

No. 635,158.

M. A. SUTHERLAND.
DRIER.

Patented Oct. 17, 1899.

(Application filed Oct. 24, 1895.)

(No Model.)

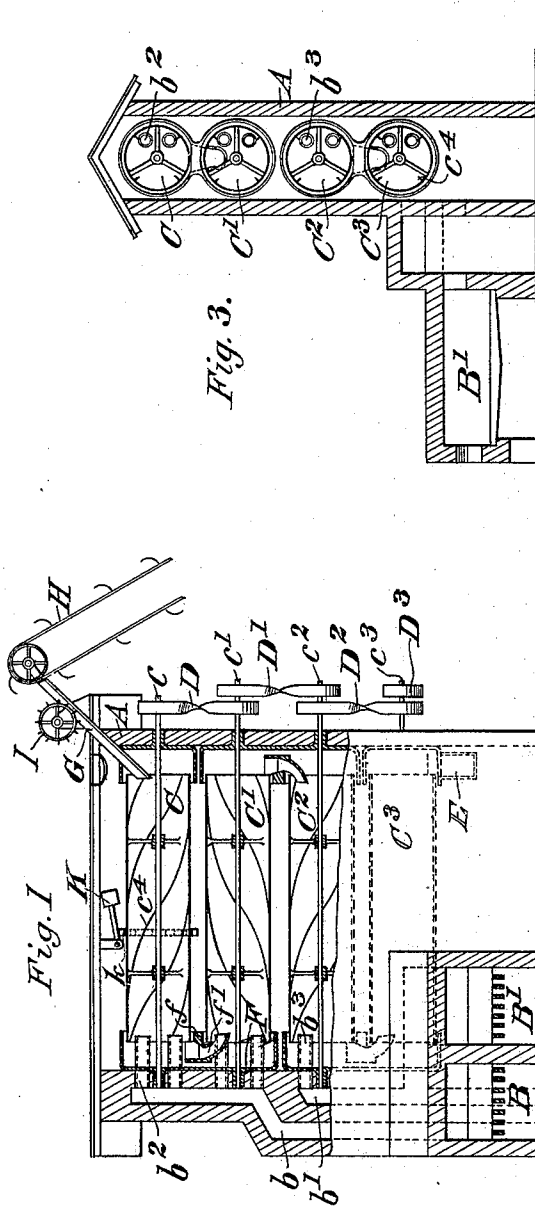


Fig. 3.

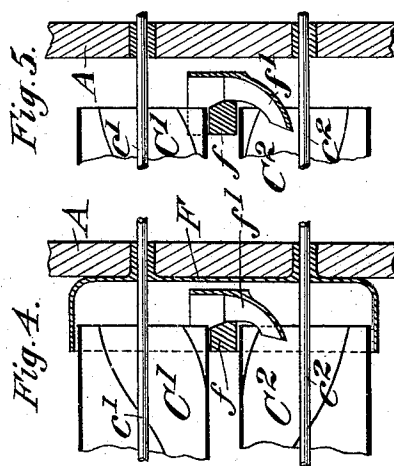


Fig. 5.

Fig. 4.

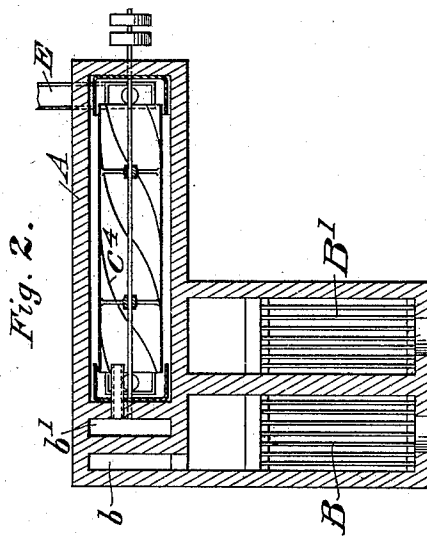


Fig. 2.

Witnesses:
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UNITED STATES PATENT OFFICE.

MOSHER A. SUTHERLAND, OF PASSAIC, NEW JERSEY.

DRIER.

SPECIFICATION forming part of Letters Patent No. 635,158, dated October 17, 1899.

Application filed October 24, 1895. Serial No. 566,740. (No model.)

To all whom it may concern:

Be it known that I, MOSHER A. SUTHERLAND, of Passaic, in the county of Passaic and State of New Jersey, have invented a new and useful Improvement in Driers, of which the following is a specification.

My invention relates to an improvement in driers in which provision is made for opposing a blast of the hot products of combustion to the travel of the material to be dried as it is passed continuously through a series of rotating cylinders.

A practical embodiment of my invention is represented in the accompanying drawings, in which—

Figure 1 is a view of the apparatus in side elevation, partly in section. Fig. 2 is a horizontal section. Fig. 3 is a transverse vertical section. Fig. 4 is an enlarged view in detail in vertical section of the ends of two consecutive cylinders, the wall adjacent thereto, and the housing for inclosing the ends of the cylinders; and Fig. 5 is a view in detail, showing the end of the cylinder open to the interior of the casing.

The casing which incloses the rotary cylinders is denoted by A and may be of any well-known or approved form, in the present instance its horizontal section being of oblong rectangular form. Adjacent to the casing A there is located a plurality of furnaces (denoted by B B') for supplying heat to the interiors of the cylinders at different heights.

The cylinders through which the material to be dried is transmitted are denoted by C, C', C², and C³, the number depending upon the time and distance required for effecting a thorough drying of the material, the number (four) shown in the present drawings being adopted as sufficient to show the manner of connecting and operating them. The cylinders are supported upon shafts (denoted, respectively, by c c' c² c³) mounted in the opposite ends of the casing A and provided exterior to the casing with pulleys for the reception of cross-bands D, D', and D², by means of which the successive cylinders are driven in opposite directions. It is obvious that intermeshing gear of well-known or approved form might be employed in the place of cross-bands. A drive-pulley D³ on the shaft c³ receives motion from a source of power, (not

shown,) and from a rotary movement of the shaft c³ motion is transmitted to the other cylinders. The interiors of the several cylinders are provided with winding-ribs c⁴, which give the interior walls of the cylinders the effect of screws to force the material along from end to end. As the material reaches the opposite end of the cylinder from which it enters it is directed into the end of the next succeeding cylinder below and after passing through it is again directed into the end of the next lower cylinder, and so on until it finally passes into a chute E, which extends through to the exterior of the casing A.

The heat is retained within the cylinders and directed from cylinder to cylinder by means of cap-pieces or housings (represented in Fig. 4) consisting of a dish-shaped piece F, fixed to the casing A with its open face toward the ends of the cylinders and of sufficient size to receive within it the ends of two consecutive cylinders. It has midway of its length a central partition f, which fills the space between the successive cylinders at their ends, and also has formed within it a chute f', into the mouth of which the material from the upper cylinder is received and by it directed into the end of the next succeeding cylinder below. The chute f' is spaced from the bottom of the cap F, so as to admit a circulation of the hot products of combustion around the chute and into the end of the cylinder above.

The flues from the furnaces B B' are denoted, respectively, by b and b' and, by means of short pipes b² and b³, lead into the ends of the upper and lower cylinders, the flues b communicating with the two upper cylinders and the flue b' connecting the two lower cylinders.

The material to be dried is here shown as being delivered into the end of the upper cylinder by a chute G from the top of an elevator H, a disintegrating and feeding wheel I being located where it will engage the material as it follows along down the chute G.

In operation the material as it falls within the end of the upper cylinder C will be carried by the rotary movement of said cylinder and the screw and ribs therein toward the opposite end of the cylinder, falling from time to time as it creeps up the side of the cylinder onto the bottom of the cylinder, thereby exposing it to the heat within the cylinder

from the flue *b*. As it reaches the opposite end of the cylinder *C* it falls through the chute *f'* into the end of the next lower cylinder, and by the opposite rotary movement of said cylinder and the winding-ribs therein it is carried to the opposite end of that cylinder meeting the blast of the hot products of combustion from the flue *b'*, reinforced by heat from the flue *b*, and again is directed from the opposite end of that cylinder into the end of the next lower cylinder, and so on, until it finally reaches the discharge-chute *E* below the lower cylinder, at which point it is discharged in a dry state.

The sudden agitation of the mass by its falling through space within the cylinders and its gradual advance movement by means of the winding-ribs therein materially increase the surface exposed to the hot blast and effect a rapid drying of the material. The arrangement is also such that the hot products of combustion are directed without material waste directly upon the substance to be dried, and the heat may be regulated by the use of one or both of the furnaces, according as the material to be dried may demand.

Where it is desired to submit the material

less directly to the continued blasts of heat, the ends of the cylinders may be left open to the interior of the casing, as shown in Fig. 5. To prevent the material from adhering to the interior of the cylinder, particularly to the upper cylinder or cylinders, I provide a hammer *K*, which may be automatically operated by suitable lugs or teeth $\frac{1}{2}$, carried by the cylinder in position to engage and lift the hammer at intervals and allow it to drop into contact with the exterior of the cylinder.

What I claim is—

The drying apparatus, comprising a series of cylinders arranged one above another and provided with interior winding-ribs, means for rotating the cylinders, means for directing the material alternately from the end of an upper to the end of a lower cylinder and a plurality of furnaces provided with independent flues for directing hot products of combustion into the ends of the cylinders at different heights, substantially as set forth.

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Witnesses:

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