(No Model.)

V. F. L. SMIDTH.

DRYING APPARATUS.

No. 456,742. Patented July 28, 1891.

Fig. 1.

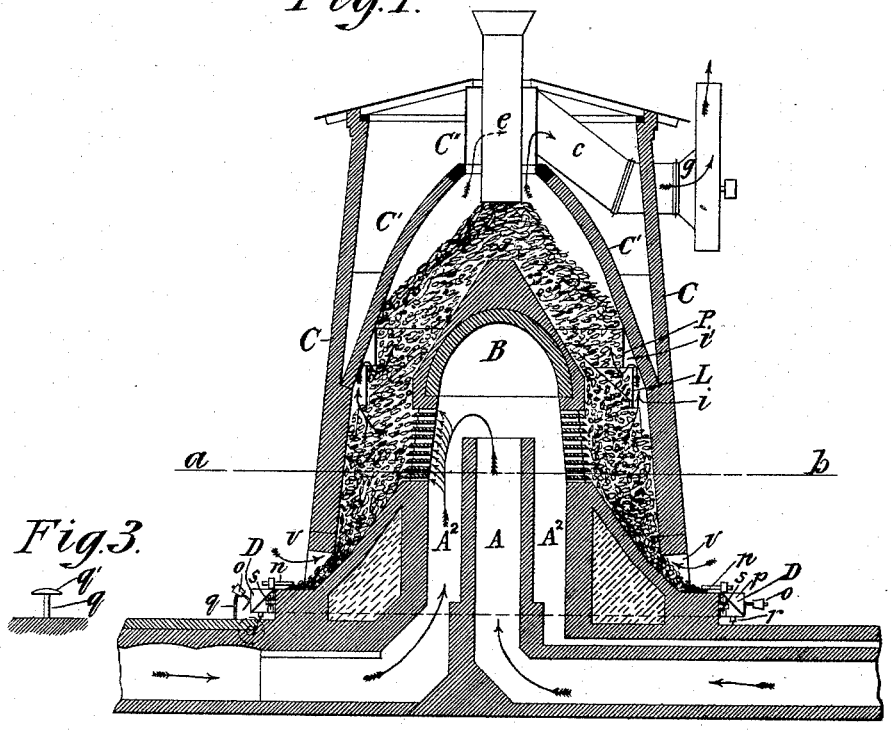
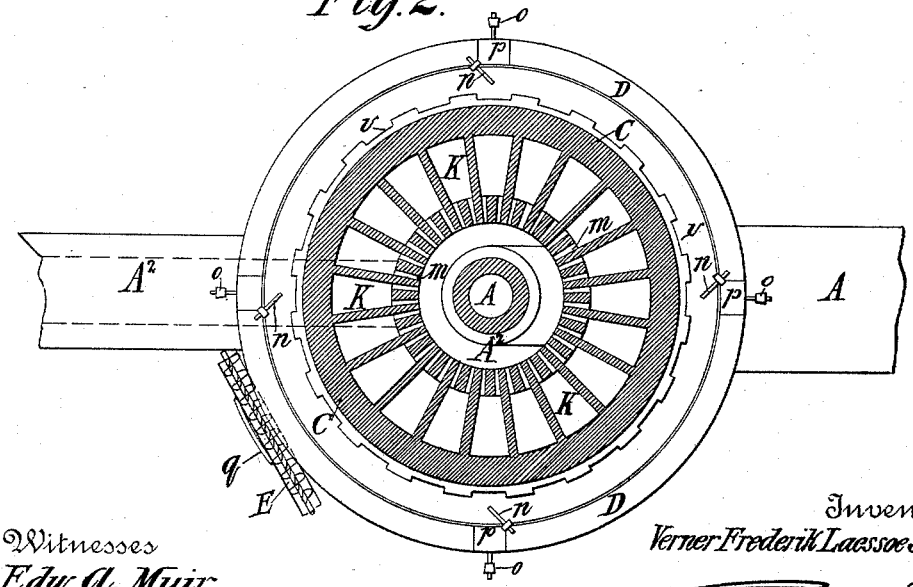


Fig. 3.

Fig. 2.



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DRYING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 456,742, dated July 28, 1891.

Application filed May 24, 1890. Serial No. 353,110. (No model.)

To all whom it may concern:

Be it known that I, VERNER FREDERIK LAESSOE SMIDTH, a resident of Copenhagen, in the Kingdom of Denmark, and a subject of the King of Denmark, have invented Improvements in Drying Apparatus, of which the following is a specification.

My invention relates to an apparatus for drying earthy disintegrated or similar materials by the application of hot air and by utilizing the air from the outside.

In order that my invention may be the better understood, I now proceed to describe the same in relation to the drawings hereunto annexed and to the letters marked thereon.

Figure 1 is a vertical section of my apparatus. Fig. 2 represents a horizontal section on the line *a b*, Fig. 1. Fig. 3 is a detail view of a striking cross-bar or tappet.

My apparatus has the form of a round shaft C, in the interior of which is arranged a dome C′, covering the lower part of the shaft. Through the foundation of the shaft enter one or more hot-air channels A A^2, ascending in the center of the shaft and ending in a distributer B, with lateral orifices *m*. Two hot-air channels are shown in the drawings terminating in concentric outlets within the distributer B as employed in practice in an apparatus for drying clay in the manufacture of bricks. One of these channels—A, for example—conducts the escaping gases from the brick-kiln to the drying apparatus. As these gases in a well-constructed kiln escape partially cooled, they do not suffice, as a rule, to work the drying apparatus. It is therefore customary to employ a supplemental air-heating apparatus connected with the drying apparatus by the other of said hot-air channels A^2. The concentric outlets of the respective channels prevent the two currents of hot air from meeting and opposing each other. There is nothing novel in this, however, and I do not consider two air-channels essential to my apparatus.

On the top of the dome C′ is arranged a cylinder C″ of sheet metal, through the upper end of which a funnel *e* reaches into the dome C′. The material to be dried is introduced into the funnel *e*, from which it sinks into the shaft, where it presses against the surrounding wall of the latter on account of the conical form of the outside of the top of the distributer B, finally leaving the shaft through a series of holes *v*, arranged at one level around the lower edge of the shaft. In order to prevent the entrance of outside air through the funnel *e* the latter is always kept completely filled with the material.

An exhauster *g*, arranged on the upper part of the shaft C, (see Fig. 1,) draws the hot air upward through the descending material and sucks at the same time outside air through the exit-holes *v*, which absorbs the otherwise waste heat of the escaping dried material and utilizes the same in drying the higher zones of the material. The hot air leaving through the lateral orifices of the distributer B endeavors to pass upward to the top of the shaft through the passages offering the least resistance, and the same is the case with air sucked in through the exit-holes for the dried material. If this tendency of the air were not provided for, two air-currents would be formed, ascending approximately vertically in the shaft—viz., a hot-air current rising near the conical cover of the distributer B and parallel to it a current of cold air ascending on the inner side of the wall of the shaft. The hot air would therefore penetrate only one part of the material in the shaft, and the cold air from the exit-holes *v* would during the greater part of its passage come into contact with material of low temperature and would absorb heat only shortly before escape through the exhaust-channel, which heat would thus be wasted.

In order to prevent the formation of the before-mentioned currents, I have designed the following arrangement: In the interior of the shaft I arrange rings L P of sheet metal at the height of the cover of the distributer B, so that there is a space formed between the upper rim of the lower ring L and the inner side of the wall of the shaft, while the upper rim of the upper ring P rests close against such inner side. (See Fig. 1.) The ring L thus forms an annular channel *i* between itself and the wall, which is kept free from the material and communicates above with the interior of the shaft by an annular opening *i′* behind the lower rim of the ring P. In this way a considerable part of the hot air leaving the distributer is induced, while seeking

to escape through the passages offering least resistance, to flow radially toward the wall of the shaft and to enter the channel i, which it leaves through the annular opening i' to take part again in drying the material. The air is thus forced to come into contact with all parts of the descending material. The outside air sucked through the holes v thus comes into contact with hot material only, absorbs the heat of the same, and is led by and with the hot air into and through the channel i to enter through the opening i' the colder regions of the material and to give off its heat before escape through the exhauster. The mixture of air escaping from the shaft enters the cylinder C″, connected to the exhauster g by the channel c, through which the air escapes. The rings L P of sheet metal rest on the edges or steps of projections K, rising from the wall of the shaft radially toward the center, or instead they may be held in proper position by bolts or brackets from the wall.

In order to continuously carry away the dried material, I surround the brick-work foundation of the apparatus with a revolving ring D, (see Figs. 1 and 2,) carried on wheels r and supported by sideward guiding-rollers s. This revolving ring D is supplied with receptacles p for the dried material. The outer longitudinal side of each of these receptacles is closed by a flap under the pressure of a weight o. Sideward over these receptacles I arrange scrapers n on the revolving ring to slide obliquely over the rim of the foundation.

The ring D, with the receptacles p, is revolved slowly by any convenient motive power, and the velocity of such travel and the position of the scrapers n are regulated, so that the latter scrape sufficient material into the receptacles to fill them during one travel around the apparatus. When a receptacle has completed its travel around the apparatus, the weight o strikes against an oblique edge of a cross-bar or tappet q', situated sideward on a standard q, Fig. 3, and is gradually lifted by the same, thus opening the flap of the receptacle. In consequence the contents of the latter are discharged into a transporting-worm E or other convenient vehicle for transport to any desired place.

Having now particularly described my invention, I declare that what I claim is—

1. A drying apparatus in the form of a vertical shaft or kiln C C′, provided with a feeding device at top, a central hot-air distributer B, having distributing-orifices in its sides, a hot-air channel or channels communicating with said distributer at bottom, rings L P, forming an annular air-space adjoining the outer wall of the vertical shaft, and a protected annular opening i' at the upper edge of the lower ring, an exhaust-fan g, connected with the interior of the shaft at top, and apertures v, through which the outside air is drawn in to mingle with the hot air, substantially as shown and described.

2. In combination with a drying apparatus comprising a vertical shaft having a circular base provided with discharge-apertures and a circular foundation below such apertures, the revolving ring D, provided with receptacles p to receive the dried material and carrying scrapers n for collecting the same, the receptacles being provided with counter-weighted valve-flaps, rollers r s for supporting the revolving ring, fixed tappets q for actuating said valve-flaps to discharge the dried material, and feeding-worms or other conveyers receiving such discharge, substantially as shown and described.

In testimony whereof I have signed my name to this specification in the presence of subscribing witnesses.

VERNER FREDERIK LAESSOE SMIDTH.

Witnesses:
JOHN CORRY FELL,
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