the fuel by the chain conveyors, and in consequence I have provided a section of an ordinary spiral flight conveyor 40, which is arranged adjacent to said passage-way 9 as shown in Fig. 2. It is quite obvious that one or several of these sections may be employed.

Heretofore it has been ordinarily impossible to determine approximately the amount of fuel being fed to the mixing chamber, and in order to accomplish this I have provided the shell 26 with an outlet or bypass 41, through which fuel may be taken and conducted through the pipe 42 to a suitable receptacle; before this can be done, the flared end of the shell 26 must be closed, for which I have arranged a disk of felt or the like material 43 slidable upon the shaft 3 and carrying a reinforcing backing plate as shown in Fig. 2. This closure may be moved into or out of engagement with the end of the shell 26, by means of the tool 44, as shown in Fig. 10 of the drawings. The closing of the outlet of the shell 26 obviously renders the determination inaccurate to the extent to which the fan effects movement of fuel through the shell, which effect is very slight. The fuel is permitted to flow through the opening 41, (which is normally closed) for a given period and thereby the operator can determine what adjustment, if any, is necessary. This operation also informs the operator as to the approximate relative positioning of the levers necessary to obtain a certain degree of temperature in a furnace. During this determination, which will not require more than a minute, the operation of the furnace is suspended.

In order to facilitate the passing of fuel through the screen 2 and to further assist in agitating the fuel contained in the reservoir, I have arranged upon the shaft 3, a curved arm 45.

In operation of this fuel feeding mechanism, it is understood that the powdered coal is placed in the reservoir, the fuel feeding openings 9, and the air inlets are adjusted after which the motor M is started. At the beginning of the operation the short lengths of chain 5 are usually wrapped about the shaft 3 and serve to loosen the fuel which is then conveyed by the spiral chain 4 through a screen 2, thence through the passage-way 9 from which it is carried to the inner ends of the fan 23, where it is thoroughly and intimately mixed with air which has been fed in through the openings 28. The individual adjustment to the fuel passage-way and the air inlets, and the common control lever 16 by which the two may be afterward regulated provides means whereby an absolutely perfect mixture and combustion may be obtained.

Varying circumstances require the feeding of a greater or lesser amount of fuel to a furnace, and in order to cope with these conditions, I have provided a second fan 46, which is separately housed from the first fan and is carried by the same shaft. When it is necessary to feed a heavy supply of fuel to the furnace an additional volume of air is required and through simultaneous operation of the two fans this extra volume of air is forced through the pipe 47 and into the mixture. If the fuel supply is to be greatly reduced, the fan 46 may be cut out, the slide 11 moved inwardly to reduce the amount of fuel being fed through the passage-way 9 and I then depend entirely upon the single fan 23 to thoroughly mix the fuel and air.

As clearly shown in Figs. 12 and 13 the housing is provided at its outer end with circumferentially spaced openings 48 adapted to be varied in size by means of the rotatable plate 49 which is provided with similarly formed openings 50. Movement of this plate 49 whereby the size of the openings is controlled, is accomplished thru the medium of the lever 51, pivoted at 52 to the housing and having its inner end loosely connected to an arm 53 which is keyed or pinned to the extension 54 of the aforementioned shaft 17. As clearly shown in Fig. 13 the outer end of the shaft of the lever 51 is loosely received in the upper end of a substantially cross-shaped bracket 55 which is adjustable upon the plate 49 so as to permit proportional adjustment of the air inlet with respect to the fuel passage-way and the main air inlet.

I claim:

1. A fuel feeding mechanism comprising a fuel reservoir a horizontally disposed conveyor shaft arranged in said reservoir, and having one end projecting outwardly of the reservoir, a suction fan carried by the outer end of said shaft, a housing enclosing the fan and the projecting portion of said shaft, a fuel feed control arranged in said housing and said housing having air inlets between the fan and fuel control.

2. A fuel feeding mechanism comprising a fuel reservoir, having an outlet, a horizontally disposed conveyor shaft arranged in said reservoir and having one end projecting outwardly of the reservoir, a housing enclos-

ing said outlet and the projected portion of said shaft, a fuel feed control arranged in said housing adjacent the reservoir, said housing having air inlets outwardly from the fuel feed control, and fan means arranged upon the shaft near its outer end for drawing in air and assisting in conveying fuel to the mixing chamber.

3. A fuel feeding mechanism comprising a fuel reservoir having an outlet, a horizontally disposed conveyor shaft arranged in said reservoir and having one end projecting outwardly of the reservoir, a housing enclosing said outlet and the projected portion of said shaft, a fuel feed control arranged in said housing adjacent the reservoir, said housing having air inlets outwardly from the fuel feed control, fan means arranged upon the shaft near its outer end for drawing in air and assisting in conveying fuel, means for adjusting the fuel feed opening and means for adjusting the air inlet.

4. A fuel feeding mechanism comprising a fuel reservoir having an outlet, a horizontally disposed conveyor shaft arranged in said reservoir and having one end projecting outwardly of the reservoir, a housing enclosing said outlet and the projected portion of said shaft, a fuel feed control arranged in said housing adjacent the reservoir, said housing having air inlets, outwardly from the fuel feed control a mixing chamber, fan means arranged upon the shaft near its outer end for drawing in air and assisting in conveying fuel to the mixing chamber, means relatively independent for adjusting the fuel feed opening and the air inlet, and a common control lever to simultaneously regulate the fuel feed and air inlets.

5. A fuel feed mechanism, comprising a fuel reservoir having an outlet, a horizontally extended housing arranged to enclose said outlet, and having a transverse partition provided with a central horizontal passage-way, a horizontal conveyor shaft arranged in the reservoir and projecting into the housing and positioned in said passageway, a vertical slide notched to straddle the shaft and capable of vertical adjustment to close the passage-way, a horizontal slide mounted in the housing and having a substantially inverted L-shaped recess to engage about the shaft and co-act with the notch in the vertical slide to vary the size and position of the passage-way and means for feeding air into the housing for mixture with the fuel prior to delivery to a furnace.

6. A fuel feed mechanism, comprising a fuel reservoir having an outlet, a horizontally extended housing arranged to enclose said outlet, and having a transverse partition provided with a central horizontal passage-way, a horizontal conveyor shaft arranged in the reservoir and projecting into the housing and positioned in said passageway, a vertical slide notched to straddle the shaft and capable of vertical adjustment to close the passageway, a horizontal slide mounted in the housing and having a substantially inverted L-shaped recess to engage about the shaft and to act with the notch in the vertical slide to vary the size and position of the passage-way, said slides being relatively independently adjustable and means for feeding air into the housing for mixture with the fuel prior to delivery to a furnace.

7. A fuel feed mechanism, comprising a fuel reservoir having an outlet, a horizontally extended housing arranged to enclose said outlet, and having a transverse partition provided with a central horizontal passage-way, a horizontal conveyor shaft arranged in the reservoir and projecting into the housing and positioned in said passage-way, a vertical slide notched to straddle the shaft and capable of vertical adjustment to close the passageway, a horizontal slide mounted in the housing and having a substantially inverted L-shaped recess to engage about the shaft and co-act with the notch in the vertical slide to vary the size and position of the passage-way, said slides being relatively independently adjustable a common control simultaneously adjusting the air and fuel inlets and means for feeding air into the housing for mixture with the fuel prior to delivery to a furnace.

8. A fuel feeding mechanism comprising a fuel reservoir having an outlet, a conveyor shaft arranged in said reservoir and extending through the outlet, a fuel feed control valve arranged outside the reservoir about the shaft, suction fan means carried by the outer portion of the shaft and adapted to mix the fuel and air for delivery to a furnace, and a housing for the elements outside of said reservoir.

9. A fuel feeding mechanism comprising a fuel reservoir, having an outlet, a fuel conveyor, a fuel feed control valve straddling the conveyor, a suction fan at the outer end of said conveyor, a housing enclosing the fan, conveyor and valve and having an air inlet, and a common control means for said fuel valve and air inlet.

10. A fuel feeding mechanism comprising a fuel reservoir, a conveyor shaft arranged in the reservoir and extending through one side wall, fan mechanism carried by the outer end of the shaft, a housing enclosing the fan mechanism and extended portions of the shaft, a fuel conveyor tube surrounding a portion of the shaft and having its outer end terminated adjacent the fan mechanism, a fuel feed control valve arranged at the inner end of said tube, and adjustable air in-

lets radially spaced from the tube and formed in the said housing.

11. A fuel feeding mechanism comprising a fuel reservoir, a conveyor shaft arranged in the reservoir and extending through one side wall, fan mechanism carried by the outer end of the shaft, a housing enclosing the fan mechanism and extended portions of the shaft, a fuel conveyor tube surrounding a portion of the shaft and having its outer end terminated adjacent the fan mechanism, a fuel feed control valve arranged at the inner end of said tube, said housing having air inlets spaced radially from the conveyor tube, and a common control for varying the air and fuel flow.

12. A fuel feeding mechanism comprising a fuel reservoir, a conveyor shaft arranged in the reservoir and extending through one wall, fan mechanism carried by the outer end of the shaft, a housing enclosing the fan and shaft and having an air inlet, a valved fuel passage way arranged between the reservoir and fan mechanism, said air inlet and fuel passage-way being independently adjustable to vary the proportionate feed of air and fuel, and a common control means for simultaneously and uniformly adjusting the air inlet and fuel passage way after the adjustment for proportions.

In testimony whereof, I affix my signature.

CHARLES I. FILSON.