Aug. 28, 1951 O. R. SMITH 2,565,826

MIXING DEVICE

Filed April 19, 1948 4 Sheets-Sheet 1

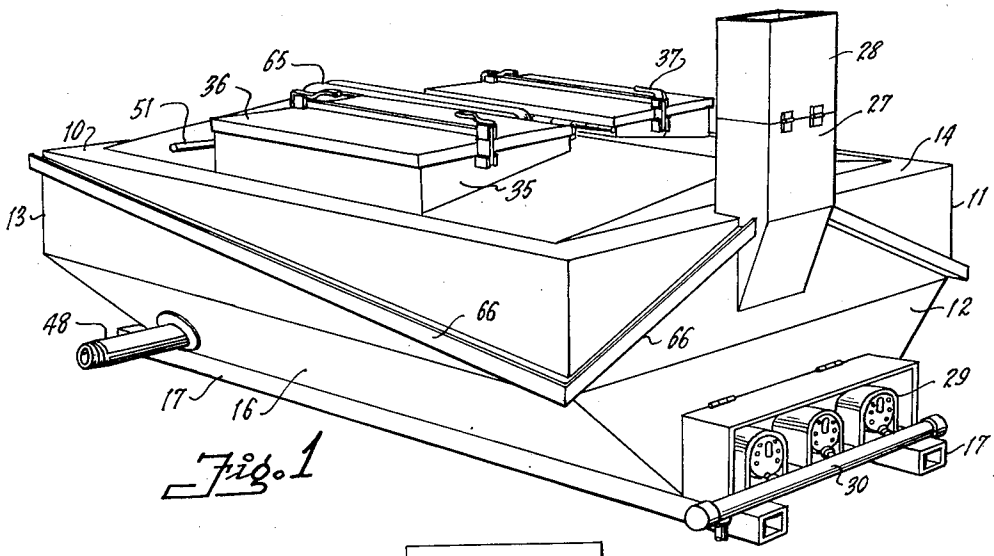


Fig. 1

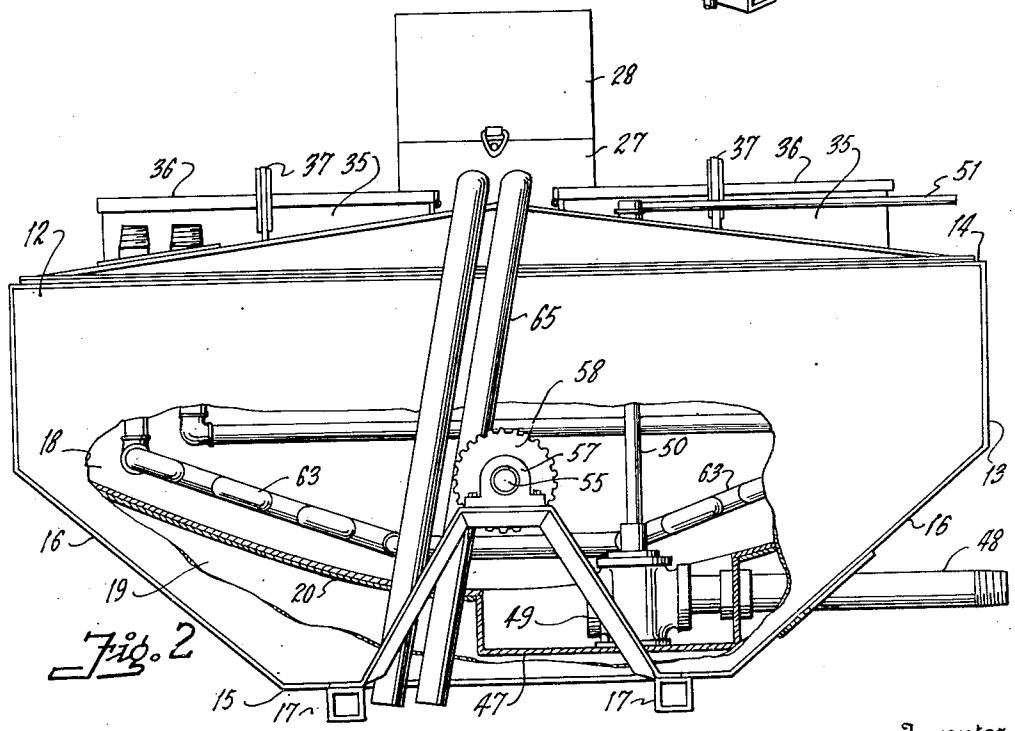


Fig. 2

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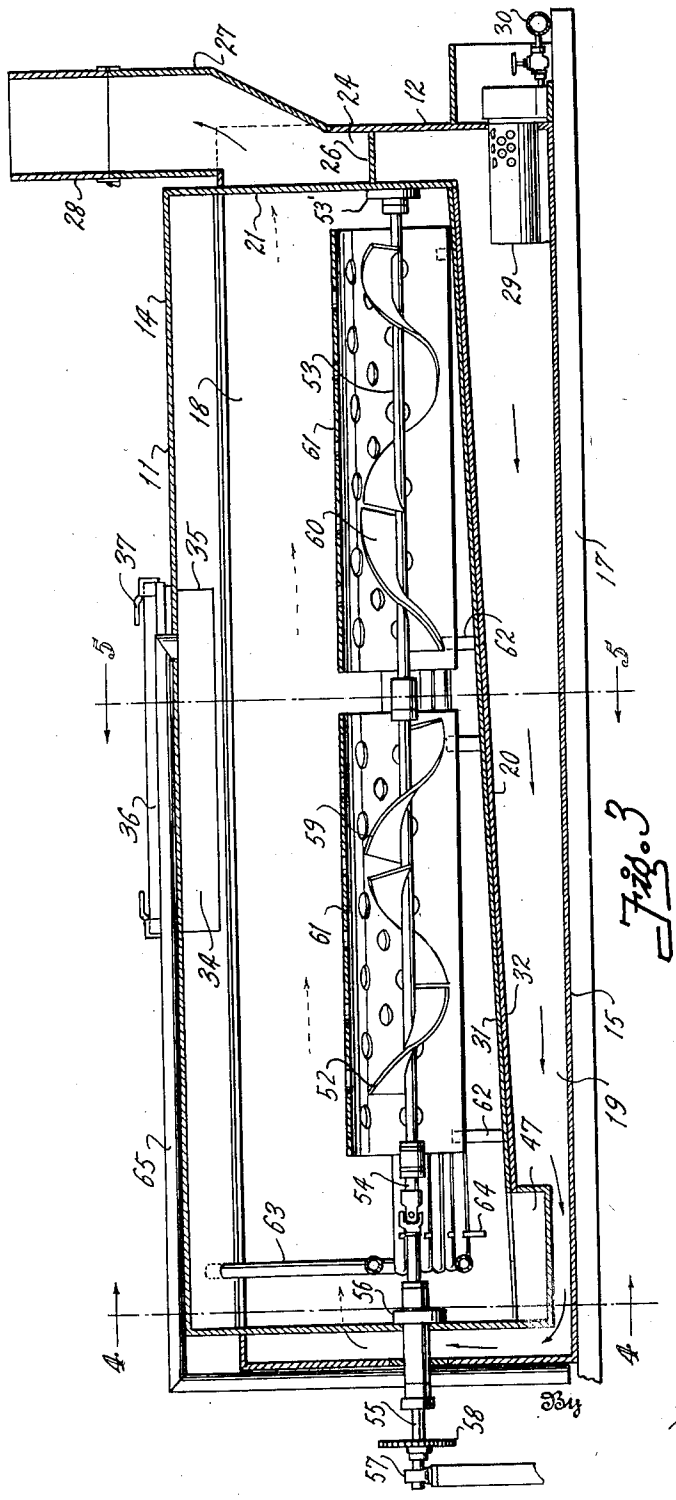


Fig. 3

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MIXING DEVICE

Filed April 19, 1948 4 Sheets-Sheet 3

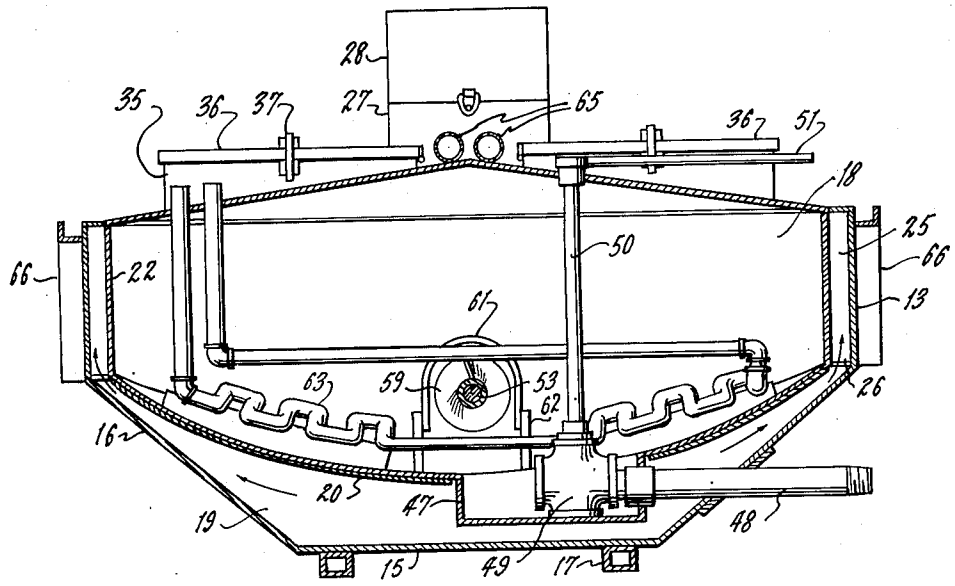


Fig. 4

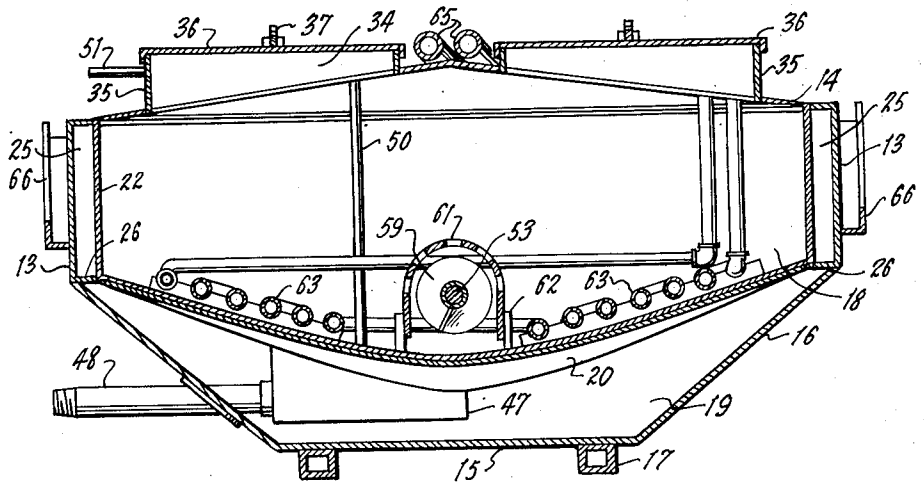


Fig. 5

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Filed April 19, 1948 4 Sheets-Sheet 4

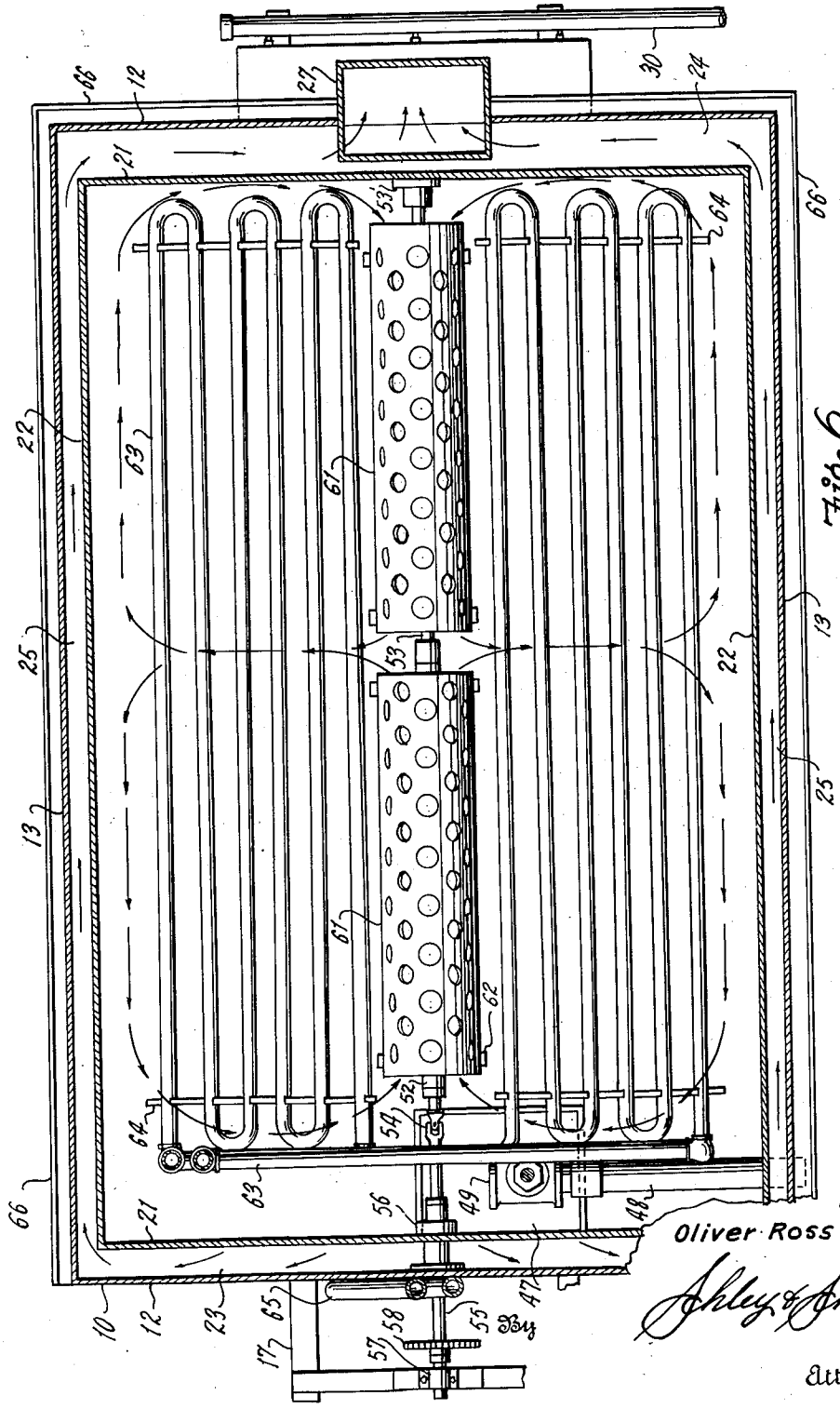


Fig. 6

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UNITED STATES PATENT OFFICE

2,565,826

MIXING DEVICE

Oliver Ross Smith, Fort Worth, Tex.

Application April 19, 1948, Serial No. 21,981

3 Claims. (Cl. 259—157)

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This invention relates to new and useful improvements in mixing devices.

One object of the invention is to provide an improved device for efficiently mixing paint, asphalt, pitch, tar, road oil or other materials and, if desired, for simultaneously heating the materials.

Another object of the invention is to provide an improved mixing device having novel agitating means in its mixing chamber which is arranged to set up currents in the material being mixed so as to circulate the same for obtaining even heat distribution and preventing charring or coking of said material.

An important object of the invention is to provide an improved mixing device having a double-bottomed mixing chamber to prevent coking of the material thereon, the plates of the bottom being secured to each other at spaced intervals to prevent undue separation of the same and a consequent heat loss.

A particular object of the invention is to provide an improving mixing device having its heating means arranged in such manner as to conduct the products of combustion beneath its mixing chamber in one direction and along the sides of the chamber in the opposite direction whereby a maximum heat transfer is had prior to the discharge of said combustion products.

Still another object of the invention is to provide an improved mixing device, of the character described, which is of such construction as to be capable of being mounted upon skids or a mobile vehicle so as to be readily portable.

A still further object of the invention is to provide an improved mixing device, of the character described, having auxiliary means in the lower portion of the mixing chamber for heating the material without coking thereof when the agitating means is not in operation.

A construction designed to carry out the invention will be hereinafter described together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, wherein an example of the invention is shown, and wherein:

Fig. 1 is a perspective view of a mixing device constructed in accordance with the invention,

Fig. 2 is a front end elevation, partly in section, of the device, the drip troughs being omitted,

Fig. 3 is a longitudinal, vertical, sectional view of the device,

Fig. 4 is a transverse, vertical, sectional view, taken on the line 4—4 of Fig. 3,

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Fig. 5 is a transverse, vertical, sectional view taken on the line 5—5 of Fig. 3, and

Fig. 6 is a detail view of the electrical loading element.

This application is filed as an improvement upon my copending application, Serial No. 741,191, filed April 14, 1947.

In the drawings, the numeral 10 designates an agitating or mixing device which includes an enclosed, substantially rectangular body or housing 11 having upright end walls 12 and side walls 13, a top 14 and a bottom 15. Upwardly and outwardly inclined walls 16 connect the side walls 13 to the bottom 15 which is of less width than the top 14 (Fig. 2). The housing 11 is mounted upon spaced, parallel beams or sills 17 which extend longitudinally beneath its bottom and preferably project beyond the ends thereof. Due to its construction, the housing may be placed upon skids or a mobile vehicle (not shown) so as to be readily portable.

An inner agitating vessel or mixing chamber 18, of less area or size than the housing, is disposed in said housing in spaced relation to the walls 12, 13 and 16 and the bottom 15 thereof, whereby a fire-box or combustion chamber 19 is formed between the mixing chamber and said housing bottom as well as said walls 16. The mixing chamber 18 has a forwardly and downwardly inclined bottom 20 (Fig. 3) which is curved or arced transversely (Figs. 4 and 5). Upright end walls 21 and side walls 22 extend between the bottom 20 and the housing top 14 in spaced, parallel relation to the housing walls 12 and 13, respectively, whereby flow spaces or passages 23, 24 and 25 are provided therebetween. These spaces serve as vertical and longitudinal flues and a horizontal partition or baffle 26 separates the rear, vertical flue 24 and the longitudinal flues 25 from the combustion chamber 19. Since the partition 26 terminates at the forward end of the mixing chamber 18, the front, vertical flue 23 establishes communication between the combustion chamber and the longitudinal flues which, in turn, discharge into the rear flue 24. An exhaust stack 27, having a hinged or downwardly-foldable, upper portion 28, extends from the rear flue 24 through the housing top and rear wall. Suitable burners 29 communicate with the rear portion of the combustion chamber and fuel is supplied thereto by a line 30. Obviously, the products of combustion or the heat from the burners 29 travels forwardly through the combustion chamber beneath the bottom of the mixing chamber, upwardly through the flue 23 and is returned along the side walls 22 through the

flues 25 to the flue 24 so as to be exhausted through the stack 27.

In order to prevent coking of the bottom 20, the same in preferably formed of a pair of coextensive plates 31 and 32 which are spot welded at spaced intervals. The lower or inner plate 32 is preferably formed of a metal having a higher coefficient of expansion than the upper or inner plate 31 and is subjected directly to the heat of the burners so as to expand or distort relative to said inner plate, thereby providing insulating spaces therebetween and indirect heating of said inner plate. This relative expansion or distortion of the outer plate is limited by the spot welds so as to restrict the space between the plates, whereby undue heat loss is obviated.

Access to the mixing chamber is obtained through a pair of substantially rectangular openings 34 which are formed in the medial portion of the housing top 14 in transverse alinement. Each opening 34 is surrounded by an upright flange 35 and is closed by a complementary hatch or lid 36. Suitable latches 37 are carried by each hatch 36 for fastening the same to the flange 35.

The mixing chamber bottom 20 has a sump 47 in its forward end portion, toward one side thereof, and a discharge pipe 48 extends from the sump through one of the inclined housing walls 16. A control valve 49 is mounted on the inner end of the pipe 48 and is adapted to be operated by a vertical stem or rod 50 which projects upwardly through the housing top 14. The rod 50 has a handle or lever 51 connected to its upper end. Due to the inclination of the chamber bottom, the material in the chamber drains toward the sump 47. An agitator 52 extends longitudinally of the mixing chamber and includes a shaft 53 having its rear end journaled in a bearing 53' mounted on the rear wall 21 of said chamber. The forward end of the shaft 53 is connected by a universal joint 54 to a drive shaft 55 extending through the forward end walls 21 and 12 of the chamber and housing, respectively, and journaled in a bearing 56 carried by said wall 21. A pillow block 57 supports the front end of the drive shaft 55 which has a drive sprocket 58 mounted thereon externally of the housing. As most clearly shown in Fig. 3, the agitator 52 has a sectional blade or a plurality of blades 59 mounted on the forward portion of its shaft 53 arranged in a continuous left-hand flight or spiral. A similar sectional blade or blades 60, arranged in a continuous right-hand flight or spiral, are carried by the rear portion of the agitator shaft, whereby the material in the chamber is caused to travel toward its center. Since the blades 59 and 60 are arranged in opposite spiral or helical paths, in effect, the same function as separate screw conveyors. For protecting the agitator blades and confining the conveying action of the same so as to cause circulation of the material in definite paths, a perforated or foraminous, semi-cylindrical hood or cover 61 overlies said blades and has depending supports or legs 62 for engaging the bottom 20. Thus, the hood 61 is spaced from the blades and is removable for cleaning purposes. Due to the perforations, there is no interference with the normal heat transfer and limited transverse movement of the material is permitted.

If desired, auxiliary heating means in the form of a steam coil 63 may extend throughout the lower portion of the mixing chamber on either side of the agitator. Suitable supports 64 rest on the chamber bottom for receiving and spacing the coil 63 from said bottom. The steam coil may be used to preheat and melt the material prior to operation of the agitator or may be used as the sole means of heat when high temperatures are not required. To prevent or control overflowing of the mixing chamber, a pair of vent pipes 65 extend through the medial portion of the housing top 14 between the openings 34 and their flanges 35, forwardly of said top and down the front housing wall 12. Inclined drip troughs 66 are carried by the rear and side walls of the housing to catch any material that overflows or is spilled.

In operation, the material to be mixed and/or reduced to a fluid condition is introduced into the mixing chamber through one of the access openings 34 in the top 14. Since the material is usually in solid form, it is necessary to cut or break the same into small chunks or pieces. As has been explained the material may be heated by the steam coil 63 or by the heat of the combustion chamber 19 and is circulated in the mixing chamber by the agitator 52. Manifestly, due to the left-hand spiral of the sectional blade 59 and the right-hand spiral of the sectional blade 60, the material in the ends of the mixing chamber is drawn toward the center thereof, and travels longitudinally of said blades within the hoods 61. Upon discharging from the inner ends of the blades, the material passes laterally toward the sides of the chamber and then longitudinally of said chamber toward the ends so as to be drawn into the outer ends of the hoods by said blades. Thus, the material is forced to travel through a plurality of oval paths as shown by the arrows in Fig. 6. The hoods facilitate this circulation by more sharply defining the paths thereof. Since the bottom 20 is inclined, material is constantly furnished to the sump 47 without interfering with the circulation of said material. Whenever desired, the mixed material may be discharged through the pipe 48 by swinging the lever 51 which opens the valve 49. Due to the provision of the drip troughs 66, the danger of burning workmen with spilled material is eliminated. Overflowing of the mixing chamber is prevented or controlled by the vent pipes 65. The construction of the mixing device is such that material may be maintained in condition for immediate use for a prolonged period of time and said device may be used indefinitely without cleaning since there is no coking of the material.

The foregoing description of the invention is explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction may be made, within the scope of the appended claims, without departing from the spirit of the invention.

What I claim and desire to secure by Letters Patent is:

1. A mixing device including, a housing, a mixing chamber in the housing having side and end walls, a combustion chamber in said housing beneath the mixing chamber, a rotatable agitator extending horizontally of the mixing chamber, the agitator including a pair of axially-alined spaced blades having oppositely directed helices for conducting the material being mixed in opposite directions, and a hood enclosing each blade and having open ends spaced from said end walls, the hoods being spaced from each other, each hood having openings intermediate their ends to permit limited transverse circulation of the material between the mixing chamber and agitator, whereby the material is drawn into one end of

each hood and forced out through the other end thereof to provide definite paths of circulation in said mixing chamber.

2. A mixing device as set forth in claim 1 wherein the helices of the blades are directed toward each other so that the agitator draws the material from the ends of the mixing chamber and forces the same to the center of said chamber.

3. A mixing device as set forth in claim 1 wherein said rotatable agitator is disposed centrally of the mixing chamber so as to be spaced from the side and end walls of said chamber.

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