June 16, 1931. W. A. HARTY ET AL 1,810,476

ROTARY DRIER

Filed Dec. 15, 1928 2 Sheets-Sheet 1

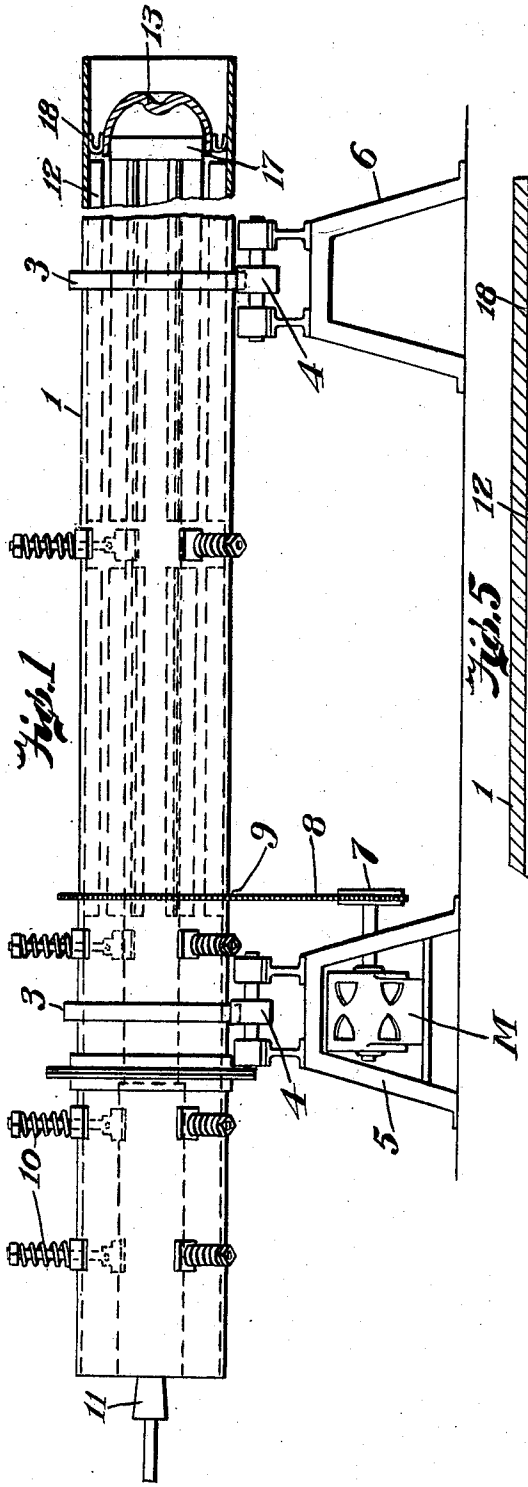



Fig. 1

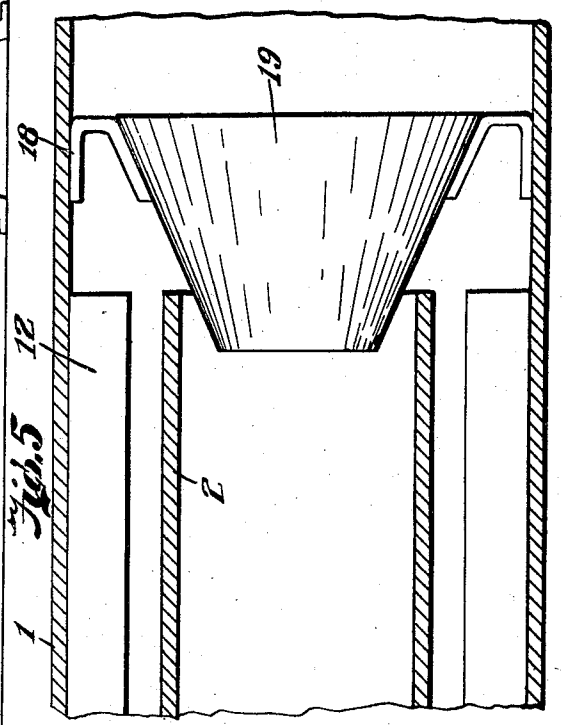



Fig. 5

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

June 16, 1931. W. A. HARTY ET AL 1,810,476

ROTARY DRIER

Filed Dec. 15, 1928 2 Sheets-Sheet 2

Fig. 2

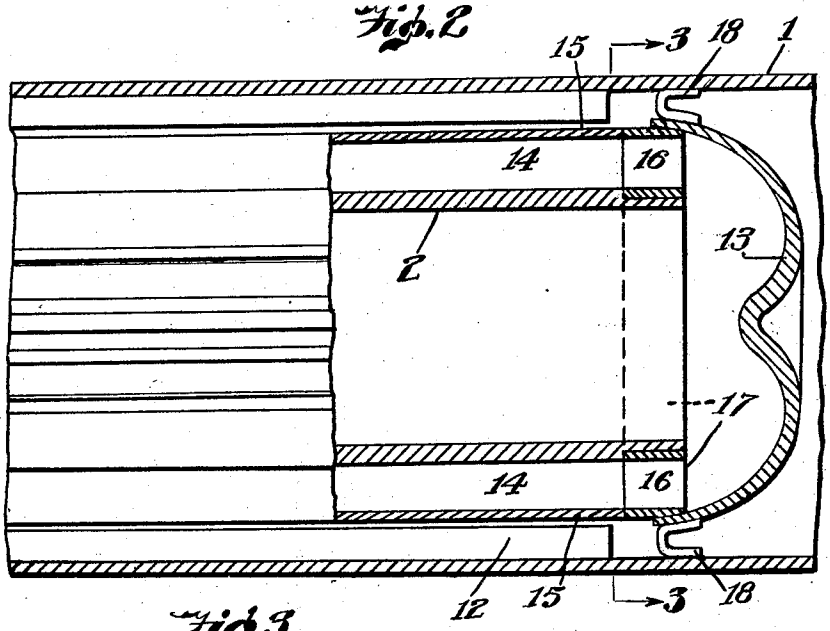



Fig. 3

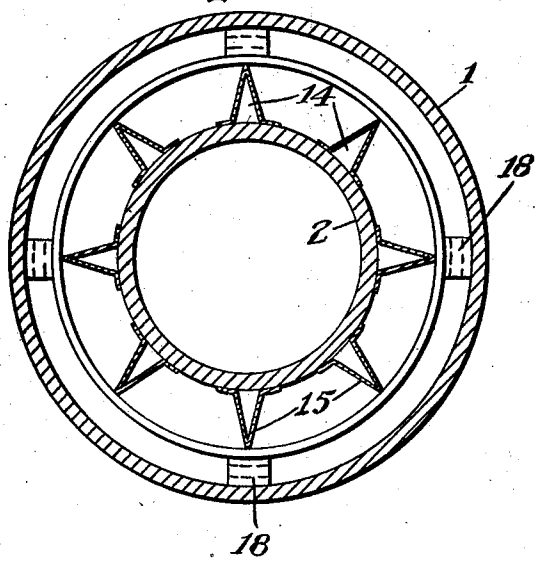
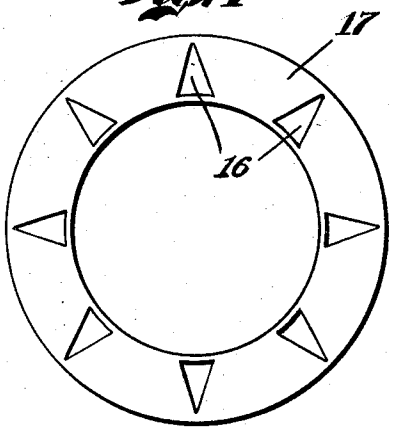



Fig. 4




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

Patented June 16, 1931 1,810,476

# UNITED STATES PATENT OFFICE

WILLIAM A. HARTY, OF BUFFALO, NEW YORK, AND FRANK W. MOORE, OF THOROLD, ONTARIO, CANADA, ASSIGNORS TO HARMOR & CO. INC., OF BUFFALO, NEW YORK, A CORPORATION OF NEW YORK

## ROTARY DRIER

Application filed December 15, 1928. Serial No. 326,253.

In our present invention we show further improvements upon and refinements over the rotary drier patented to us under Reissue No. 16,265 granted February 6, 1926.

In general, such improvements involve a more complete utilization of the drying heat to the end that the efficiency of the drier may thereby be increased.

To this end, our invention consists in the novel construction, combination and relation of parts described and illustrated in the accompanying specification and drawings and particularly pointed out in the appended claims.

In the drawings:—

Fig. 1 is an elevation, partly in section, of a rotary drier of the type disclosed in our said reissue patent and embodying the features of our present invention.

Fig. 2 is a partial longitudinal section at the exhaust end of the hot core or mandrel.

Fig. 3 is an enlarged cross section on the line 3—3, of Fig. 2.

Fig. 4 is a detail view of the collar shown in Fig. 3, and

Fig. 5 is a fragmentary section showing a modification.

As in our patented drier we provide an external rotary shell 1 and an internal hollow core or hot mandrel 2 which rotates with said shell and preferably extends the full length thereof. For convenience of shipment or replacement of parts, the shell and mandrel may be made in sections, the shell sections being provided with circumferential tires 3 running on suitable rollers 4 carried by supporting bases 5 and 6.

The shell may be rotated from any suitable power source. Where a base such as the portable bases 5 and 6 is used, the shell is directly driven from an electric motor M mounted on the base 5 through a sprocket 7, chain 8 and sprocket 9 on one of the shell sections.

The mandrel sections are suspended within the shell by means of a plurality of spring suspension members 10 which are especially 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. As here shown it is heated by means of a burner nozzle 11 discharging directly into the firing end of the mandrel. The shell is provided interiorly thereof with a plurality of lifting flanges 12 which lift the material being dried and cascade it on to the hot mandrel.

In order more completely to utilize the drying heat we provide at the exhaust end of the mandrel a deflector 13, Figs. 1 to 4, which returns the hot gases discharging from the discharge end of the mandrel back along the mandrel itself. For the purpose of maintaining the contact of the hot gases returned by such deflector with the exterior surface of the mandrel itself rather than allowing them to be dissipated through the shell of the drier, as well as preventing contamination of the material by such return heat, we provide the mandrel with an external series of longitudinally extending return heat channels 14. These may conveniently be constituted by a series of spaced longitudinally extending hollow ribs 15 welded or otherwise permanently secured to the mandrel itself. In addition to their function as heat conducting passages the hollow ribs 15 serve to keep the material in contact with the hot mandrel and to transmit the heat into and through the material as it travels therealong.

At the exhaust end of the mandrel, the hollow ribs 15 register with openings 16 in a collar 17 which is slipped endwise over the mandrel and rotates therewith. The openings 16 correspond in shape to the shape of the ribs and the ribs are received therein. By this construction the return heat deflected by the baffle 13 is positively directed into the channels 14 of the mandrel.

The deflector is mounted across the exhaust end of the mandrel in any convenient manner, as by providing the drier shell with an internal series of clips 18.

We thus return a substantial portion of the hot gases discharging from the exhaust end of the mandrel directly along the outer surface of the mandrel itself. In this way we secure a concentration of the hot gases along the mandrel and reduce dissipation of the heat by radiation through the shell of the

drier as would be the case where the exhaust heat was simply returned through the open drying chamber defined by the shell and mandrel.

The action of the deflector moreover is to some extent to retard the discharge of the hot gases from the mandrel thus increasing the internal temperature of the mandrel itself by this partial baffling or restriction of the free discharge thereof.

Where an even more pronounced heat retarding effect is desired, without regard to the heat return feature exteriorly of the mandrel, we may provide the plug 19 (Fig. 5) at the discharge end of the mandrel. This plug acts to cause a substantial portion of the hot gases to be backed up within the mandrel and thus increase the temperature thereof. Obviously, however, such retardation may be effected by other means, as by constricting the discharge end of the mandrel or by providing the mandrel with an internal series of baffles which will retard the discharge of hot gases by compelling them to follow a tortuous path.

Various modifications in the operation and construction of our device may obviously be resorted to if within the spirit and scope of our invention without departing from the limits of the appended claims.

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

1. In a heat exchanger, a hot mandrel and a shell spaced therefrom and rotating therewith, having an external series of longitudinally extending return heat channels, and a return heat deflector mounted over the exhaust end of the mandrel in spaced relation thereto for returning a substantial portion of the hot gases discharging from the mandrel into and along said return heat channels.

2. In a heat exchanger, a hot mandrel and a shell spaced therefrom and rotating therewith, having an external series of spaced hollow ribs constituting longitudinally extending return heat channels, and a return heat deflector mounted over the exhaust end of the mandrel in spaced relation thereto for returning a substantial portion of the hot gases discharging from the mandrel into and along said return heat channels.

3. In a heat exchanger a rotary shell and a central heating tube extending therethrough and rotating therewith, said tube having an external series of longitudinally extending return heat channels, and a baffle plate suspended within the drier over the exhaust end of the tube and effective to return a substantial portion of the hot gases discharging from the tube into and along said heat return channels.

4. In a heat exchanger a rotary shell and a central heating tube extending therethrough and rotating therewith, an external series of hollow ribs on said tube constituting longitudinally extending return heat channels, and a circular baffle plate suspended within the drier over the exhaust end of the tube and effective to return a substantial portion of the hot gases discharging from the tube into and along said heat return channels.

5. In a heat exchanger a rotary shell and a central heating tube extending therethrough and rotating therewith, a collar sleeved about the exhaust end of said tube and having a series of heat passage openings, said tube having an external series of longitudinally extending return heat channels registering with said openings of said collar, and a baffle plate suspended within the drier over the exhaust end of the tube and effective to return a substantial portion of the hot gases discharging from the tube into and through said heat return channels.

6. In a heat exchanger, a rotary shell and a central heating tube extending therethrough and rotating therewith, and spaced therefrom, a means interposed in the space between the shell and the tube and constituting a series of longitudinally extending return heat channels, and a return heat deflector mounted over the exhaust end of said tube in spaced relation thereto for returning a substantial portion of the hot gases discharging from the tube into and along said return heat channels.

In testimony whereof we affix our signatures.

WILLIAM A. HARTY.
FRANK W. MOORE.