No. 613,382. Patented Nov. 1, 1898.

O. MEINSHAUSEN.

GRAIN DRIER.

(Application filed Jan. 17, 1898.)

(No Model.) 4 Sheets—Sheet 1.

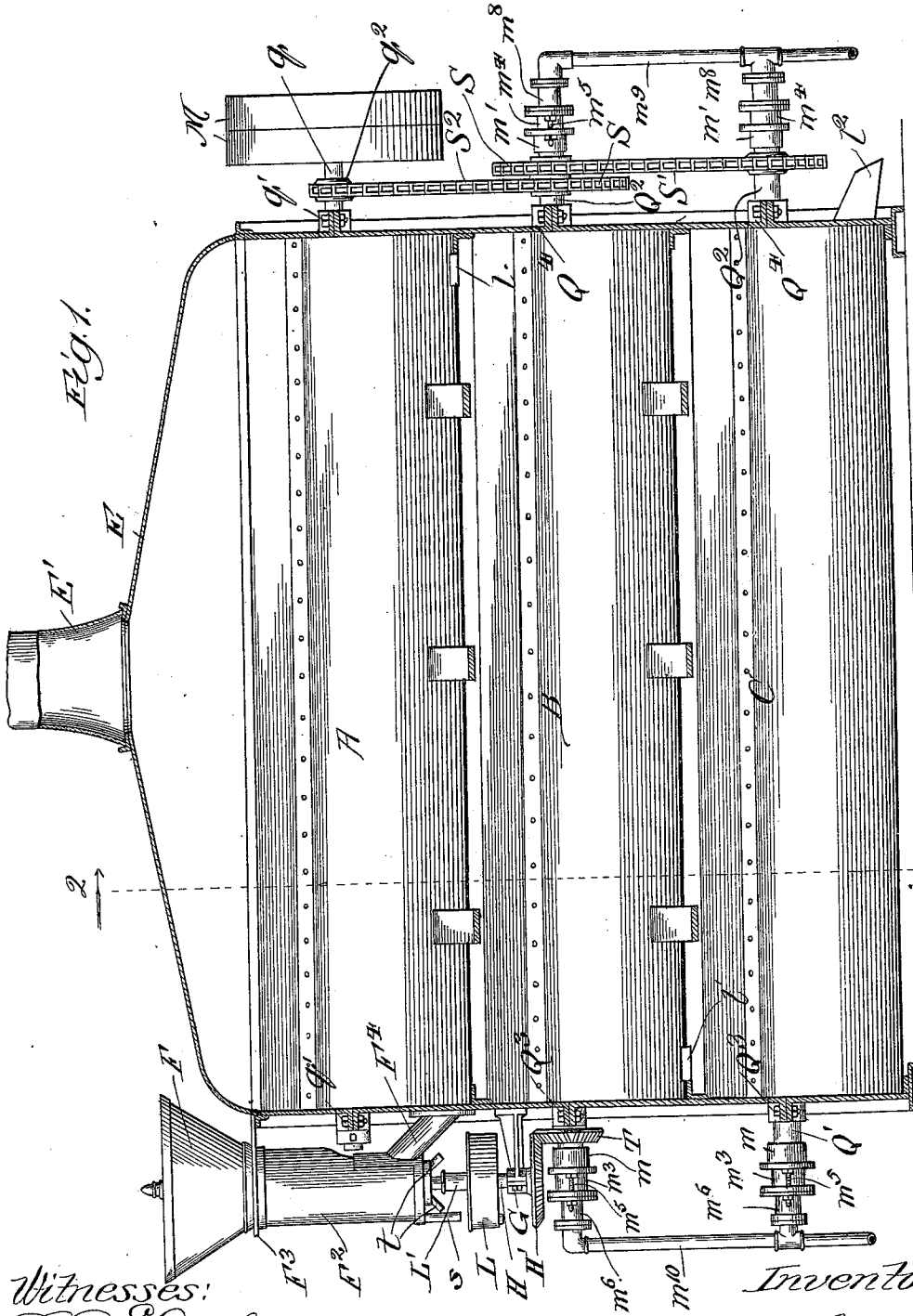


FIG. 1.

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Inventor:
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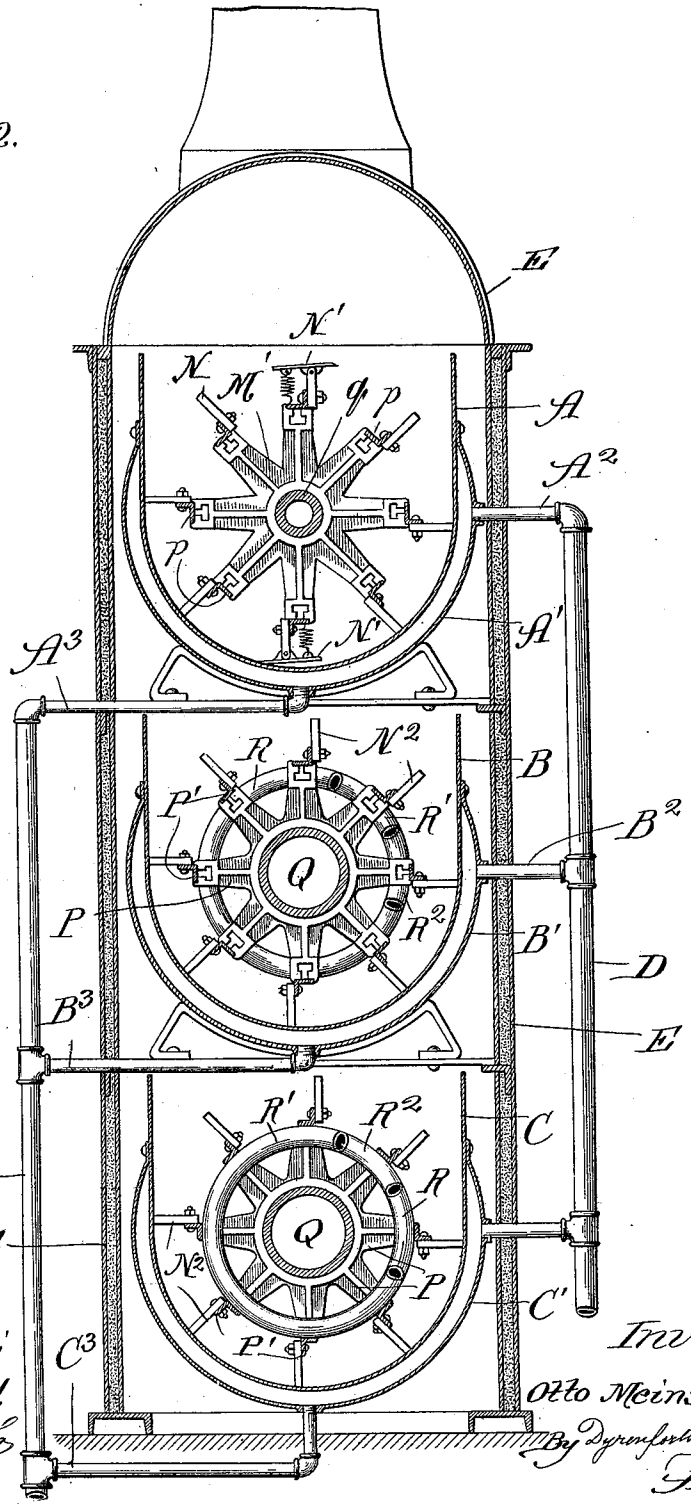
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(No Model.) 4 Sheets—Sheet 2.

Fig. 2.



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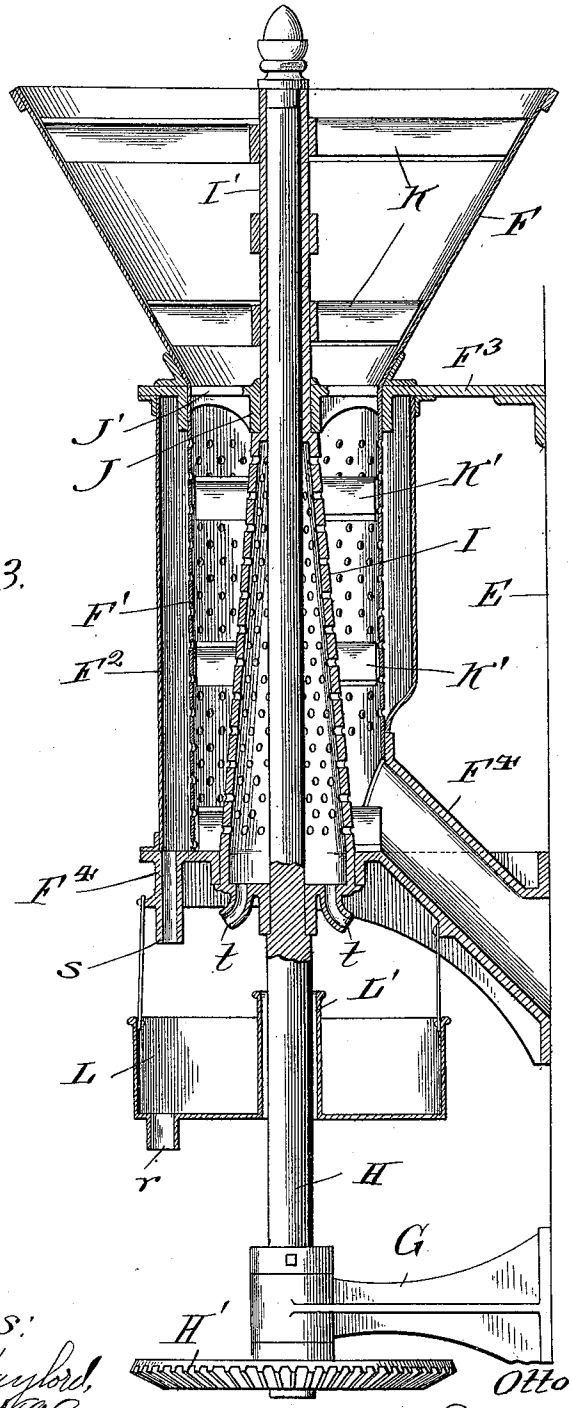
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GRAIN DRIER.

(Application filed Jan. 17, 1898.)

(No Model.) 4 Sheets—Sheet 3.

Fig. 3.



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(No Model.) 4 Sheets—Sheet 4.

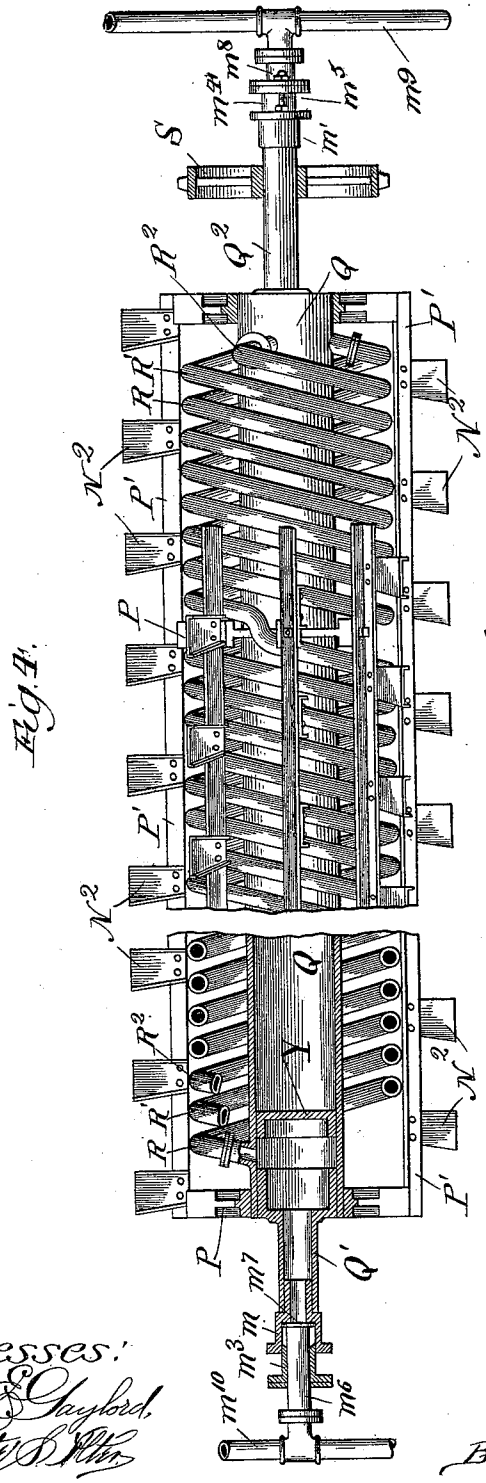


Fig. 4.

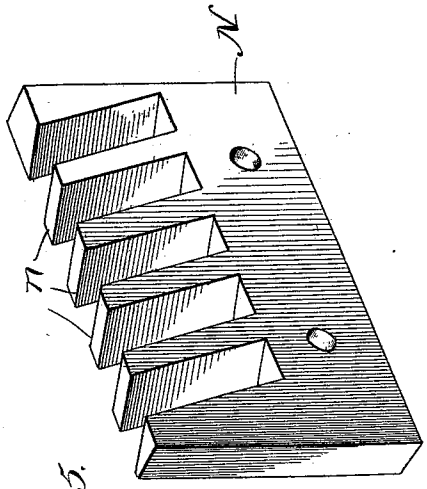


Fig. 5.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

OTTO MEINSHAUSEN, OF CHICAGO, ILLINOIS.

GRAIN-DRIER.

SPECIFICATION forming part of Letters Patent No. 613,382, dated November 1, 1898.

Application filed January 17, 1898. Serial No. 666,843. (No model.)

To all whom it may concern:

Be it known that I, OTTO MEINSHAUSEN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Grain-Driers, of which the following is a specification.

My invention relates to an improvement in grain-driers; and my object is to provide certain improvements in the feeding mechanism both of the introductory or initial feed, through which the material passes to have expressed from it the excess moisture while on its way to the drying-chambers, and of the subsequent or drying-chamber feed located in the drying-chambers.

My invention consists in the improved feeding devices and in minor details of construction, all as hereinafter described.

In the accompanying drawings, Figure 1 is a view in side elevation and partly in section of a drier embodying my improvements; Fig. 2, a vertical transverse section on line 2 of Fig. 1; Fig. 3, a vertical section of the introductory feed and preliminary drying device; Fig. 4, a broken partially-sectional view of the interior mechanism of one of the steam-heated drying-chambers, and Fig. 5 a view in perspective of one of the conveyer-combs with which the rotating spider in the upper drying-chamber is equipped.

I shall describe the general construction of the drier with only such a degree of particularity as will render easy an understanding of my improvements, said construction being old and well known.

The drier proper comprises three drying-chambers A, B, and C, of U shape in cross-section and arranged in a vertical row. These chambers are provided with steam-jackets A′, B′, and C′, fitted with steam-supply pipes A^2, B^2, and C^2, branching from a common supply-pipe D, and with drain-pipes A^3, B^3, and C^3, branching from a common drain-pipe D′.

The drying-chambers mentioned are open from above, as most clearly shown in Fig. 2, and are all contained within a suitable casing E, which is supplied with a stack E′, through which the vapors arising from the drying materials escape.

The material to be dried is emptied first into a hopper F, communicating with a perforated cylinder F′, inclosed in a jacket F^2, supported by brackets F^3 F^4, attached to the front end of the casing E. The bracket F^4 takes the form of a discharge-spout leading from the perforated cylinder to the upper drying-chamber, but not communicating directly with the space between the perforated cylinder and its inclosing jacket.

Supported on a bracket G, attached to the casing E, is a vertically-disposed shaft H, which carries a perforated cone I, supplied at the bottom with discharge-pipes *t*. The cone rests upon a shoulder with which the shaft is provided and forms a close joint at the bottom with the bracket F^4, through which it passes and upon which the lower end of the cylinder F′ rests. At its upper end the cone is provided with a sleeve I′, which fits closely about the shaft H, with which it revolves, the sleeve being journaled in a bearing J, supported by inward-projecting arms J′ at the top of the cylinder. The sleeve is provided with radial blades or inclined fan-like propellers K, which serve in their rotation to force the material downward. The body of the cone is similarly provided on its exterior surface with inclined propelling-blades K′, which rotate with it and serve to compact the material.

Depending from the bracket F^4 is a drip-pan L, provided with a central hub L′, through which the shaft H passes. This pan serves to receive the liquid expressed from the material through the hollow perforated cone and through the perforated cylinder, the liquid in the latter instance passing into the jacket F^2, whence it escapes through a drip-pipe *s*. The drip-pan is itself provided with a discharge-pipe *r*, which may lead to any suitable reservoir. At its lower end and below the bracket G the shaft H is provided with a bevel-gear H′. The hopper, perforated cone, cylinder, and attendant parts are hereinafter termed the "introductory-feed" mechanism.

The upper drying-chamber is equipped with my improved internal stirring and conveying mechanism and the two lower chambers with peculiarly-arranged heating-coils.

For reasons readily understood by those skilled in the art the top drying-chamber is left unprovided with internal heating device. It is provided with a shaft q, journaled in boxes q' at the ends of the casing and carrying at one end a pulley M and sprocket-wheel q^2. On the interior of the chamber the shaft is provided with spiders M', to which are secured angle-bars p, to which are secured at intervals in the ordinary manner conveyer and stirrer combs N and spring-held scrapers N'. The combs N are of improved construction, being supplied with peculiarly-constructed teeth n, as shown in Fig. 5. These teeth are so set with relation to the flat sides of the base of the comb as to be inclined thereto in two planes—that is to say, they not only have their sides inclined to the plane surfaces or flat sides of the comb-base, but also they have a slant in the direction of their length, the slant of the teeth being in a direction to assist the inclined sides thereof in their function of propelling or conveying the damp material longitudinally of the drying-chamber during the rotation of the shaft. Such an arrangement aids materially in the stirring as well as the advancing of the material.

The lower chambers are provided with spiders P, Fig. 4, angle-bars p', and conveyer-shovels N^2, the whole arragement being very similar to that of the corresponding elements in the upper chamber, except that here the spiders are supported on large central steam-pipes Q. Into the ends of the steam-pipes Q are rigidly secured hollow trunnions Q' Q^2, journaled in boxes Q^3 Q^4, supported by the ends of the casing E. The trunnions are supplied at their ends with rigidly-secured stuffing-boxes m m', packing-rings m^2, and packing-adjustment rings m^3 m^4, adjustable by means of bolts m^5 in a usual manner. Into the stuffing-boxes m are fitted exhaust-steam pipes m^6, provided at their inner ends with flanges m^7, which secure the pipes rotatably within the stuffing-boxes. Similarly the stuffing-boxes m' receive live-steam pipes m^8, rotatably secured with relation to the stuffing-boxes. Communicating with the pipes m^8 is a steam-supply pipe m^9. Similarly communicating with the pipes m^6 is an exhaust-pipe m^{10}.

Confined within the angle-irons P' and secured thereto by any suitable means (none being here shown) are two or more (the preferred number, as here shown, being three) spiral steam-coils R R' R^2, &c., arranged close together and communicating with the pipes Q toward their opposite ends. These coil-pipes emanate from the central pipes on the same transverse vertical plane and are given the same pitch after the manner of a many-threaded screw. Such an arrangement, while preserving all the advantage of a single close-coiled pipe, has the additional advantage that more direct passages for the flow of steam and water are afforded, whereby the steam can be maintained in a dryer condition and at a higher temperature, conditions of initial pressures, &c., remaining unchanged. In Fig. 2 the true section indicated is not shown, an inclined section being shown so far as it relates to the pipes in order that the cutting-plane may clearly disclose all the pipes. Near their discharge ends the pipes Q are provided with partitions or drum-heads Y.

The trunnions Q^2 are provided with sprocket-wheels S, geared together and to the sprocket-wheel q^2 by sprocket-chains S' and S^2, respectively. On the trunnion Q' of the middle drying-chamber is a bevel-gear T, meshing with the gear H' of the shaft H.

The operation is as follows: Motion is communicated to the revolving parts through the medium of the pulley M. The material to be dried is introduced into the hopper F. Steam enters through the steam-supply pipe D to heat the jackets A', B', and C' and is discharged through the pipe D'. Steam enters the pipes Q through the steam-supply pipe m^9, fills the pipes Q to the partition-wall or drum-head Y, and then circulates through the coils R R', &c., thence passing into the portions of the pipes Q beyond the drum-heads, and finally escaping through the exhaust-pipe m^{10}. The material is first engaged by the blades or propellers K K' upon the revolving sleeve I' and cone I and is thereby, as well as by gravity, forced downward and compacted between the hollow cylinder and cone. By the time the material reaches the discharge-chute F^4 the excess of moisture has been all expressed through the perforations of the cone and cylinder, passing through the drain-pipes s and t to the drip-pan L. The still damp material passes through the chute F^4 to the upper drying-chamber proper. The upper chamber is only moderately heated by steam introduced into its jacket, and during its passage therethrough the material passes through the viscous or sticky stage, which would be more noticeable and objectionable were the first drying-chamber highly heated. The material as it enters the drying-chamber A is loosened and stirred by the rotating conveyer-combs N and is rapidly advanced thereby toward the right-hand, Fig. 1, or discharge end of said chamber, where it drops through an opening l into the chamber B. The scrapers N' serve to keep the material from accumulating on the inner surface of the chamber. In the chamber B the material is caught up successively by the shovels N^2 and advanced toward a discharge-opening l'. The shovels empty the material over the surfaces of the heated coils, which latter serve to some extent as worm conveyers, and thus assist in the advancement of the material. The material is discharged at l' into the chamber C, from whence it is ejected, thoroughly dried, at the discharge-chute l^2.

It is obvious that the drier may be modified

in matters of detail without departing from my invention. For instance, the number of drying-chambers may be varied, and the construction of the preliminary drying-chamber and attendant parts may be variously modified so long as the principle of feeding the wet material into a contracting chamber provided with a perforated surface, which is the essential feature of this part of the mechanism, is preserved.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a drier, the combination with the drying-chambers proper and the casing, of introductory-feed mechanism through which the grain passes to the first drying-chamber, comprising concentric relatively-rotatable perforated members affording between them an annular space gradually reducing in size from the inlet to the discharge and in communication at the discharge with the first of said drying-chambers, means for rotating one of said members, and means on the surface of one of said members for forcing the grain through said gradually-reducing annular space, substantially as and for the purpose set forth.

2. In a drier, the combination with the drying-chamber proper, of introductory-feed mechanism, comprising, in combination, a hollow shell, a body surrounded by said shell and rotatable with reference thereto and forming with said shell an annular chamber having walls contracting toward the discharge end, one or both of said walls being perforated as described and provided with propelling means, substantially as and for the purpose set forth.

3. In a drier, the combination with the drying-chamber proper, of introductory-feed mechanism, comprising telescoping cylinder and cone relatively rotatable and affording between them an annular chamber contracting toward the discharge end, one or both of said members being provided with perforations and one of said members being provided with propeller-blades, substantially as and for the purpose set forth.

4. In a drier, the combination with the drying-chamber proper, of introductory-feed mechanism, comprising a perforated hollow cylinder F′, a perforated hollow rotatable cone I located within said cylinder provided with discharge-outlet, propeller-blades upon said cone, a jacket surrounding said cylinder and provided with a discharge-opening, a discharge-chute joining the annular space between said cone and cylinder to said drying-chamber proper and means for rotating the cone, substantially as and for the purpose set forth.

5. In a drier, the combination with the drying-chamber proper and the casing, of introductory-feed mechanism comprising a vertically-disposed perforated cylinder, a jacket surrounding the cylinder provided with a discharge-opening, a chute leading from the discharge end of the cylinder to the top drying-chamber proper, a hopper above the cylinder, a perforated cone I provided with a sleeve I′ and propeller-blades K K′ journaled in the cylinder, and means for rotating the cone, substantially as and for the purpose set forth.

6. In a drier, the combination with the drying-chambers proper and the casing, of introductory-feed mechanism comprising a perforated cylinder, a hopper located above said cylinder, a jacket surrounding said cylinder, a bracket F^4 supporting said device and affording a bottom for said cylinder and jacket, and a discharge-chute for the cylinder, a bracket G beneath said bracket F^4 supported by the casing, a shaft H journaled in the bracket G, a hollow perforated cone in said cylinder upon said shaft provided with an upward-extending sleeve and journaled in the bottom of the cylinder, propelling-blades on said cone and sleeve, and means for rotating the shaft, substantially as and for the purpose set forth.

7. In a drier, the combination with the drying-chambers proper and the casing, of a hollow perforated cylinder, a hopper located above said cylinder, a jacket surrounding said cylinder provided with an outlet, a discharge-pipe leading from said cylinder to the top drying-chamber proper, a perforated cone journaled in said cylinder and provided with propeller-blades and with a discharge-opening at its lower end, a drip-pan suspended beneath said cylinder, and means for rotating said cone, substantially as and for the purpose set forth.

8. In a drier, the combination with the drying-chambers proper and the casing, of a hollow perforated cylinder, a hopper located above said cylinder, a jacket surrounding said cylinder provided with an outlet, a discharge-pipe leading from said cylinder to the top drying-chamber proper, a bracket G supported by the casing, a shaft H journaled therein, a hollow perforated cone rigidly attached to the shaft and provided with a discharge-outlet at its bottom, propelling-blades upon the cone, a drip-pan L suspended beneath said cylinder provided with a sleeve or hub L′ for the passage of the shaft H, and means for rotating the shaft, substantially as and for the purpose set forth.

9. In a drier, the combination with the drying-chambers proper, heating-pipes therein, and gears connected with said heating-pipes for rotating them, of introductory-feed mechanism, comprising a stationary perforated member, a revolving perforated member concentric therewith and forming with the stationary member an annular chamber having converging walls, propeller-blades on the revolving member, gear connection between said revolving member and the gearing of said heating-pipes, and means of communication

between said annular chamber and the first of said drying-chambers, substantially as and for the purpose set forth.

10. In a drier, the combination with a drying-chamber, of rotating conveyer-combs provided with teeth having propelling-surfaces inclined both to the axis of rotation and to a plane containing said axis, substantially as and for the purpose set forth.

OTTO MEINSHAUSEN.

In presence of—
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J. H. LEE.