May 24, 1927. 1,629,921

D. E. MANSFIELD

FURNACE FOR SUPPLYING DRYING GASES

Filed March 13 1926

Fig. 4

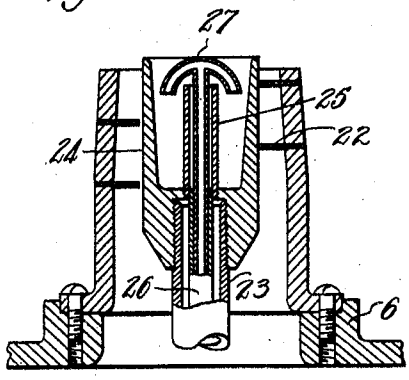
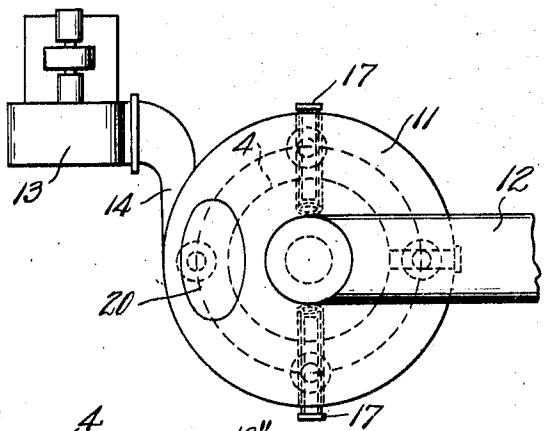


Fig. 3



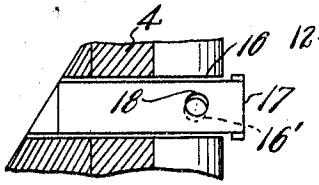


Fig. 1

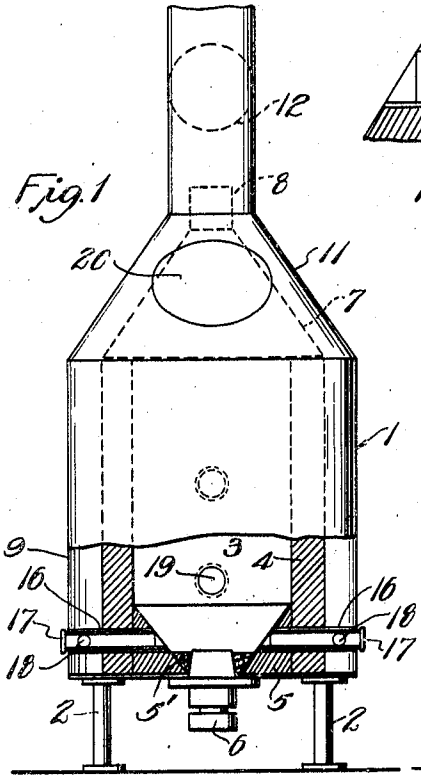


Fig. 5

Fig. 2

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UNITED STATES PATENT OFFICE.

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FURNACE FOR SUPPLYING DRYING GASES.

Application filed March 13, 1926. Serial No. 94,562.

This invention relates to a furnace for supplying drying gases, more particularly to one for supplying drying gases for the spray drying of rubber latex and similar materials.

Numerous types of furnaces have been used for furnishing the drying gases for spray driers, some of which operate by direct heating, others by indirect heating, and still others by a combination of the two methods. An example of a furnace using the combination of the two methods is that disclosed in patent to Bradley and Coffin, No. 1,466,443, issued August 28, 1923. This furnace has been found to be very efficient for use with relatively large spray drying units. However, there is a demand for a small unit for spray drying rubber latex, to be used on small plantations, and the above mentioned furnace by reason of its size and lack of portability is not so readily applicable for this purpose. In the drying of rubber latex it has been found that by the use of relatively high temperature gases economy in operation is secured and at the same time the dried rubber produced has its characteristics changed so that it can be more readily milled.

An object of my invention is to provide an improved furnace for supplying high temperature drying gases. Another object is to provide a furnace particularly adapted for vertical operation. Still another object is to provide a furnace in which the temperature and other characteristics of the drying gases may be easily controlled. A further object is to provide a furnace of the character specified which is simple, compact, portable, easily controlled, and economical to both build and operate.

Without intention to limit the invention otherwise than as is required by the prior art, it consists broadly in a combustion chamber provided with means for both directly and indirectly heating drying gases, which means at the same time functions to prevent heat losses from the furnace. It further consists in means by which equilibrium in pressure can be secured in the various parts of the furnace. It further consists in supplying under pressure the gases to be heated. It also consists in an improved form of burner for use in the furnace.

For a detailed disclosure of the nature and objects of the invention reference is had to the accompanying specification and drawing, in which latter:

Figure 1 is a side elevation, partly in section of the furnace,

Figure 2 is a transverse vertical section taken at right angles to the section in Figure 1,

Figure 3 is a top plan view of the furnace,

Figure 4 is a section of the burner nozzle, and

Fig. 5 is an enlarged detail of an air valve.

Referring to the drawing, the numeral 1 designates generally the furnace, which in the present instance is shown as vertically disposed, but it is obvious that it may be disposed at any desired angle from the vertical to horizontal. The furnace is supported on legs 2, and is provided with a combustion chamber 3, formed by the wall 4 of any suitable refractory material.

The lower portion of the furnace is partly closed by the refractory material 5, which latter is provided with a central opening in which is disposed a burner 6, the two completely closing the lower end of the furnace. Asbestos 5′ or other suitable material is disposed between the burner nozzle and refractory material 5 to protect the nozzle and assist in sealing the lower end of furnace. The burner may be of any suitable type, but is preferably a modified form of a centrifugal spray oil burner known to the trade as the Ray burner, to be later described. A dome 7 is provided at the upper end of the combustion chamber and connected to the dome is an exhaust pipe 8.

Surrounding the wall 4 is a casing or jacket 9 which is spaced from the wall to provide a chamber 10 through which the gases to be heated may circulate. By this construction the gases are not only partly heated but they also act as a heat insulator for the furnace. Extending from the upper end of the jacket 9 is a dome 11, to which is connected the exhaust pipe 12, and the exhaust pipe 8 of the combustion chamber opens into the pipe 12.

The pipe 12 is provided with a damper 12′ by means of which the combustion products from the furnace can be directed into a pipe 12″ opening to the outer air. In starting

up the furnace some smoke and soot are generated, and in the drying of some materials these may be injurious. However, by moving the damper 12′ to the position shown in dotted lines in Figure 2, the combustion products may be directed through pipe 12″ to the outer air until such time as the furnace is functioning properly, when the damper may then be shifted to the position shown in full lines in Figure 2 to allow the combustion products to pass through the pipe 12 to the drier.

A blower 13 is provided for supplying air or other gas under pressure, the outlet of the blower being connected to a pipe 14 which leads substantially tangentially into the lower portion of the jacket 9. Leading from the pipe 14 is a pipe 15 which is connected to the casing of the burner 6, the inflow of air to the burner being controlled by a valve 15′. The pipe 15 constitutes the sole supply means for furnishing air for combustion to the burner. Disposed in the lower portion of the furnace are horizontal cylindrical sleeves 16, opening through the jacket 9 at their outer ends and to the interior of the combustion chamber at their inner ends. Rotatably mounted in said sleeves are cylinder valves 17 which are closed at their outer ends and at their inner ends open into the combustion chamber adjacent the burner. The valves 17 are provided with ports 18 which are adapted to register with similar ports 16′ in the sleeves 16 opening into the space 10. In the present instance but two of the valves have been shown, but it is obvious that any desired number may be used. The furnace is provided with any desired number of peep holes 19 spaced along the length of the combustion chamber, in order that combustion conditions may be readily ascertained and controlled. The domes 7 and 11 are also provided with manholes 20.

Burners of the Ray type as supplied to the market can be operated only in a substantially horizontal position, and in order to adapt this burner for use with the improved furnace when disposed in a vertical position, the construction of the burner nozzle has been modified as shown in Figure 4. The nozzle 21 for supplying air for combustion is provided with spirally directed vanes 22 in order to impart a whirling movement to the air. A rotatable hollow shaft 23 is connected at its end to an oil discharge cup 24 provided centrally with an upward projecting sleeve 25. An oil supply pipe 26 extends through the hollow shaft 23 and up through the sleeve 25, terminating in the downwardly extending branches 27. In the present instance but two of these branches are shown, but it is obvious that any suitable number may be used. By the above construction, the oil discharged through the branches 27 falls to the bottom of the rotating cup 24 and is then carried by centrifugal action along the inclined side walls of the cup until it is discharged from the latter. The sleeve 25, secured to and rotating with the cup, prevents the escape of any oil through the bottom of the cup.

In operation the blower 13 and burner 6 are started, and the drying gas entering the jacket 9 through the pipe 14 flows through the jacket with a rotary movement, and during its travel it absorbs heat from the wall 4 and at the same time prevents heat losses from the furnace through radiation. The heated gas then passes up through the dome 11 and pipe 12 where it meets the high temperature combustion gases issuing from the pipe 8 and is mixed therewith. By suitably regulating the speed of the blower, the rotation of the burner, the oil supply, the supply of air through pipe 15 and the supply of air through valves 17, the temperature and other characteristics of the drying gases may be varied over a wide range with the greatest ease. In previous furnaces of the type described, it has been the custom to place the blower in the supply pipe to the drying unit, so that the drying gases are sucked through the furnace under reduced pressure and at the same time the combustion in the combustion chamber takes place at somewhat reduced pressure. Another difficulty caused by the location of the blower at this point was that the blower rapidly deteriorated by reason of the intense heat of the drying gases and the latter therefore could not be heated to the most efficient temperature. By placing the blower 13 in advance of the furnace the gases to be heated are supplied under pressure, and as the blower operates only with a cool gas, the temperature of the drying gases may be raised to any desired temperature. Owing to the drying gases passing through the jacket 9 under pressure, suction is caused at the outlet of the nozzle 8 so that combustion would ordinarily take place in the chamber 3 under reduced pressure. To obviate this, the burner 6 is entirely closed to the air at atmospheric pressure and is supplied only through the pipe 15, taking its air from the blower 13. In this way the pressure in the combustion chamber 3 and the jacket 9 can be equalized. As an additional means for equalizing the pressure the valves 17 are used, and by their rotation regulated quantities of air may be led from the lower portion of the jacket 9 into the combustion chamber adjacent the burner. The valves 17 are particularly useful in the case where for any reason it may be desired to keep up the pressure of the drying gases but at the same time to lower their temperature by a reduction of the supplies of oil and air to the burner 6.

While as before stated the furnace has

been particularly designed for vertical operation, it can be operated at any desired angle, and while it is particularly adapted for supplying a drying medium for the drying of rubber latex, it is equally well applicable for the drying of clay, sugar, starch and many other materials which can be dried by the use of a direct heated drying gas. A very high temperature of the drying gases can be obtained when desired and at the same time these gases can be supplied at a desired pressure without injury to the blowing apparatus. The furnace is of relatively large capacity in proportion to its size, it is portable, can be built and operated very economically, is easily controlled, and can be operated by relatively unskilled labor.

With the above detailed disclosure it is obvious that changes will suggest themselves to those skilled in the art, and it is not desired to limit the invention otherwise than as set forth in the appended claims.

Having thus described my invention what I claim and desire to protect by Letters Patent is:

1. A furnace for supplying drying gases comprising a combustion chamber, a gas heating jacket surrounding the same, a burner at one end of the combustion chamber, an exhaust passage directly communicating with both the combustion chamber and heating jacket, means for supplying gaseous fluid under pressure to the jacket, and means for equalizing pressure in the jacket and combustion chamber.

2. A furnace for supplying drying gases comprising a combustion chamber, a gas heating jacket surrounding the same, means for supplying a gaseous medium under pressure to said jacket, an exhaust passage communicating with the chamber and jacket, a fluid fuel burner at the end of said chamber opposite the exhaust passage, and regulable means for conducting gas under pressure from said supply means directly to the combustion chamber.

3. A furnace for supplying drying gases comprising a combustion chamber, an insulating and air heating jacket surrounding the same, means for supplying air under pressure to said jacket, a common exhaust passage leading directly from both the combustion chamber and jacket, a fluid fuel burner operatively connected to said combustion chamber, and regulable means for equalizing pressure in the combustion chamber and jacket by supplying air from the air supply means to both the interior and exterior of the burner.

4. A furnace for supplying drying gases comprising a combustion chamber, an insulating and air heating jacket surrounding the same, means for supplying air under pressure to said jacket, a common exhaust passage leading directly from both said combustion chamber and jacket, a burner operatively connected to the combustion chamber, and regulable means for equalizing pressure in the combustion chamber and jacket by supplying air from the air supply means to both the burner and the combustion chamber.

5. A furnace for supplying drying gases comprising a vertical combustion chamber, an insulating and air heating jacket surrounding the same, a pressure blower connected to said jacket, a common exhaust passage from the combustion chamber and jacket, a fluid fuel burner at the end of the combustion chamber opposite the exhaust passage, regulable means for supplying air from the blower to the burner, and regulable means for supplying air from the jacket to the combustion chamber.

6. A furnace for supplying drying gases comprising a combustion chamber, an insulating and air heating jacket surrounding the same, a burner operatively connected to the combustion chamber, a conduit for air under pressure tangentially connected to the jacket, a common exhaust passage from the chamber and jacket, and means for equalizing pressure in the chamber and jacket.

7. A furnace for supplying drying gases comprising a combustion chamber, an insulating and air heating jacket surrounding the same, a burner operatively connected to the combustion chamber, a conduit for air under pressure tangentially connected to the jacket at the end adjacent the burner, a common exhaust passage from the chamber and jacket, means for supplying air to the burner from said conduit, and means for supplying air to the combustion chamber from the jacket.

8. A furnace for supplying drying gases comprising a vertical combustion chamber, an insulating and air heating jacket surrounding the same, a burner operatively connected to the combustion chamber, a conduit for air under pressure tangentially connected to the jacket at the end adjacent the burner, a common exhaust passage from the chamber and jacket, means for supplying air to the burner from said conduit, and regulable means for supplying air to the combustion chamber from the jacket.

9. A furnace for supplying drying gases comprising a vertical combustion chamber, an insulating and air heating jacket surrounding the same, a burner closed to atmospheric air and connected to said combustion chamber, a conduit for air under pressure tangentially connected to said jacket at the end adjacent the burner, an air supply pipe leading from said conduit to the burner, regulable means for supplying air from the jacket to the combustion chamber, and a common exhaust passage from the chamber and jacket.

10. A furnace for supplying high temperature drying gases comprising a vertical combustion chamber, an air heating chamber surrounding the same, means for supplying air under pressure to the air heating chamber, a common exhaust pipe communicating with the air heating chamber and combustion chamber, a branch leading from said pipe to the atmosphere, and a damper for at will directing the exhaust either to said branch pipe or to a drying apparatus.

Signed at New York, county of New York, and State of New York, this 6th day of March, 1926.

DANIEL E. MANSFIELD.