June 25, 1929. P. T. LINDHARD 1,718,243

DRIER

Filed Jan. 26, 1928

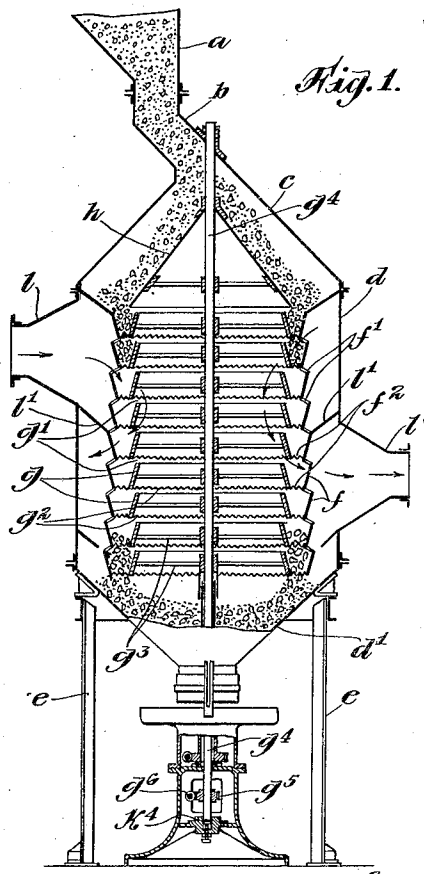


Fig. 1.

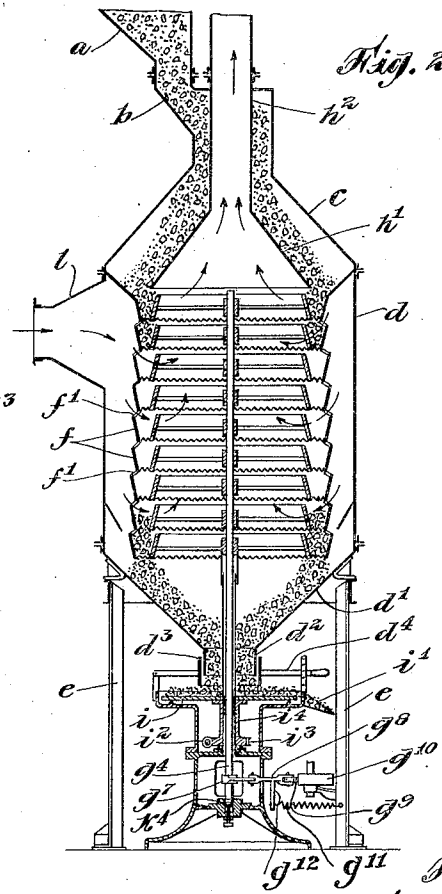


Fig. 2.

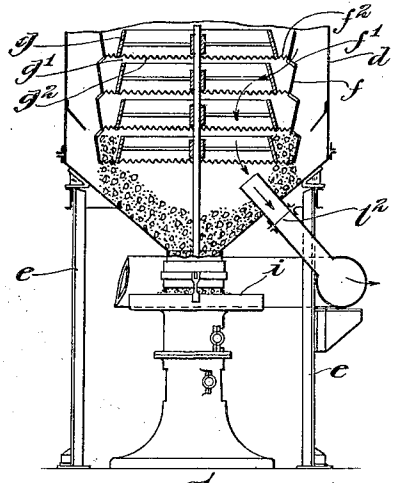


Fig. 3.

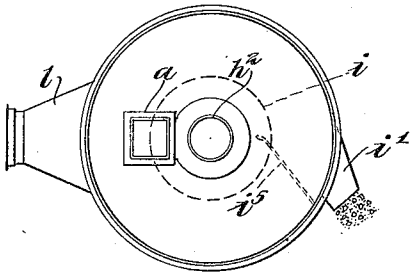


Fig. 4.

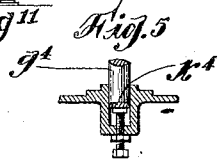


Fig. 5.

Inventor

Poul T. Lindhard

By his Attorneys

Redding, Ferley, Shea & Campbell

Patented June 25, 1929. 1,718,243

UNITED STATES PATENT OFFICE.

POVL T. LINDHARD, OF BROOKLYN, NEW YORK, ASSIGNOR TO F. L. SMIDTH & CO., OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

DRIER.

Application filed January 26, 1928. Serial No. 249,603.

This invention relates to driers for the removal of excess moisture from coal and other materials and in which dry air or other drying medium is made to pass through a layer of the material, which itself is supposed to move forward, usually under the influence of gravity, as the moisture is progressively removed. In the use of apparatus of this general character, as heretofore constructed and in which the apertured or foraminous wall, over which or in contact with which the material moves, is stationary, it often happens that the material clogs at one point or another. With material of any kind such clogging is likely to result in the formation of voids through which the drying medium passes freely while it does not pass through the clogged areas, with the result that the material is not uniformly or thoroughly dried. With other materials, particularly coal, spontaneous combustion sometimes results also. The purpose of the present invention, therefore, is to provide a drying apparatus or drier in which all of the difficulties referred to shall be overcome and the material being dried shall move forward steadily without clogging and without the formation of voids. In accordance with the invention the material to be dried is caused to move forward between apertured or foraminous walls, formed, for example, by louvers, which have slight relative movement such that the material is agitated slightly and thereby is prevented from clogging. Preferably the apertured walls are arranged one within the other in circular or other convenient form so that the material is supported and moved forward by gravity in a hollow column, the air or other drying medium being passed inward from without or outward from within throughout the height of the column. One of the walls receives a relative rotary movement or a relative oscillatory movement with respect to the other so that the material is slightly agitated in its passage and prevented from clogging. The invention will be described more particularly hereinafter with reference to the accompanying drawing in which different embodiments of the invention are illustrated and in which:

Figure 1 is a view in vertical sectional elevation of one embodiment of the invention.

Figure 2 is a similar view of a different embodiment.

Figure 3 is a partial view, also in sectional elevation, illustrating still another embodiment.

Figure 4 is a top view of the construction shown in Figure 2.

Figure 5 is a detail view on a larger scale showing a means for effecting vertical adjustment of the inner wall.

In the several embodiments of the invention illustrated in the drawing the material to be dried is fed from a bin, a portion of which is indicated at a, through a chute b into a conical upper end c of a cylindrical shell d which may be supported on a suitable framework e.

In each of the embodiments illustrated there is supported within the shell d a series of tapered rings f which form a louver-like wall with openings f^1 between successive rings. The rings are sloped inwardly from the top down and at their lower edges are preferably coarsely sawtoothed, as at f^2.

Also in each of the embodiments illustrated there is supported within the louver-like wall formed by the rings f, another louver-like wall formed of rings g which are sloped outwardly from the top down, are spaced from each other by openings g^1, and are also coarsely sawtoothed at the lower edge as indicated at g^2. The rings g are supported by spiders g^3 from a central shaft g^4, which may receive a slow relative movement of rotation or a slight relative movement of oscillation. In the construction shown in Figure 1 the shaft g^4 at its lower end carries a worm gear g^5 engaged by a worm g^6 which may be driven by any suitable means. In the construction shown in Figure 2 the shaft g^4 carries near its lower end an arm g^7 which is connected to a link g^8. The latter carries a roller g^9 for coaction with a cam g^{10} which may be driven by any suitable means, the roller g^9 being held in contact with the cam g^{10} by a spring g^{11} attached at one to the link g^8 through an arm g^{12} and at the other end to the supporting frame. In this manner the shaft g^4 and the rings g may be made to receive a slight movement of oscillation with respect to the louver-like wall f.

The material received through the chute b slides down upon a conical distributor, which, as shown at h in Figure 1, is carried by the shaft g^4 and, as shown at h^1 in Figure 2, forms part of the air discharge pipe h^2. From the distributor h or h', as the case may be, the material passes down through the

space between the louver-like walls f and g, forming a hollow column. The material completely fills the space between the two walls from top to bottom, representation of the material between the upper portion and the lower portion being omitted in order that the construction of the coned or sloped rings may be more clearly shown. As will be observed the space between the two walls is widened slightly from the top to the bottom so as to avoid the possibility of bridging or clogging of the material in its passage. From the space between the two walls the dried material falls into the conical portion d^1 of the shell d where it accumulates to some extent and from which it passes through a sleeved central opening at d^2 upon an ordinary feed table i from which it is discharged through a spout i'. A regulating sleeve d^3, surrounding the sleeved opening d^2 and carried by an adjustable lever d^4, serves to regulate the discharge of the dried material from the shell d. The feed table i may be rotated through a worm i^2 and worm wheel i^3, the latter being secured to the feed table i through a sleeve i^4. A scraper, as indicated at i^5 in Figure 4, may be provided to direct the material from the feed table into the chute i^1.

In the construction shown in Figure 1 the dry air or drying medium is delivered to the drier through an inlet l and, being directed by an annular partition l^1 passes through the apertured wall and through the interposed hollow column of material into the space within the rings g, from which space it passes out, below the annular partition l^1, through the apertured walls and hollow column of material to an outlet l^3.

In the construction shown in Figure 2 the dry air or other drying medium is delivered from the inlet l to the annular space between the shell d and the outer wall f and passes thence through the two walls and the interposed material into the space within the wall f, from which it passes upward through the discharge pipe h^2.

In the construction shown in Figure 3 the air passes through the apertured walls and the interposed material from the annular space between the shell d and the outer apertured wall f, as before, and passes from the space within the wall g downward through an outlet pipe l^2.

In Figure 5 the thrust bearing k which supports the shaft g^4 is shown as adjustable vertically for the purpose of effecting adjustment of the rings g with respect to the rings f and thereby regulation of the movement of the material.

It will be understood that various changes in details of construction and arrangement can be made to suit different materials and different conditions of use and that, except as pointed out in the accompanying claim, the invention is not restricted to the particular construction and arrangement shown and described herein.

I claim as my invention:

In a drier, the combination of a supporting and enclosing shell, a vertical series of spaced coned rings, a second series of spaced coned rings, the two series being spaced one from the other, means to deliver to the space between the two series of rings the material to be dried, means to effect a relative movement in horizontal direction of one of said series of rings with respect to the other, means to effect vertical adjustment of one of said series of rings with respect to the other, and means to deliver a drying medium and cause the same to pass through said series of rings and through the material between the same.

This specification signed this 25th day of January A. D. 1928.

POVL T. LINDHARD.