G. H. FRASER.

DRIER, COOLER, AND SIMILAR DEVICE.

APPLICATION FILED APR. 27, 1915. RENEWED JULY 29, 1920.

1,378,407. **Patented May 17, 1921.**

3 SHEETS—SHEET 1.

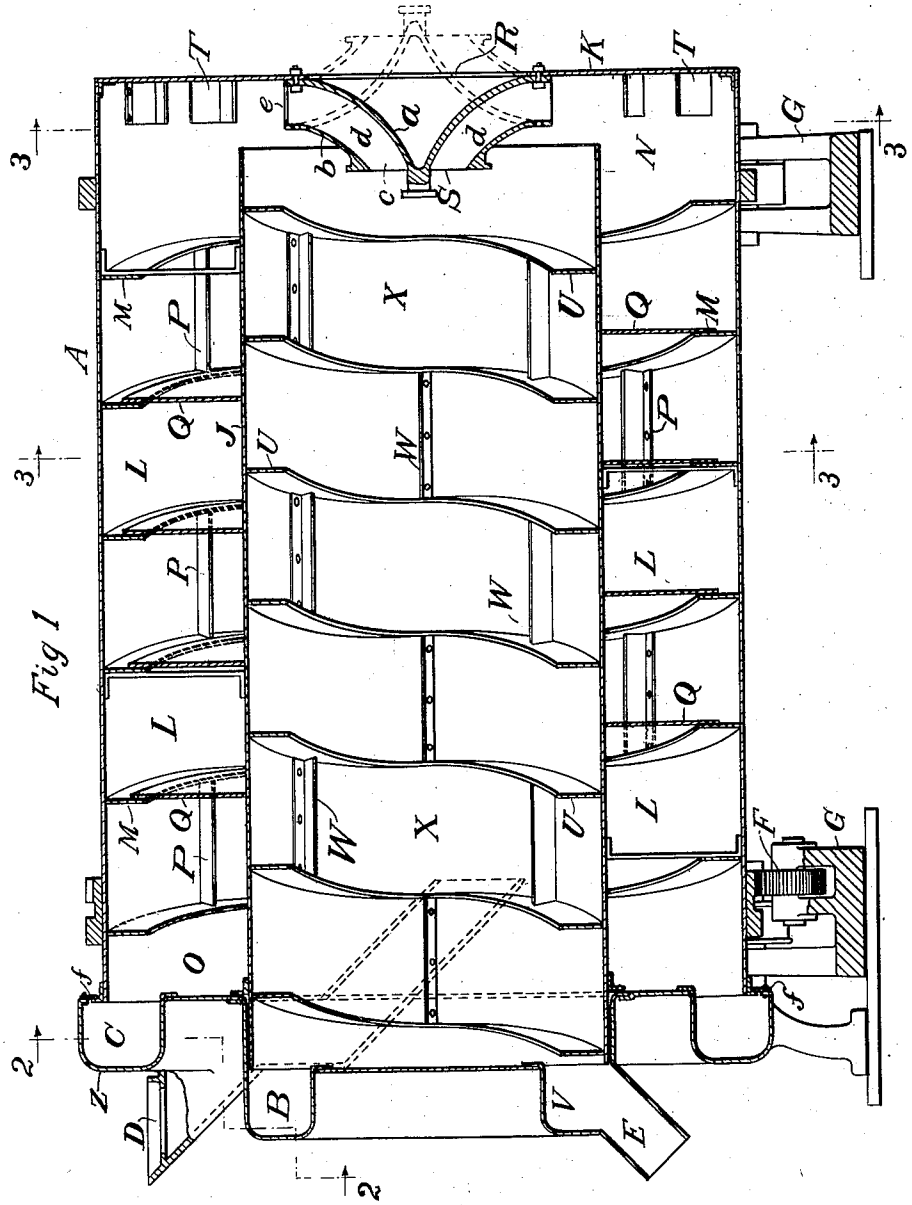


Fig 1

INVENTOR

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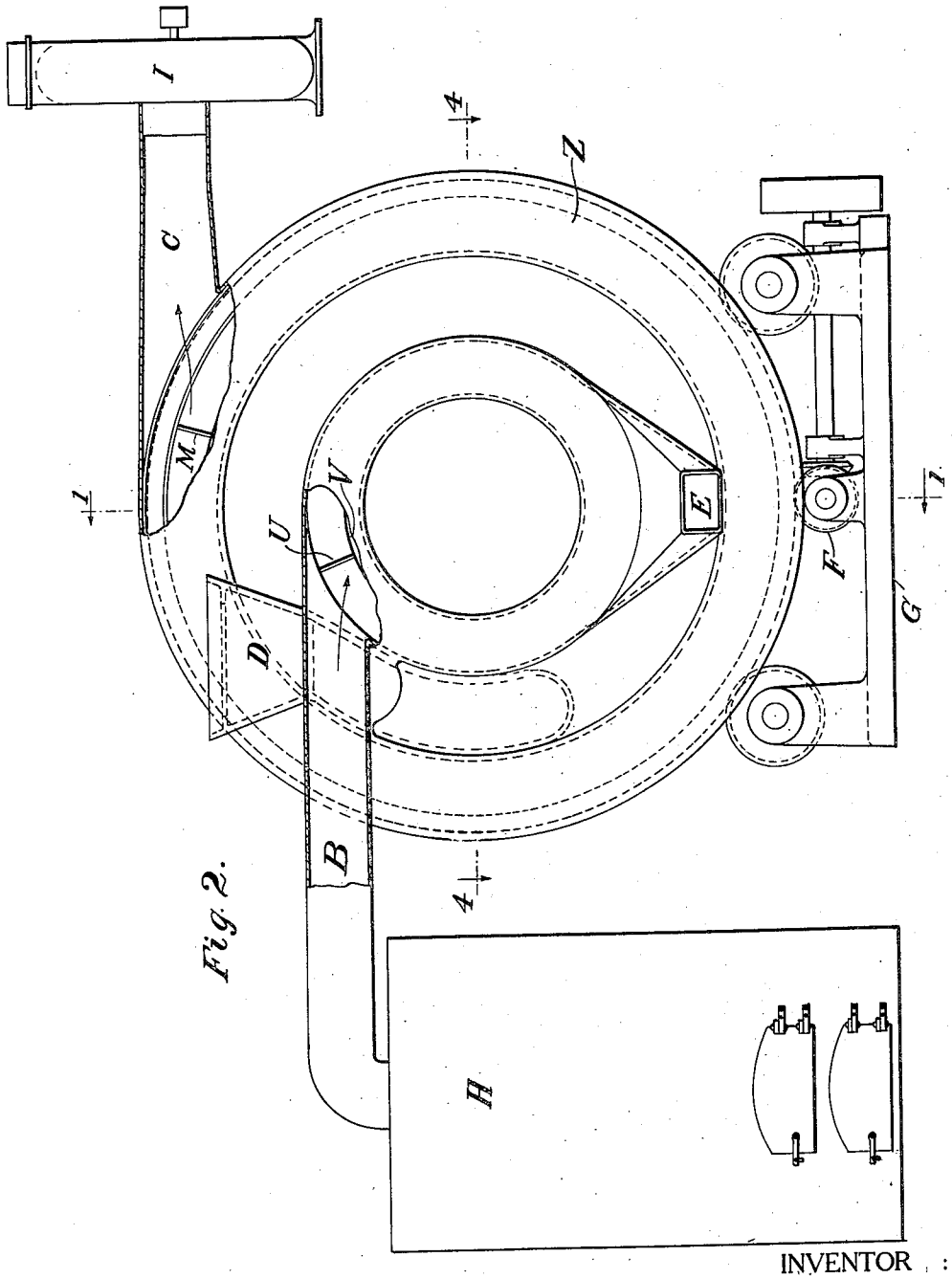


Fig. 2.

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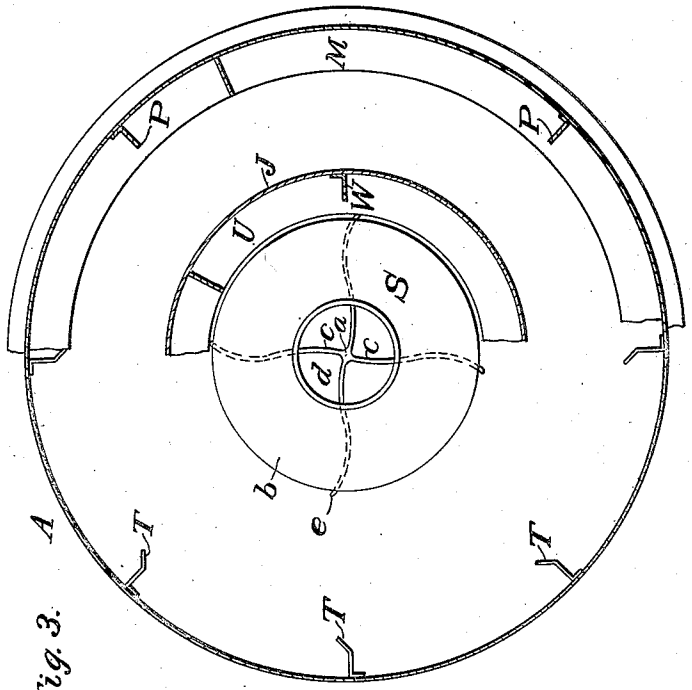


Fig. 3.

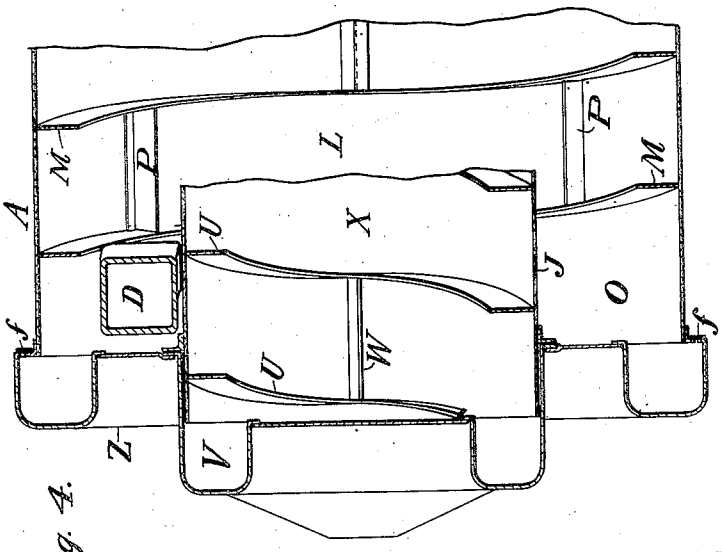


Fig. 4.

INVENTOR :

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UNITED STATES PATENT OFFICE.

GEORGE HOLT FRASER, OF BROOKLYN, NEW YORK.

DRIER, COOLER, AND SIMILAR DEVICE.

1,378,407. Specification of Letters Patent. Patented May 17, 1921.

Application filed April 27, 1915, Serial No. 24,221. Renewed July 29, 1920. Serial No. 399,891.

To all whom it may concern:

Be it known that I, GEORGE HOLT FRASER, a citizen of the United States, residing at No. 226 Quincy street, in the borough of Brooklyn, county of Kings, city and State of New York, have invented certain new and useful Improvements in Driers, Coolers, and Similar Devices, of which the following is a specification.

This invention relates to driers, coolers and the like, and aims to provide certain improvements therein.

Heretofore driers of the revolving drum type have been constructed with a horizontally disposed revolving shell receiving feed at one end and discharging it at the other, an internal tube or flue connected with the furnace and conducting the hot current through the shell to near the discharge end thereof, where the current could flow from the flue into the shell and be drawn to and out of the other end of the latter by the exhaust fan, so that the current would travel in reverse direction to the travel of material being treated. Vanes in the shell have lifted the material and dropped it through the current, and the shell has usually been inclined to cause the material to progress toward the discharge end.

My present invention aims to provide improvements especially applicable to revolving shell driers or coolers and by which these may be made more compact and efficient than heretofore.

To this end in carrying out the preferred embodiment of my present improvements as applied to a revolving shell drier or cooler, I provide means for causing the current to travel in a circular or spiral path so that it may act centrifugally outwardly against the interior of the shell and preferably progress in a direction reverse to that of the travel of the material being treated, and I provide means for utilizing this current in both its ingress and egress through the apparatus; I provide means for causing the material under treatment to travel longitudinally of the shell in one direction and then reversely so that it enters and discharges at the same end and is subject to treatment throughout its transit, whereby the desired travel can be attained with a comparatively short shell, and I provide tangential current entering and exhaust provisions, and improved feeding, progressing and discharge means, and certain other features of improvement, all of which will be hereinafter more fully set forth.

In the accompanying drawings which illustrate the preferred form of my invention as applied to a revolving shell drier,

Figure 1 is a vertical axial section of a revolving drum drier;

Fig. 2 is a front elevation thereof, partly in vertical section on the line 2—2 of Fig. 1.

Fig. 3 is a vertical cross section thereof cut on the planes of the line 3—3 of Fig. 1, and Fig. 4 is a fragmentary horizontal axial section.

Referring to the drawings let A represent the shell or drum of a revolving drier, B an inlet flue for supplying current thereto, C an outlet or exhaust flue thereof, D a feed inlet or chute for material to be treated, E a discharge or outlet spout for removing treated material, F the driving mechanism for revolving the drum, and G the main frame or casing for supporting these parts.

These parts may be of any usual or suitable construction adapted to suit the functions of the apparatus. If the machine is used as a clinker cooler the inlet flue will be opened to the air to permit an inflowing current of cool air. If other fluid current is to be utilized this flue will be connected with a suitable source of supply thereof.

As shown the flue is connected with a furnace H for supplying a hot gaseous current.

Suitable means for causing the desired flow of fluid current are provided according to requirements, such as a pressure blower, a natural draft, or an exhaust fan, the latter being preferable for the construction shown, wherein the exhaust flue C is shown as connected to the suction inlet of a blower I.

The inner tube or flue J affords a passage from the inlet flue B to the rear end K of the shell A so that the current entering will traverse centrally of the shell to its inner end and then flow around the end of the flue J and travel reversely of the shell A to its outlet end where the current will escape through the outlet flue C.

According to one feature of improvement I cause the fluid current to revolve in the shell A and preferably follow a sinuous or spiral path therein from the inner to the outer end of the shell so that the current tends under centrifugal force to impinge against the inner wall of the shell and any material carried therein, and its path

of travel is relatively long, according to the pitch of its spiral progression through the shell. This is preferably accomplished by introducing the fluid current tangentially or in a revolving or whirling stream at one end of the shell and extracting it therefrom preferably also tangentially or centrifugally at the same end thereof. I prefer to construct the interior of the shell with spiral grooves, paths or conduits L, and intermediate radially disposed spiral or screw like partitions M for affording a path for the fluid current and controlling its direction and course through the shell, these partitions terminating near the inner and outer edges of the shell so as to leave annular entrance and exit spaces or chambers N and O in which the whirling of the current may take place at the extremities of the spiral passageway L.

According to another feature of improvement the material to be treated is introduced through the spout D at the side of the drum and deposited in the spiral passageway L so that it will be caught by the partitions M, which serve as inclined progressing means for the material, which is thereby screwed toward the inner end of the drum as the latter revolves, so that the material will progress in opposition to the fluid current and be subject to the centrifugal action therethrough until it is fed to the chamber N at the other end of the drum. To agitate and facilitate progress of the material I prefer to place additional progressing means having their edges inclined relatively to the spiral of the partitions and preferably comprising axially extending short elevating vanes or shelves P in the path L which will raise the material and drop it through the current, and where the current is to be confined exclusively to spiral flow through the drum I prefer to form the partitions M with removable extensions Q forming a closed passage within the drum so that the fluid cannot flow directly axially thereof, if these auxiliary partitions fill the annular space between the short partition M and the concentric pipe or flue J as shown.

When the inner end of the drum A is used as the discharge end the treated material will be removed therefrom in any usual way, but one feature of my improvement comprises closing this end and reversing the flow of material and causing it to again traverse longitudinally of the drum and removing it from the front end thereof. This, I preferably accomplish by closing the usual outlet hole R and providing a lifting unloader preferably comprising a conical or inclined re-feeder or deflector S, and collectors and elevators T at the inner end of the drum which will pick up the treated material reaching this end and raise it and drop it on to the re-feeder S which will direct it forwardly into the open end of the central flue J, within which according to my invention I provide a spiral or other reverse feeding provision as the screw or worm partition U, which is shown as a right hand worm, being the reverse of the left hand worm M of the shell. The material falling in the open end of the flue is caught by the worm U and fed forwardly as the latter revolves until it is dropped into the chamber V and falls into the outlet chute E, so that the material is caused successively to travel from the outer to the inner end of the drum and then from the inner end to the outer end of the central flue. I preferably use lifting vanes W between the partitions U for lifting and progressing the material in the flue J so that it will be agitated and successively exposed therein.

According to another feature of improvement I provide for whirling and spirally progressing the fluid current as it traverses the flue J, so that it will centrifugally impinge against the wall of the latter and the material therein and will be whirling as it passes therefrom to the inner end of the shell A. This is preferably accomplished by introducing the fluid current tangentially into the chamber V at the front end of the flue J, and causing it to traverse the sinuous or spiral path X between the projecting partitions U in the flue. When the furnace is at one side as shown the flue B preferably enters the top of the chamber V tangentially.

In detail the front ends of the shell A and flue J are preferably opened, and these parts which revolve together abut against the hood Z which is non-rotary and removable, and each has the tangential or other connections for the inlet and exhaust flues and the chute D and discharge spout E.

In operation the current being induced and the material being introduced to the drum while it is revolving, the current will be caused to follow a long path through the flue in one direction, and then a longer path through the drum in the reverse direction, always revolving in the same direction, so that a great extent of current travel may be attained with a relatively short drum, and centrifugal force will be utilized to cause the current to impinge on the material.

The material will be screwed or fed along the path of the current, traveling in reverse direction axially of the drum and flue, and will be thoroughly agitated and subjected to the treating action. The worm or screw action of the partitions will obviate the necessity of suspending the drum out of the horizontal and facilitate mounting and driving connections. The pitch of the worms will be suited to the speed of feed desired for material.

It will be seen that my invention provides

improvements which can be variously and advantageously availed of in whole or in part, and it will be understood that the invention is not limited to the particular details of construction, arrangement, combination of parts, nor to the particular use, set forth as constituting its preferred embodiment, since my improvements can be employed in whole or in part according to such modifications as those skilled in the art may dictate without departing from the spirt of the invention.

According to another feature of my invention the deflector S is reversible and has an imperforate tapering or inclined wall *a* adapted to be fastened against the rear wall of the shell to close the opening R therein when the material is to be re-fed from the shell to the flue J, in which case this wall will deflect the material forwardly into the latter and has an annular curved or tapering wall *b* spaced apart from the wall *a* and connected thereto by intervening walls or partitions *c* leaving the chutes or spaces *d* through which the material dropped by the lifters T passes as it is deflected by the deflector S. The lips *e* of the deflector catch the material and it slides down the walls *c* as the deflector revolves, and when the deflector is pointed forwardly as shown in full lines in Fig. 1 it acts to unload the shell and load the flue with the material. In such case a curved or inclined wall *b* acts as a guide or bevel for the fluid current.

When the shell is to discharge at its rear end the deflector S is reversed as shown in dotted lines, and it then discharges the material through this end.

The annular inlet and exhaust chambers are separate and removable parts, and the space between them is closed by an annular cover carrying the feed spout, so that each of these is removable. These parts slide into or over the revolving parts with a loose joint, and suction leakage is prevented by a flat valve *f* surrounding a drum.

When my improvements are used as kilns or roasters, I prefer to reverse the rotation of the parts and the directions of travel of the material and current, and to introduce the material through the flue and the current through the drum by appropriate feed and inlet means, and to remove these by suitable means, reversely of those shown.

Tubular and solid trunnions on the walls *b* and *a* respectively may be used to rotatively support the shell, if desired, when the deflector is reversed as shown in dotted lines in Fig. 1.

What I claim is:

1. In combination, a rotatable drum, means for discharging a fluid current tangentially therefrom and means for introducing material to said drum.

2. In combination a rotatable drum, means for introducing a whirling fluid current into one end of said drum, means for discharging a fluid current from the other end of said drum, means near one end of said drum for discharging material therefrom, and means for introducing material to said drum.

3. In combination, a rotatable drum, means for introducing a fluid current tangentially of said drum, a lifting unloader for discharging material from said drum, and means for feeding material into said drum.

4. In combination, a rotatable drum, an internal flue opening thereinto, means for introducing material into said drum, and means for transferring material from said drum into said flue.

5. In combination, a revolving drum having near one end an internal portion for receiving material and having a longitudinally extending flue or passage revolving with it and communicating with its interior near its other end, lifting means within said drum for lifting material therefrom and discharging it into said flue or passage, and progressing means in said flue or passage for progressing material therethrough to discharge it from said drum.

6. In combination a rotatable drum, an inner flue opening thereinto, means for introducing a fluid current to said flue, lifting means rotatable with said drum for introducing material into said flue and means in the latter for causing said current to travel spirally thereof.

7. In combination, a rotatable drum, an inner flue opening thereinto, and means for introducing a fluid current tangentially into said flue.

8. In combination a rotatable drum, an inner flue opening thereinto, means for feeding material from said drum to said flue and spiral means in the latter for feeding material outwardly.

9. In combination, a rotatable drum, an inner flue opening thereinto, means for causing a fluid current to traverse inwardly through said flue and outwardly through said drum, and means for causing material to traverse inwardly through said drum and outwardly through said flue.

10. In combination, a revolving drum having near one end an internal portion for receiving material, having near its other end elevating means for lifting material, and having intermediate of its ends progressing means for progressing material from said portion toward said elevating means, and a revolving flue or conduit within and extending longitudinally of said drum and communicating with the latter near said elevating means for receiving material elevated thereby and discharging it without said drum having intermediate of

its inner and outer ends progressing means for progressing such material from its inner end outwardly of said drum.

11. In combination, a rotatable drum having an aperture at its rear end, and reversible means opposite said aperture for unloading said drum adapted to discharge material, therefrom through said aperture.

12. In combination a rotatable drum, and an unloader therefor comprising a member having inner and outer inclined walls and an intervening passage for material unloaded from said drum.

13. In combination, a rotatable member comprising a spiral conduit, means for feeding material into said conduit to traverse the latter in one direction, a tubular member extending longitudinally of or concentric of said conduit, lifting means for transferring material from said conduit to said tubular member, and means for causing a fluid current to travel through said conduit in another direction.

14. In combination, a rotatable member, means for feeding material therein, means extending axially of said member and comprising a spiral conduit in communication with the inner end thereof, lifting means near the inner end of said member for transferring material therefrom into said conduit, and means for causing a fluid current to traverse said member.

15. In combination, a rotatable member comprising two reversely extending spiral conduits or passages in communication with one another at one extremity, means for feeding material into the one of said passages near one end, lifting means for transferring such material from such passage near its other end to the adjacent end of the other one of said passages, means affording an outlet from the latter passage near its other end, and means for rotating said member.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

GEORGE HOLT FRASER.

Witnesses:
GUSTAV SCHONHEIT,
ANTONIO BUONO.