May 31, 1932. W. A. HARTY ET AL 1,860,738

ROTARY DRIER

Original Filed April 23, 1928

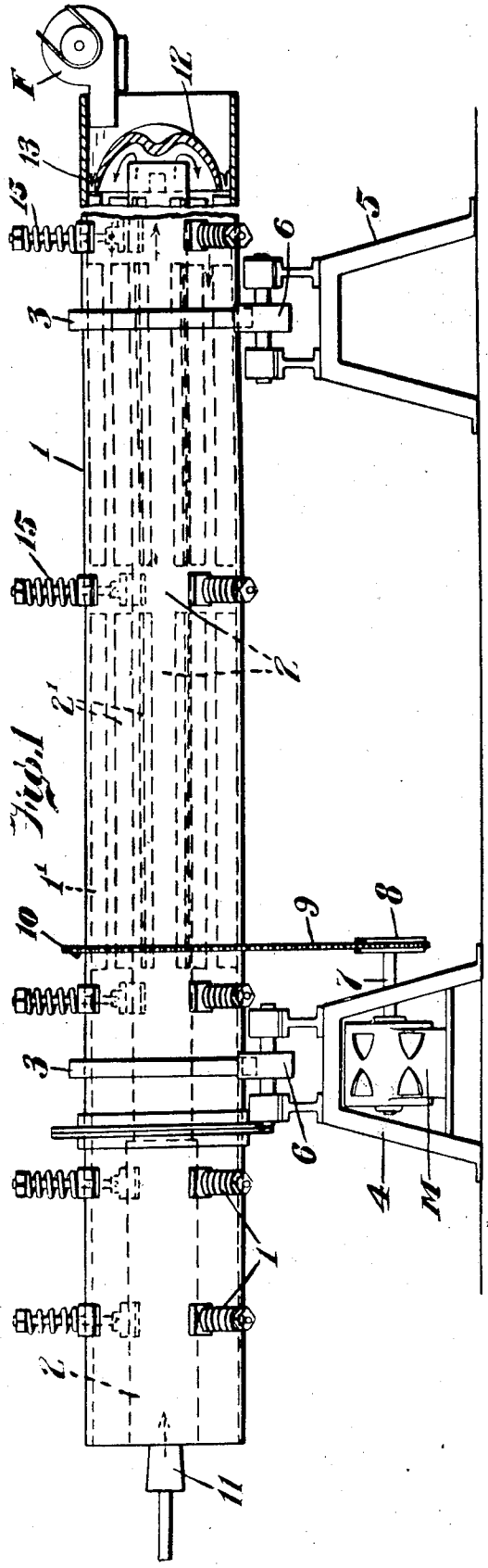


Fig. 1

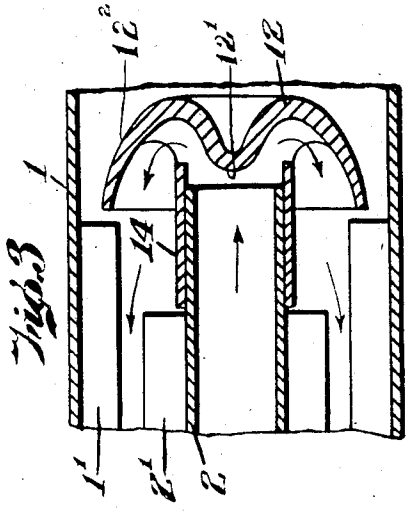


Fig. 3

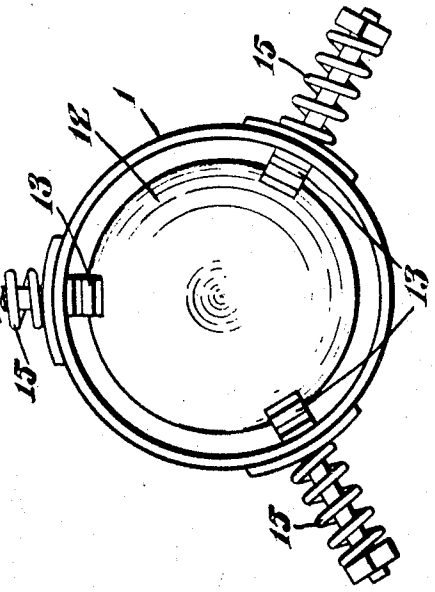


Fig. 2

Inventors
William H. Harty
Frank W. Moore
Ellis Spear Jr.
By Attorney

Patented May 31, 1932 1,860,738

UNITED STATES PATENT OFFICE

WILLIAM A. HARTY, OF BUFFALO, NEW YORK, AND FRANK W. MOORE, OF THOROLD, ONTARIO, CANADA, ASSIGNORS, BY MESNE ASSIGNMENTS, TO THE W. S. TYLER COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO

ROTARY DRIER

Application filed April 23, 1928, Serial No. 272,269. Renewed June 1, 1931.

This invention relates to rotary driers of the hot mandrel type such as is illustrated in our prior patents Reissue #16,265 of February 6, 1926, and #1,587,727 of June 8, 1926, and is in part a division of our prior application Serial No. 228,212, being particularly directed to the heat return deflector or baffle which may be provided as an attachment for our driers and which utilizes the exhaust heat from the hot core or mandrel to increase the operating efficiency of the drier by returning the heat bearing gases back through the drier thereby not only augmenting the drying action but carrying off the vapors created by the more or less wet material placed in the drier at the intake end thereof.

The construction and operation of our drier is described and illustrated in the accompanying specification and drawings, and the characteristic features of novelty are particularly pointed out in the appended claims. In the drawings:

Fig. 1 is a side elevation, partly in section, of a drier assembly in accordance with our general type and equipped with the device of the present invention.

Fig. 2 is an end view of the drier shell as seen from the right of Fig. 1, the blower fan being omitted, and

Fig. 3 in a fragmentary section showing a modified form of heat return deflector or baffle.

We have indicated at 1 the rotary shell and at 2 the internal hollow core or hot mandrel which rotates with said shell and which is characteristic of our drier.

The mandrel preferably extends the full length of the shell and both shell and mandrel may be in sections for convenience of shipment or replacement of parts.

In order to keep the material in its travel in direct contact with the hot surface of the mandrel, the mandrel is provided with longitudinally extending heat-radiating ribs 2′, and the shell is provided interiorly thereof with a plurality of lifting flanges 1′ which lift the material being dried and cascade it onto the hot mandrel.

As in our said prior application, the shell sections are provided with circumferential tires 3 running on suitable rollers on the supports for the drier. If the metal supporting bases 4 and 5 shown in these drawings are used as supports for the shell, the tires run on a pair of spaced vertically disposed rollers 6 mounted on the base frames. These rollers may conveniently serve as ground wheels when the bases are up-ended and used as wheeled trucks for moving the bases from place to place.

The drier shell may be rotated from any suitable power source. Where a base such as the base 4 is used, the shell is directly driven from an electric motor M mounted on said base. The motor shaft 7 carries a sprocket 8, which through chain 9 drives a sprocket 10 on one of the shell sections.

As in our said prior application the mandrel sections telescopically fit one within the other and are suspended within the shell by means of a plurality of spring suspension members 15 which are specially designed to overcome the effects of expansion and contraction.

The drier may be heated in any suitable manner as by oil, gas, steam or powdered fuel. We have shown it as oil fired in these drawings by means of the burner nozzle 11 discharging directly into the firing end of the mandrel.

As contemplated herein, the exhaust heat from the mandrel is returned through the space between the mandrel and shell with a resultant increase of drying efficiency. The exhaust heat returned also serves to carry off, at the firing or intake end of the drier, any vapors given off by the more or less wet material being fed into the drier at said intake end. To accomplish this result we mount, preferably detachably, over the ex-

haust end of the mandrel a baffle or deflector 12 which as shown in Figs. 1 and 2 consists of a member having a central forwardly directed curved or pointed portion 12′ alined with the mandrel and against which the exhaust heat from the mandrel discharges and by reason of which eddy currents are reduced, and an enclosing reversely curved portion 12² substantially spanning the space between the mandrel and outer shell and by means of which such exhaust heat is returned back through the space between the mandrel and shell towards the firing end of the drier. This return may be assisted, if desired, by the blower fan F, which is mounted at this end of the shell. It will be noted that projecting the flame into the central tube which serves as a combustion chamber as shown in Fig. 1 of our drawings creates a pressure in the gases contained within this tube. These gases then travel down the central tube to the heat deflecting baffle where their direction of flow is sharply reversed. The centrifugal force involved by this sharp turn causes the gases to hang to the inside curved surface of the deflecting baffle, thereby constricting the effective area through which they pass and forming a jet of swiftly moving gases across the annular space between the lip of the deflecting baffle and the outer shell, striking the outer shell at such an angle that they rebound towards the firing end of the drier. The formation of this jet results in a change in the pressure conditions existing in the gases, the static pressure which was in the central tube being converted into velocity pressure, and as the gases pass on back between the inner and outer shells they again slow down, re-converting the velocity pressure generated at the time of reversal of flow into static pressure. This allows the material which has been dried to flow out through the annular orifice between the heat deflector and the outer shell without allowing the gases from within the inner shell to escape at this point in any substantial amount, as the only available outlet at this end of the drier is sealed by said jet, as described above. This obviates the necessity of using any form of mechanical air lock. Also, it is clear that by means of the action of our baffle the static pressure within the inner shell is passed on to the annular space between the two shells. This establishes a positive flow of those gases to any point of exit that may be provided for them and, as our drawings show, such an exit is provided at the feed end of the drier. The flow thus set up clears the drying chamber of the products of evaporation and causes the hot gases to flow back through and in direct contact with the material which is drying.

The baffle 12 in Figs. 1 and 2 may be mounted over the exhaust end of the mandrel in any suitable manner, as by means of the three point suspension clips 13 shown in these figures, and when so applied its action is to reverse the direction of flow of the heat as indicated diagrammatically by the arrows in Fig. 1. As a modification we may mount the baffle 12 as shown in Fig. 3 wherein the baffle is provided with a collar 14 which is sleeved about the exhaust end of the mandrel.

Various other modifications in design and method of mounting the baffle may obviously be resorted to if within the spirit and scope of our invention as defined by the appended claims.

What we therefore claim and desire to secure by Letters Patent is:

1. A drier comprising spaced inner and outer shells both continuously open from end to end, means for projecting drying heat into one end of said inner shell, and a baffle spaced from the exhaust end of said inner shell and substantially spanning the space between said shells for returning substantially all of the hot gases discharging from the inner shell in counter-current relation through the space between said shells and over the material therein to be dried, said baffle formed to present a forwardly directed central portion alined with the inner shell and an enclosing heat return portion.

2. A drier comprising spaced inner and outer shells forming two chambers, one of which is a drying chamber and the other of which is a combustion chamber, each end of said drying chamber being open and offering substantially unobstructed passageways for the material to enter and leave the drying chamber, means for forcing a combustible mixture into said combustion chamber, and means at one end of said combustion chamber substantially spanning the end of the drying chamber for directing gases flowing from said combustion chamber toward the end of the drying chamber at which said combustible mixture is introduced into the combustion chamber.

3. A drier as claimed in claim 2 wherein the inner shell constitutes the combustion chamber and the space between the inner and outer shells constitutes the drying chamber.

4. A drier as claimed in claim 2 wherein the gas deflecting means is a baffle of mushroom shape set at the discharge end of said inner shell with the stem thereof pointing into said open end of said shell along the axis of said shell.

5. A drier of the class described, comprising in combination, an outer material confining shell, an inner heating gas conveying shell spaced from said outer shell and open at its exhaust end, means for projecting a heating medium into said inner shell, and a baffle member disposed across the open

exhaust end of said inner shell, of such a diameter as to substantially span the outer shell and provided with an axially directed outer peripheral portion extending toward the opposite end of said inner shell.

In testimony whereof we affix our signatures.

WILLIAM A. HARTY.
FRANK W. MOORE.