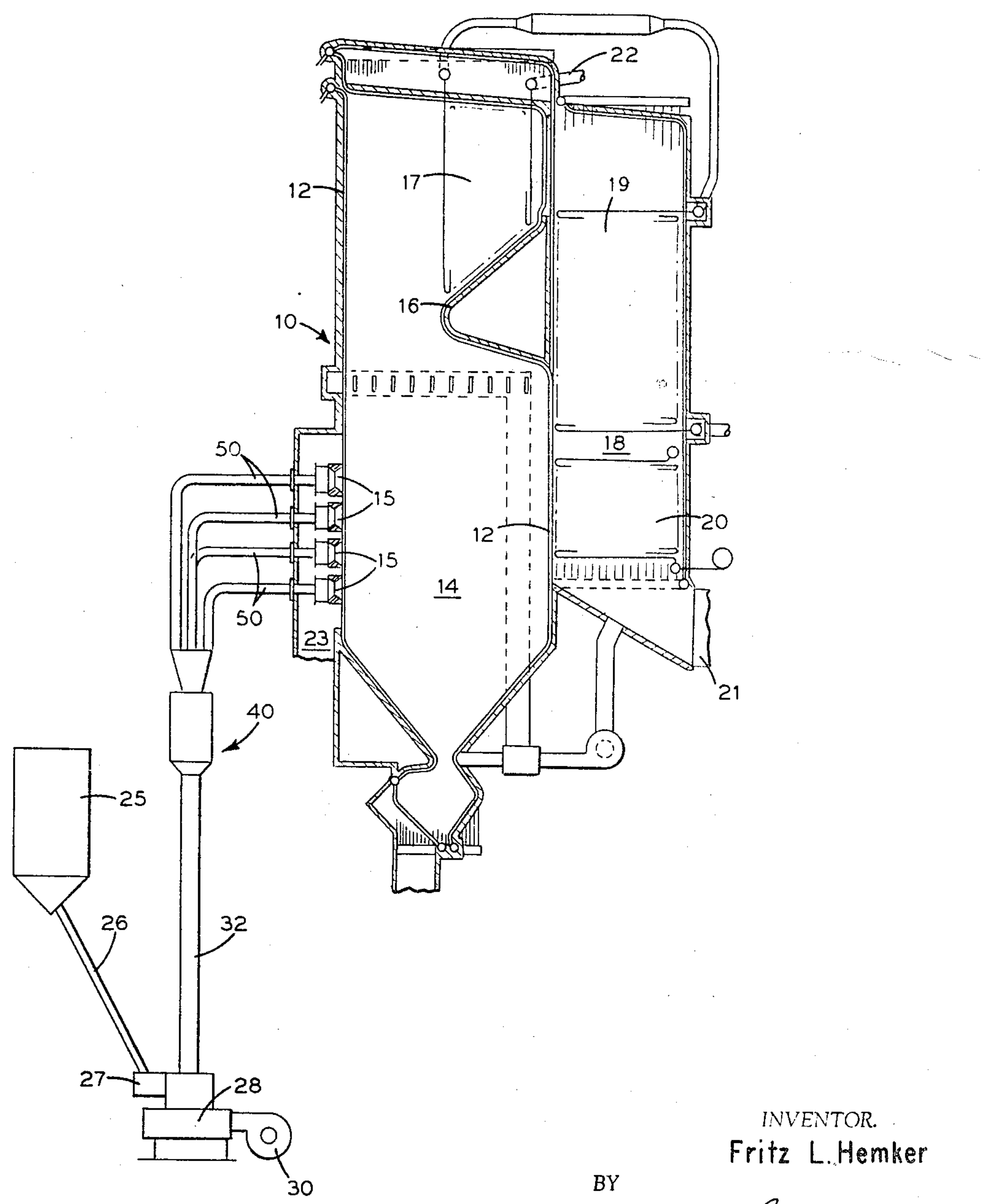
Aug. 23, 1966 F. L. HEMKER 3,267,891

DISTRIBUTOR FOR PARTICLE-FORM MATERIAL

Filed Oct. 7, 1964 2 Sheets-Sheet 1

FIG. 1



INVENTOR.
Fritz L. Hemker

BY

ATTORNEY

Aug. 23, 1966 F. L. HEMKER 3,267,891

DISTRIBUTOR FOR PARTICLE-FORM MATERIAL

Filed Oct. 7, 1964

2 Sheets-Sheet 2

FIG. 2

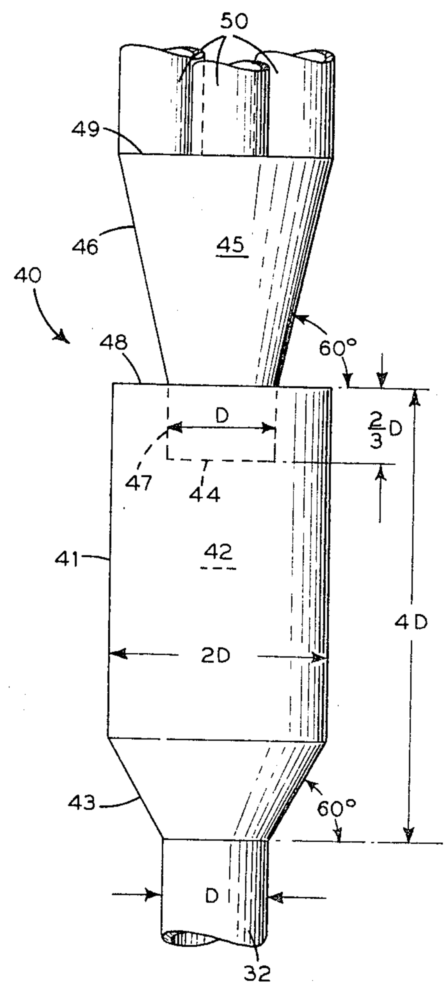


FIG. 2B

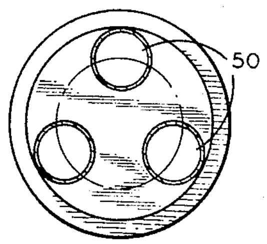
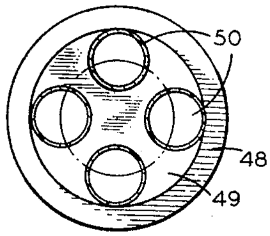


FIG. 2A



United States Patent Office

3,267,891

Patented August 23, 1966

3,267,891

DISTRIBUTOR FOR PARTICLE-FORM MATERIAL

Fritz L. Hemker, Wadsworth, Ohio, assignor to The Babcock & Wilcox Company, New York, N.Y., a corporation of New Jersey

Filed Oct. 7, 1964, Ser. No. 402,207
11 Claims. (Cl. 110—28)

The present invention relates generally to the distribution of fluid conveyed particle-form material, and more particularly to the division or distribution of a stream of air-borne particle-form fuel into a plurality of equal density streams of fuel and air for delivery to burners serving a combustion space or furnace.

The combustion of large quantities of fuel in modern high capacity boiler furnaces or other types of furnaces necessitates that these furnaces be equipped with multiple burners. In many installations, solid fuel such as coal is used as the primary fuel because of its low cost in relation to other available fuels. The coal is usually burned in suspension in pulverized or crushed form in order to obtain the benefits of high heat release rates in the furnace, and various types of pulverizers and crushers have been developed for the preparation of coal for suspension burning. It has been found that the optimum size of a pulverizer or crusher from an operating economics standpoint is such that the pulverizer or crusher usually has the capacity for delivering coal at full rate to several burners. As an example of the relationship between the capacities of pulverizers and burners as applied to the combustion of coal in vapor generators, the highest capacity commercial pulverizer available can prepare about 50 tons per hour of coal for suspension firing, while the highest capacity single nozzle pulverized fuel burner commercially available has a rated capacity of about 7 tons of fuel per hour. Thus, for economic reasons, it has become normal practice to convey the fuel from a single pulverizer to a multiplicity of coal burners, the usual method of conveying the coal being in air-borne suspension.

When the distribution of a coal/air stream into a plurality of smaller streams for delivery to the burners firing into a combustion space fails to provide substantially equal densities of coal/air mixtures in the smaller streams, several problems may arise. If the maldistribution to the burners is severe enough, the coal/air ratio to one or more of the burners may result in unstable burner ignition with its attendant dangers. If the maldistribution is not so severe as to cause ignition instability, it may nevertheless result in incomplete combustion of the fuel being delivered to one or more of the burners and/or an undesirable uneven heat release pattern in the furnace.

In the past, many attempts have been made to solve the problems of developing distributors which effectively divide an air-borne stream of coal into a plurality of equal density streams. Among the devices tried have been simple splitters, relatively complicated riffle arrangements, rotating distributors employing centrifugal forces, etc. These attempts at solving this problem have generally been unsuccessful either because of their inability to provide the desired distribution efficiency or because the devices contrived were expensive to construct due to their complicated nature or were expensive to operate because of moving parts or high pressure drop.

The continuing failure to solve this seemingly simple distribution problem is probably traceable to the characteristic of a coal/air stream, in that the coal in a moving air stream within an enclosed conduit or pipe tends to "rope," i.e., the coal becomes concentrated in unstable longitudinally extending streams within the pipe. This "roping" characteristic renders impossible any presumption that the distribution of coal and air across the cross-sectional flow area of a conduit is uniform, even after a long straight section of the conduit. Moreover, this inherent "roping" characteristic has been found to be prevalent in the air/coal ratio and velocity ranges normally employed in conveying pulverized coal to burners, i.e., air/coal ratios of 22 to 30 standard cubic feet of air per pound of coal and conveying burner pipe velocities of 3000 to 4000 feet per minute.

It is therefore an object of the present invention to provide a distributor which is capable of effectively dividing or apportioning a fluid transported particle-form material, for example air-borne pulverized coal, into a plurality of equal density streams for delivery to multiple points of use, for example, multiple burners arranged to discharge combustion gases into a furnace chamber. It is a further object that this distributor be simple in construction so that it is inexpensive to manufacture and occupies a minimum of space. It is a still further object that this distributor be inexpensive to operate in that it has a low pressure drop characteristic and requires no moving parts.

To accomplish these objects, there is herein described and disclosed an aparatus for dividing a continuous stream of fluid transported particle-form material into a plurality of equal density smaller streams comprising walls defining a substantially unobstructed vertically disposed mixing chamber symmetrically arranged about its vertical axis. The lower end of the mixing chamber is provided with a bottom closure formed with a centrally disposed inlet opening arranged for the axial introduction, into the mixing chamber, of a jet of the stream to be divided. The top of the chamber is closed and is also formed with a centrally disposed discharge opening. The dimensions of the chamber are such that the energy of the incoming jet is substantially completely dissipated within the chamber and at least a major portion of the particle-form material is released from suspension to recirculate downwardly within the chamber and become re-entrained with the incoming stream prior to exiting from the chamber through the discharge opening. An enclosed transition zone, symmetrically formed about its vertical axis, is provided immediately above the mixing chamber in axial alignment therewith, and a conduit communicating with the lower end of the transition zone extends downwardly through the discharge opening of and into the mixing chamber to form a re-entrant outlet therefrom. A plurality of spaced outlet conduits open into and are symmetrically arranged about the vertical axis of the transition zone for discharge of the smaller streams therefrom.

The present invention also includes the above described distributing apparatus in combination with a furnace combustion space having a multiplicity of pulverized fuel burners arranged to discharge fuel and air into the furnace, and a pulverized fuel delivery system which supplies a single continuous stream of pulverized coal and air to the distributing apparatus which is preferably located adjacent the furnace and near to the burners.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawing and descriptive matter in which there is illustrated and described a preferred embodiment of the invention.

In the drawings:

FIG. 1 is a sectional side view of a vapor generator showing the fuel delivery system therefor;

FIG. 2 is a side view of the distributor as incorporated in the fuel delivery system shown in FIG. 1;

FIG. 2A is a top view of the distributor of FIG. 2; and

FIG. 2B is a top view of a distributor of the type as shown in FIG. 2, but having three rather than four outlet conduits.

In FIG. 1 is shown a vapor generator **10** including water-cooled walls **12** which define a furnace chamber or combustion space **14** to which fuel and air mixtures are supplied by pulverized coal burners **15**. After combustion has been completed in the furnace chamber **14**, the heated gases flow upwardly around the nose **16**, over the tubular secondary superheater **17**, and thence downwardly through the convection pass **18**, containing the tubular primary superheater **19** and the economizer **20**, to the outlet **21**, from which the cooled gaseous combustion products may be passed through an air heater (not shown) before discharge to the atmosphere. It will be understood that the gaseous combustion products passing over the above mentioned heat exchange sections, give up heat to the fluid contained within and passing serially through the tubular members of the heat exchange sections to produce highly superheated vapor which is taken from the vapor generator **10** via the secondary superheater outlet **22**.

The pulverized coal and primary air are supplied to the burners **15** through the coal pipes **50**. The remaining required amount of air necessary to complete combusition of the coal supplied to the burners **15** is supplied to the burners **15** through the windbox **23** from a secondary air fan (not shown).

The coal to be burned in the vapor generator **10** is delivered in raw form via pipe **26** from the raw coal storage bunker **25** to the pulverized feeder **27**, which regulates the quantity of coal supplied to the pulverizer **28** in response to the load demand on the vapor generator **10** in a manner well known in the art. The pulverizer **28**, being of the air-swept type, is supplied with pressurized air from a primary air fan **30**, the quantity of air supplied being regulated to within the range of 22 to 30 standard cubic feet of air per pound of coal supplied to the pulverizer, the exact amount of air depending primarily on the percentage of volatile matter contained in the particular coal being used. The air-borne pulverized coal leaves the pulverizer **28** via outlet conduit **32** and flows thence to the distributor **40**.

Because of its weight, the pulverizer **28** is usually mounted on the basement floor to avoid the necessity of heavy and expensive foundation support structure. This usually means that the pulverizer **28** is a considerable distance from the burners **15** and therefore relatively long conveying lines are needed between the pulverizer **28** and the burners **15**. To avoid multiple long burner pipes **50**, the distributor **40** is preferably located near the burners **15** so that only a single long conveying line (outlet conduit **32**) is required from the pulverizer **28**.

Where, as in the installation shown in FIG. 1, a single pulverizer **28** supplies fuel to more than one burner **15**, it is necessary that the air-borne stream of coal be equally divided, both qualitatively and quantitatively among the multiple burners **15**. The burner coal pipes **50** are initially sized to optimally satisfy a balance of primary air velocity, air/coal ratio and volatility of the particular coal being burned, which balance will result in the establishment and maintenance of a stable ignition zone immediately downstream of the discharge end of the coal pipes **50**. The coal volatility, of course, does not materially change unless a different species of coal is used; however, if the air/coal ratio or the primary air velocity in any of the burners **15** is upset appreciably due to the maldistribution of the air-borne stream of coal leaving the pulverizer, it may result in ignition instability. It will be appreciated that such upsets normally occur simultaneously in more than one burner **15**. Thus, if one burner **15** receives a fuel rich mixture, some other of the burner **15** must be receiving a lean mixture. Accordingly, the distribution of the fuel stream leaving the pulverizer **28** among the burners **15** is of prime importance to stable burner operation.

The distributor **40** (see FIGS. 2 and 2A) includes walls **41** which form a substantially unobstructed vertically disposed cylindrical mixing chamber **42**. A frusto-conical bottom closure **43** of downwardly diminishing diameter closes the bottom of the mixing chamber **42** and is formed with an axially disposed inlet opening which communicates with the uppermost end of the pulverizer outlet conduit **32**. Immediately above and in communication with the mixing chamber **42** is a transition zone **45** of gradually upwardly increasing diameter, the transition zone **45** being defined by frusto-conical walls **46**. A cylindrical member **47** is connected to the lower end of the frusto-conical walls **46** and extends downwardly into the mixing chamber **42** to form a re-entrant outlet **44** therefrom. The closure of the mixing chamber **42** is completed by an annular top closure member **48**. The top of the transition zone **45** is closed by a plate **49** formed with openings which respectively communicate with the four burner coal piper **50** leading to the individual burners **15**. As shown in FIG. 2B, a different number of pipes **50** may be provided so long as they are evenly or symmetrically spaced about the vertical axis of the distributor **40**.

In operation, the air-borne pulverized coal from the pulverizer **28** is axially introduced into the mixing chamber **42** from the conduit **32** at a velocity in the range of 3000 to 4000 feet per minute, this being the normal range of line velocities used in conveying pulverized coal streams having an air/coal ratio within the limits of pulverized coal burner operation. The height and diameter of the mixing chamber **42** are such that the energy of the incoming jet is substantially completely dissipated in the chamber **42** so that at least a major portion of the coal entering with the jet is recirculated downwardly within the chamber **42** prior to turning upwardly exiting therefrom through the re-entrant outlet **44**. This constant downward recirculation of coal and its recombination with the incoming stream produces a thorough mixing action so that the coal carried from the mixing chamber **42** is evenly dispersed in the air passing upwardly through the re-entrant outlet **44**.

In order for the jet to be sufficiently dissipated, it has been found that the height of the chamber **42** must be at least four times the inside diameter D of the inlet (pulverized discharged conduit **32**). If the height of the chamber **42** is less than 4D, a significant portion of the incoming jet, with perhaps a concentrated fuel stream, can short-circuit the mixing process and pass directly through the re-entrant outlet **44**. Experiments have shown that increasing the height above 4D has no apparent effect on distribution.

The diameter of the mixing chamber **42** must also be sufficiently large to promote dissipation of the incoming jet, and it has been found by experimentation that a diameter of above twice the diameter D will provide sufficient volume for dissipation of the jet. The frusto-conical bottom closure **43** preferably has an included angle of about 60° and serves to prevent the accumulation of coal in the bottom of the mixing chamber **42**.

The re-entrant outlet **44** precludes the coal from leaving the chamber **42** before the recirculation and mixing action are completed. It has been found that satisfactory results are obtained if the height of the cylindrical member **47** is at least ⅔ of the diameter D. The function of the transition zone **45** is to afford gradual expansion of the stream of air of the evenly dispersed air/coal mixture so that it will flow evenly into the symmetrically arranged outlets. In order to avoid re-segregation of the coal between the re-entrant outlet **44** and the pipes **50**, the included angle of the frusto-conical walls **46** should be no greater than 60°. Equal division and distribution of the mixture is assured by symmetrically arranging the openings communicating with the burner pipes **50** about the vertical axis of the distributor **10**.

The cumulative cross-sectional flow area of the burner pipes **50** should be approximately equal to the area of the inlet pipe (pulverizer outlet conduit **32**) to insure the proper conveying velocity in all the lines. Moreover, the diameter of the cylindrical member **47** should also be substantially equal to the diameter D to assure the proper conveying velocity between the mixing chamber **42** and the transition zone **45**. Test data indicates that a distributor constructed in accordance with the above description will have a pressure drop thereacross of about two inches of water when the inlet velocity is approximately 3000 feet per minute and where the incoming coal air stream has an air/coal ratio of 24 standard cubic feet of air per pound of coal.

It should be recognized from the above description that a distributor of the type herein disclosed is applicable to the division of any fluid conveying particle-form material. It is particularly useful for pneumatically conveying pulverized material, but it may also be used for the division of liquid suspended material or for fluid suspended crushed material. For the purposes of this specification therefor, the term fluid includes liquids as well as gases and the phrase particle-form material includes pulverized as well as crushed material as these terms are commercially understood.

It should also be recognized that the distributor herein described, although specifically described in terms of an apparatus having circular horizontal cross-section, might be constructed with horizontal cross-sections having other shapes which are symmetrical about their centers.

While in accordance with the provisions of the statutes there is illustrated and described herein a specific embodiment of the invention, those skilled in the art will understand that changes may be made in the form of the invention covered by the claims, and that certain features of the invention may sometimes be used to advantage without a corresponding use of the other features.

What is claimed is:

1. Apparatus for distributing fluid transported particle-form material comprising walls defining a substantially unobstructed mixing chamber symmetrically arranged about its vertical axis, a bottom closure for said chamber including means forming a centrally disposed inlet for the introduction of said material axially into said chamber, a top closure for said chamber formed with a centrally disposed discharge opening, walls defining a transition zone disposed co-axially above said mixing chamber and being symmetrically arranged about its vertical axis, a downwardly extending conduit connected to the lower end of said transition zone and extending downwardly through said discharge opening and into said chamber to form a re-entrant outlet therefrom, and a plurality of spaced outlet conduits opening into and symmetrically arranged about the vertical axis of said transition zone.

2. Apparatus for distributing fluid transported particle-form material comprising walls defining a substantially unobstructed vertically disposed cylindrical mixing chamber, a bottom closure of downwardly diminishing diameter for said chamber including means forming a centrally disposed inlet for the introduction of said material axially into said chamber, said inlet having a cross-sectional area substantially less than the cross-sectional area of said chamber, a top closure for said chamber formed with a centrally disposed discharge opening, walls defining a transition zone disposed co-axially above said mixing chamber and being symmetrically arranged about its vertical axis, a downwardly extending conduit connected to the lower end of said transition zone and extending downwardly through said discharge opening and into said chamber to form a re-entrant outlet therefrom, and a plurality of spaced outlet conduits opening into and symmetrically arranged about the vertical axis of said transition zone.

3. Apparatus for distributing fluid transported particle-form material comprising walls defining a substantially unobstructed vertically disposed cylindrical mixing chamber, a bottom closure for said chamber including means forming a centrally disposed inlet for the introduction of a jet of said material axially into said chamber, the dimensions of said chamber being such that said jet is substantially completely dissipated within said chamber, a top closure for said chamber formed with a centrally disposed discharge opening, walls defining a transition zone disposed co-axially above said mixing chamber and being symmetrically arranged about its vertical axis, a downwardly extending conduit connected to the lower end of said transition zone and extending downwardly through said discharge opening and into said chamber to form a re-entrant outlet therefrom, and a plurality of spaced outlet conduits opening into and symmetrically arranged about the vertical axis of said transition zone, the combined cross-sectional flow area of said outlet conduits being substantially equal to the area of said inlet.

4. Apparatus for distributing pneumatically transported particle-form material comprising walls defining a substantially unobstructed vertically disposed cylindrical mixing chamber, a frusto-conical bottom closure of downwardly diminishing diameter for said chamber, said bottom closure being formed at its lower end with a centrally disposed inlet opening for the introduction of said material axially into said mixing chamber, a top closure for said chamber formed with a centrally disposed discharge opening, frusto-conical walls forming an unobstructed transition zone of upwardly increasing diameter disposed above said mixing chamber and in axial alignment therewith, an axially disposed outlet conduit connected to the lower end of said transition zone and extending downwardly through said discharge opening and into said mixing chamber to form a re-entrant outlet therefrom, and a plurality of spaced outlet conduits opening into and symmetrically arranged about the vertical axis of said transition zone.

5. Apparatus for distributing pneumaticaly transported particle-form material comprising walls defining a substantially unobstructed mixing chamber symmetrically arranged about its vertically disposed axis, a bottom closure of downwardly diminishing diameter for said chamber, said bottom closure being formed at its lower end with a centrally disposed inlet opening for the introduction of a jet of said material axially into said mixing chamber, said inlet having a cross-sectional area substantially less than the cross-sectional area of said chamber, a top closure for said chamber formed with a centrally disposed discharge opening, the dimensions of said chamber being such that said jet is substantially completely dissipated and at least a major portion of the particle-form material jetting into said chamber recirculates downwardly within said chamber prior to exiting therefrom, walls forming an unobstructed transition zone of upwardly increasing diameter disposed above said mixing chamber and in axial alignment therewith, an axially disposed outlet conduit connected to the lower end of said transition zone and extending downwardly through said discharge opening and into said mixing chamber to form a re-entrant outlet therefrom, and a plurality of spaced outlet conduits opening into and symmetrically arranged about the vertical axis of said transition zone.

6. Apparatus for distributing pneumatically transported particle-form material comprising walls defining a substantialy unobstructed vertically disposed cylindrical mixing chamber, a frusto-conical bottom closure of downwardly diminishing diameter for said chamber, said bottom closure being formed at its lower end with a centrally disposed inlet opening for the introduction of a jet of said material axially into said mixing chamber, the dimensions of said chamber being such that said jet is substantially completely dissipated within said chamber, a top closure for said chamber formed with a centrally disposed discharge opening, frusto-conical walls forming an unobstructed transition zone of upwardly increasing diameter disposed above said mixing chamber and in axial alignment therewith, an axially disposed outlet conduit connected to the lower end of said transition zone and extending downwardly through said discharge opening and into said mixing chamber to form a re-entrant outlet therefrom, and a plurality of spaced outlet conduits opening into and symmetrically arranged about the vertical axis of said transition zone, the combined cross-sectional flow area of said outlet conduits and the flow area of said inlet opening and the flow area of said re-entrant outlet all being substantially equal.

7. Apparatus for distributing pneumatically transported particle-form material comprising walls defining a substantially unobstructed vertically disposed cylindrical mixing chamber, a frusto-conical bottom closure of downwardly diminishing diameter for said chamber, said bottom closure being formed at its lower end with a centrally disposed inlet opening arranged for the introduction of a jet of said material axially into said chamber, said inlet having a cross-sectional area substantially less than the cross-sectional area of said chamber, a top closure for said chamber formed with a centrally disposed discharge opening having a cross-sectional area substantially equal to the cross-sectional area of said inlet opening, the dimensions of said chamber being such that said jet is substantially completely dissipated within said chamber and at least a major portion of the particle-form material jetting into said chamber is released from said jet and recirculates downwardly within said chamber prior to exiting therefrom through said discharge opening, walls forming an unobstructed transition zone of upwardly increasing diameter disposed above said mixing chamber and in axial alignment therewith, an axially disposed outlet conduit connected to the lower end of said transition zone and extending downwardly through said discharge opening and into said mixing chamber to form a re-entrant outlet therefrom, and a plurality of spaced outlet conduits symmetrically arranged about the vertical axis of said transition zone and opening thereinto, the cumulative cross-sectional area of said outlet conduits being substantially equal to the cross-sectional area of said inlet opening.

8. Apparatus for dividing a continuous stream of a mixture of pulverized fuel and an oxygen containing carrier gas into a plurality of equal density streams comprising walls defining a substantially unobstructed vertically disposed cylindrical mixing chamber, a bottom closure of downwardly diminishing diameter for said chamber, said bottom closure being formed at its lower end with a centrally disposed inlet opening arranged for the introduction of a jet of said mixture axially into said chamber at a velocity in the range of 3000 to 4000 feet per minute through said inlet, a top closure for said chamber formed with a centrally disposed discharge opening, the inside diameter of said chamber being at least about twice the inside diameter of said inlet opening, and the height of said chamber being at least four times the inside diameter of said inlet opening so that said jets is dissipated and at least a major portion of the particle-form material is released from said jet and recirculates downwardly within said chamber prior to exiting therefrom through said discharge opening, walls forming an unobstructed transition zone disposed above said mixing chamber and in axial alignment therewith, an axially disposed outlet conduit connected to the lower end of said transition zone and extending downwardly through said discharge opening and into said mixing chamber to form a re-entrant outlet therefrom, and a plurality of spaced outlet conduits symmetrically arranged about the vertical axis of said transition zone and opening thereinto, the cumulative cross-sectional area of said outlet conduits being substantialy equal to the cross-sectional area of said inlet opening.

9. Apparatus for dividing a continuous stream of a mixture of pulverized fuel and an oxygen containing carrier gas into a plurality of equal density streams comprising walls defining a substantially unobstructed vertically disposed cylindrical mixing chamber, a frusto-conical bottom closure of downwardly diminishing diameter for said chamber, said bottom closure being formed at its lower end with a centrally disposed inlet opening arranged for the introduction of a jet of said mixture axially into said chamber at a velocity in the range of 3000 to 4000 feet per minute through said inlet, a top closure for said chamber formed with a centrally disposed discharge opening having a cross-sectional area substantially equal to the cross-sectional area of said inlet opening, the inside diameter of said chamber being at least about twice the inside diameter of said inlet opening, and the height of said chamber being at least four times the inside diameter of said inlet opening so that said jet is substantially completely dissipated and at least a major portion of the particle-form material is released from said jet and recirculates downwardly within said chamber prior to exiting therefrom through said discharge opening, frusto-conical walls forming an unobstructed transition zone of upwardly increasing diameter disposed above said mixing chamber and in axial alignment therewith, an axially disposed outlet conduit connected to the lower end of said transition zone and extending downwardly through said discharge opening and into said mixing chamber to form a re-entrant outlet therefrom, and a plurality of spaced outlet condits symmetrically arranged about the vertical axis of said transition zone and opening thereinto, the cumulative cross-sectional area of said outlet conduits being substantially equal to the cross-sectional area of said inlet opening.

10. In combination, walls defining a combustion space, a multiplicity of burners arranged to discharge combustion gases into said space, and means for delivering particle-form fuel to said burners comprising a pulverizer, a source of air, means for delivering raw solid fuel to said pulverizer for converting said raw coal fuel into particle-form material to be carried to said burners in suspension in said air, and means for dividing the fuel/air stream from said pulverizer into a plurality of equal density streams comprising a distributor disposed adjacent the walls of said furnace chamber and near to said burners, said distributor including walls defining a substantially unobstructed vertically disposed cylindrical mixing chamber, a bottom closure for said chamber including means forming a centrally disposed inlet for the introduction of a jet of said fuel and said air axially into said chamber, the dimensions of said chamber being such that said jet is substantially completely dissipated within said chamber, a top closure for said chamber formed with a centrally disposed discharge opening, walls defining a transition zone disposed co-axially with and immediately above said mixing chamber and being symmetrically arranged about its vertical axis, a downwardly extending conduit connected to the lower end of said transition zone and extending downwardly through said discharge opening and into said chamber to form a re-entrant outlet therefrom, and a plurality of spaced outlet conduits connected to said burners and opening into and symmetrically arranged about the vertical axis of said transition zone, the combined cross-sectional flow area of said outlet conduits being substantially equal to the area of said inlet.

11. In combination, walls defining a furnace combustion space, a multiplicity of pulverized fuel burners arranged to discharge combustion gases into said combustion space, and means for delivering air-borne pulverized fuel to said burners including an air-swept pulverizer arranged to discharge a stream of air-borne pulverized fuel therefrom, means for delivering raw solid fuel to said pulverizer, means for supplying pressurized air to said pulverizer at the rate of 22 to 30 standard cubic feet of air per pound of said raw fuel delivered to said pulverizer, and means for dividing said stream among said burners

including a distributor disposed near to said burners and adjacent said furnace, said distributor comprising walls defining a substantially unobstructed vertically disposed cylindrical mixing chamber, a bottom closure of downwardly diminishing diameter for said chamber, said bottom closure being formed at its lower end with a centrally disposed inlet opening arranged for the introduction of said stream in the form of a jet axially into said chamber, a top closure for said chamber formed with a centrally disposed discharge opening, the dimensions of said chamber being such that said jet is substantially completely dissipated within said chamber and a major portion of the fuel entering said chamber recirculates downwardly within said chamber prior to exiting therefrom through said discharge opening, walls defining a transition zone disposed co-axially above said mixing chamber and being symmetrically arranged about its vertical axis, and

a plurality of spaced outlet conduits opening into and arranged symmetrically about the vertical axis of said transition zone, the combined cross-sectional flow area of said outlet conduits and the cross-sectional flow area of said inlet opening and the cross-sectional flow area of said discharge opening all being substantially equal.

References Cited by the Examiner

UNITED STATES PATENTS

3,204,942	9/1965	Matthys et al. ------	110—104 X

FOREIGN PATENTS

735,373	8/1932	France.
822,453	9/1937	France.
309,572	6/1930	Great Britain.

CHARLES J. MYHRE, *Primary Examiner.*