

July 3, 1945.

T. KRUGER

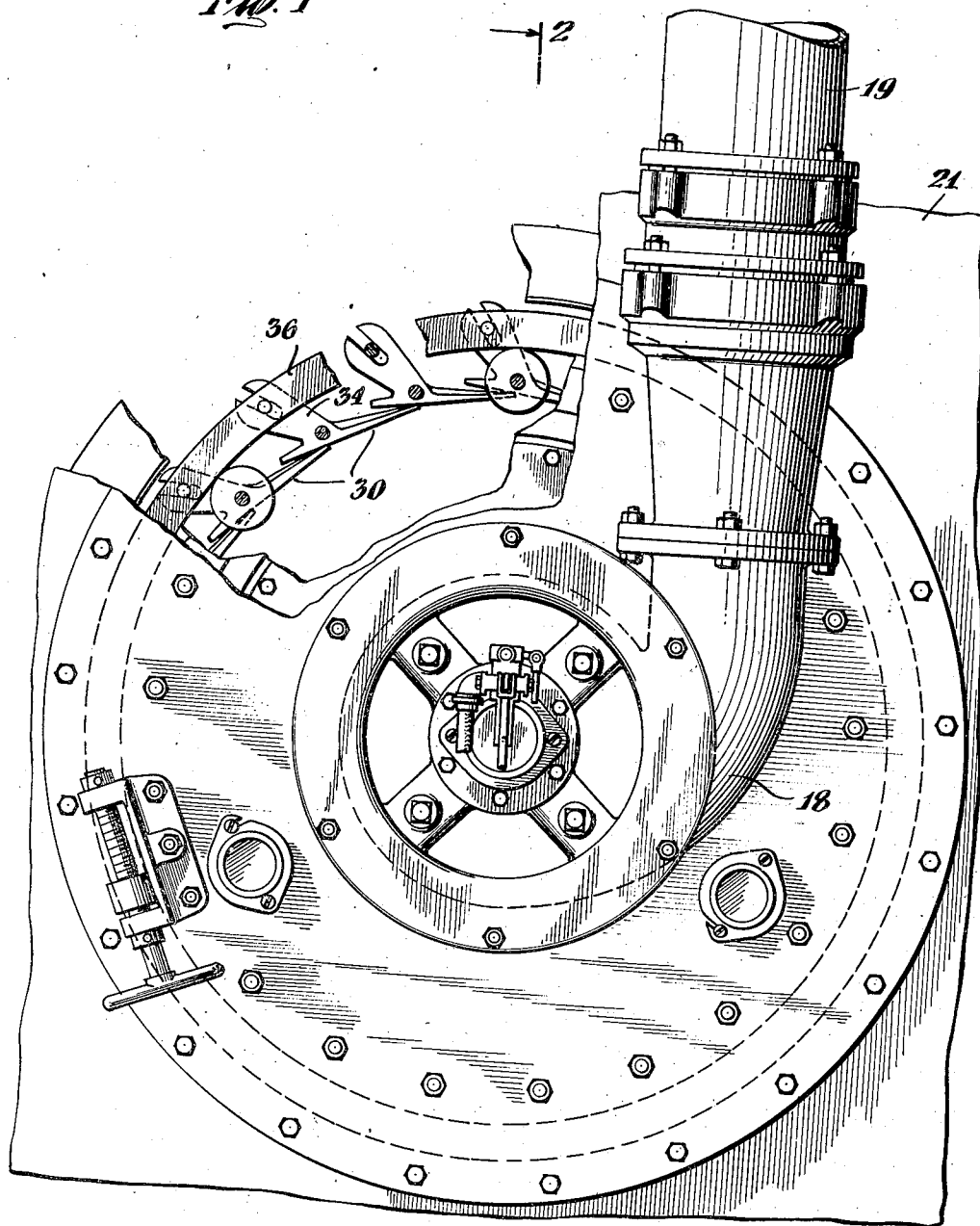
2,379,490

AIR DISTRIBUTION TO BURNERS

Filed Feb. 21, 1942

2 Sheets-Sheet 1

Fig. 1



2

INVENTOR.
Theodore Kruger

BY

James J. Whelan

ATTORNEY

July 3, 1945.

T. KRUGER

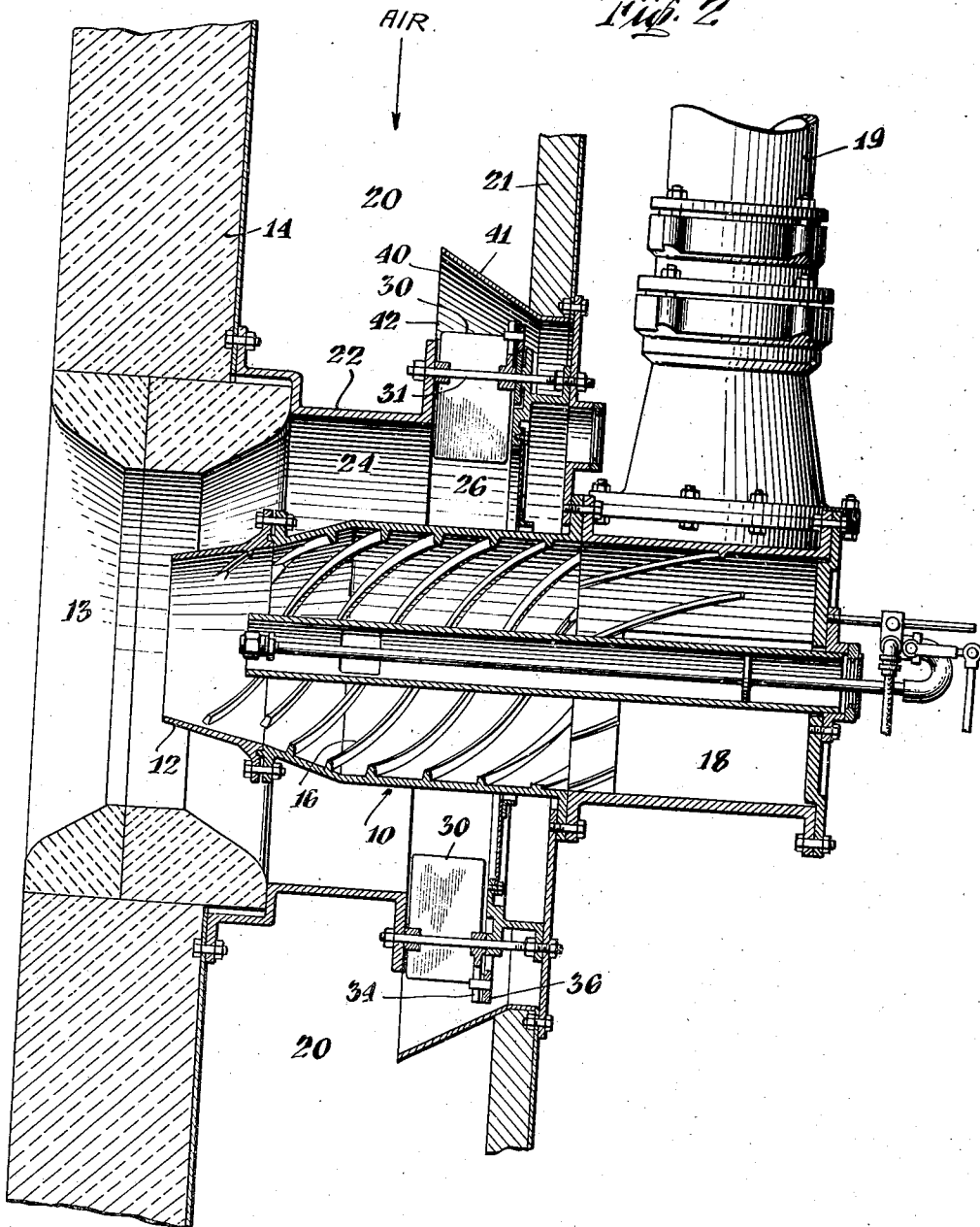
2,379,490

AIR DISTRIBUTION TO BURNERS

Filed Feb. 21, 1942

2 Sheets-Sheet 2

Fig. 2



INVENTOR.
Theodore Kruger
BY *James F. Whelan*
ATTORNEY

UNITED STATES PATENT OFFICE

2,379,490

AIR DISTRIBUTION TO BURNERS

Theodore Kruger, Peoria, Ill., assignor to Combustion Engineering Company, Inc., New York, N. Y.

Application February 21, 1942, Serial No. 431,852

3 Claims. (Cl. 110-104)

This invention relates to pulverized fuel burners and particularly to the means for effecting a uniform distribution of secondary air at the burner tip.

In horizontally disposed pulverized fuel burners the fuel and air mixture is given a rotary movement as it passes through the burner pipe. This rotary movement imparts turbulence to the mixture and causes it to bush out into a flat cone upon entering the furnace. Seen through an observation opening in the wall opposite the burner the flame from a well designed and operated horizontal burner appears to radiate from the burner center and form an annular disc. Secondary air is admitted to the furnace around the tip of the fuel burner pipe.

Even distribution of fuel and air to a furnace with horizontal burners is more difficult than with vertical burners because fewer are utilized and hence the streams of fuel entering the furnace from each burner are larger. Further the path of the burning mixture from the mouth of a burner to the tube bank of a boiler is usually shorter than with vertical firing. Consequently, the distribution of coal and air over the cross section of the furnace must be accomplished close to the burner and the distribution of both fuel and air must be uniform throughout. If the distribution is not uniform, certain parts of the furnace get too much air and too little fuel.

An object of this invention is to provide means for distributing the secondary air uniformly around the primary air and fuel mixture issuing from a burner.

In the drawings:

Figure 1 is an end elevation of a pulverized fuel burner embodying the present invention; and

Figure 2 is a sectional view on line 2-2 in Fig. 1.

In the drawings, the burner designated as a whole by the numeral 10 is disposed horizontally and its tip 12 projects into an aperture 13 in the furnace wall 14. The burner 10 is cylindrical and provided on its interior with rifling comprising a plurality of helical ribs 16 extending nearly throughout its length. The burner 10 has a volute entrance section 18 through which pulverized fuel in flotation in primary air is supplied tangentially to the burner nozzle through a fuel pipe supply 19.

Secondary air is delivered to the tip of burner 10 from a windbox 20 through which the burner projects. The nozzle section of burner 10 is enclosed in a casing 22 forming an annular chamber 24 surrounding the burner. At its outer end

the annular chamber 24 is in communication with windbox 20 through a circumferential port 26 on the wall of casing 22. Dampers 30 pivoted on shafts 31 are arranged around the burner and each is provided with an arm 34 having a pin and slot connection to an operating ring 36. As ring 36 is rotated clock-wise (Fig. 1) the dampers 30 separate with respect to one another and open to permit secondary air to flow around burner 10 and when ring 36 is rotated counter-clock-wise the dampers close and reduce the air flow.

It has been found that when air enters the windbox 20 in one general direction as downward in Fig. 1 a major part of the secondary air supply enters the annular chamber 24 around burner 10 through the upper part of port 26. Little air enters around other parts of the burner, as at the lower part thereof. This inequality of air supply through port 26 around the burner prevails in the travel of the air toward the furnace through the annular chamber 24 and results in an uneven distribution of the secondary air discharging into the furnace around the burner tip 12. This in turn causes an unbalance in the fuel air mixture within the furnace and inefficient combustion.

According to the invention, a baffle 40 having a conical outer surface 41 extends inwardly from the casing 21 of windbox 20 across the circumferential port 26 in burner casing 22. The inner edge of baffle 40 is substantially in alignment with but spaced from the furnace-side edge of port 26 to provide an annular opening through which the windbox is in communication with the enclosed space around port 26. Baffle 40 prevents air from flowing directly into port 26 from the windbox 20 and causes it to flow toward port 26 through annular opening 42 around the entire circumference of baffle 40 in a direction substantially parallel to the axis of the burner. Thence the air turns 90° into the port 26 and again 90° into chamber 24 to pass toward the burner tip 12. By blocking the direct entry of the air into port 26 from any direction by means of baffle 40 the velocity of the air from that direction is diminished and is no longer effective to cause an excess flow of air from that direction into the burner. Thus, all of the air is then forced to enter port 26 through opening 42 at right angles to its direction of flow in windbox 20 and then caused to make abrupt turn into port 26, thereby substantially equalizing resistance to air flow into the burner.

What I claim is:

1. In a pulverized fuel burner; a windbox; a fuel injector pipe projecting horizontally through

said windbox; a casing enclosing said pipe to form an annular chamber therearound and having a port formed in its wall extending substantially completely around the fuel injector pipe adjacent the outer end wall of said windbox for admitting air to said chamber; a deflecting sleeve supported within said windbox so as to extend completely across and around said port and spaced from said casing near one end of said port to form an annular opening between said sleeve and casing leading to said port for causing the air stream in said windbox approaching said port to abruptly change its direction before entering said port.

2. In a horizontal burner having a central nozzle pipe for delivering a fuel and air mixture tangentially from the periphery of its tip; means forming a chamber surrounding said nozzle and having an air inlet port extending substantially completely around said chamber and an annular opening adjacent said nozzle tip for delivering additional air for combustion of the fuel to the fuel and air mixture leaving said tip; a windbox surrounding said chamber and communicating therewith through said port; and baffle means

supported within said windbox so as to overlie and be spaced radially from said port between said windbox and chamber.

3. In a burner of the horizontal type comprising a central burner pipe for delivering a fuel and air mixture from its discharge end; a casing surrounding said pipe and spaced therefrom to provide an annular air passage therearound formed with an air inlet port extending substantially completely around the casing and an annular air discharge opening adjacent the discharge end of said burner pipe; means forming a windbox around said casing communicating with said air passage through said inlet port and through which air under pressure moves in a direction toward one side of said burner; and a deflector sleeve supported within said windbox so as to extend completely across and around said port and spaced from said casing to form an annular opening between said sleeve and said casing for causing the air stream in said windbox approaching said port to abruptly change its direction before entering said port.

THEODORE KRUGER.