

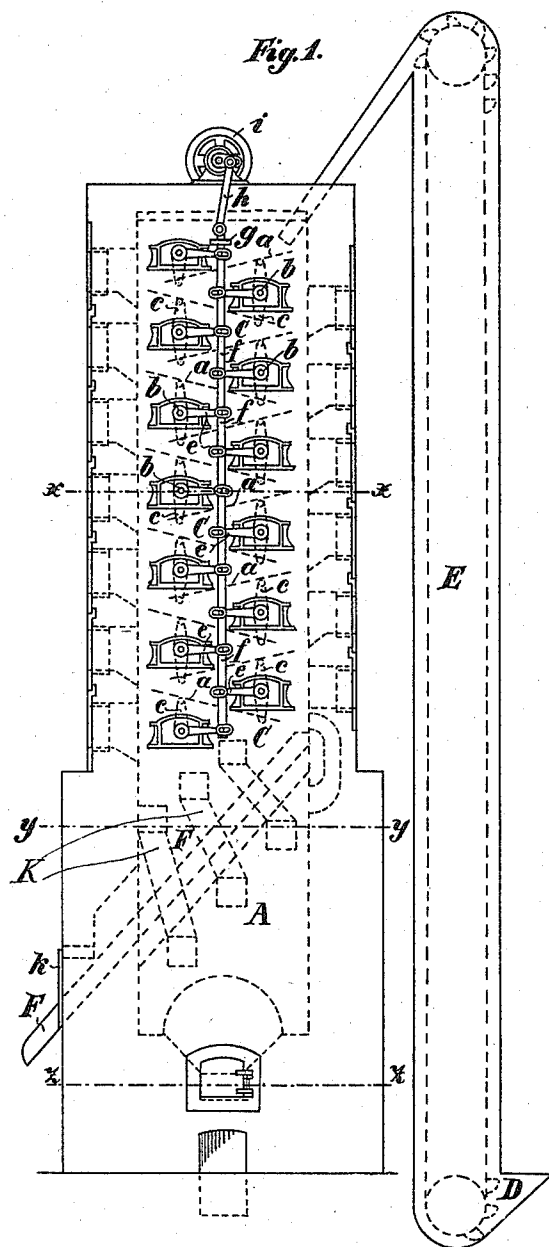
(No Model.)

3 Sheets—Sheet 1.

L. KLIPPERT.
DRYING KILN.

No. 579,398.

Patented Mar. 23, 1897.



Witnesses:

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Inventor:
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his atty.

(No Model.)

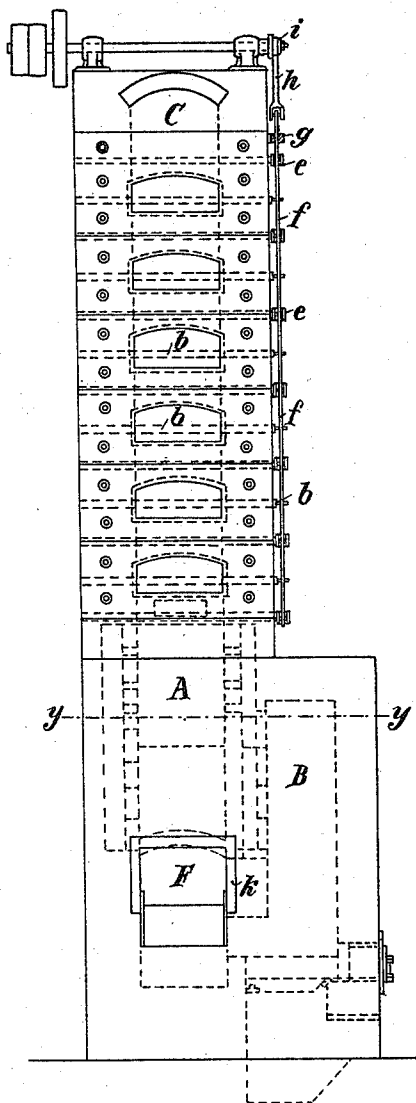
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Fig. 2.



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(No Model.)

3 Sheets—Sheet 3.

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Fig. 3.

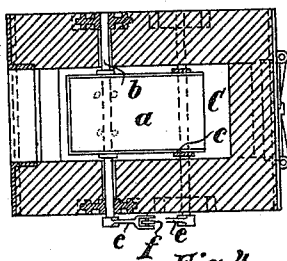


Fig. 4.

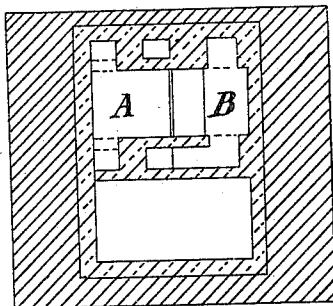
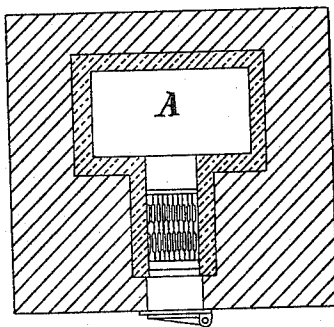


Fig. 5.



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UNITED STATES PATENT OFFICE.

LUDWIG KLIPPERT, OF STETTIN, GERMANY.

DRYING-KILN.

SPECIFICATION forming part of Letters Patent No. 579,398, dated March 23, 1897.

Application filed September 3, 1896. Serial No. 604,708. (No model.) Patented in Germany April 2, 1895, No. 85,273; in England June 24, 1895, No. 12,243; in Belgium June 24, 1895, No. 116,255; in France June 24, 1895, No. 248,403; in Italy June 25, 1895, LXXVII, 98; in Hungary July 4, 1895, No. 3,154, and in Austria September 13, 1895, No. 3,257.

To all whom it may concern:

Be it known that I, LUDWIG KLIPPERT, doctor of philosophy, a subject of the King of Prussia, Emperor of Germany, residing at Stettin, in the Kingdom of Prussia, German Empire, have invented new and useful Improvements in Drying-Kilns, (for which I have obtained patents in Germany, No. 85,273, bearing date April 2, 1895; in Great Britain, No. 12,243, bearing date June 24, 1895; in Belgium, No. 116,255, bearing date June 24, 1895; in France, No. 248,403, bearing date June 24, 1895; in Austria, No. 3,257, bearing date September 13, 1895; in Hungary, No. 3,154, bearing date July 4, 1895, and in Italy, No. 98, Vol. LXXVII, bearing date June 25, 1895,) of which the following is a specification.

This invention relates to an improved vertical drying-kiln adapted to operate by vibration or oscillation, and has for its object to dry materials such as manure, superphosphates, gypsum, malt, and the like; and the invention consists in certain improvements in the mechanism for suspending and imparting motion to the shaking-surfaces receiving the material to be dried, as well as in the method of circulating the hot drying-gases around the delivery-chute for the purpose of effecting a supplemental or final desiccation, as required.

The invention will be best understood by reference to the accompanying drawings, illustrating an improved vertical kiln constructed according to this invention, but I do not limit myself to the precise details.

Figure 1 is a front elevation, and Fig. 2 a side elevation, of the improved kiln. Figs. 3 to 5 are sections thereof on lines $x x$, $y y$, and $z z$, Fig. 1, respectively.

A and B are heating-chambers, forming a continuation of the fire-chamber or furnace, and C is the shaft or flue constituting the drying-chamber proper. After the said heating-chambers and shaft or flue have been moderately heated the material to be dried is introduced into the kiln by placing it in a trough or hopper D of an elevator E. It is thence transferred and delivered by the movement of the elevator onto the uppermost of a

series of alternately-inclined shaking plates or frames a . Owing to the inclined position of these plates and to the up, down, and side-ward motion imparted to them, the material is caused to pass from the top to that next below and then in succession to each of the remaining plates, all of which are subjected to the same shaking or reciprocating motion. In order to prevent the shaking plates or trays from moving endwise with reference to the supports, I provide pins x (seen in Fig. 3) on each side of the upper supports or spindles b , which laterally embrace the same. From the bottom plate the material drops into a channel or chute F, leading to the discharge-door h , constituting a collector where the material may be retained, so as to be subjected to a final stage of drying and steaming by the heated gases which circulate round the said chute by the passages K for that purpose. The shaft or flue C of the kiln is fitted with a number of spindles b , arranged alternately, to support which special boxes or bearings, adapted to be cooled by cold air, are provided in the sides of the kiln. On both sides of each of the spindles b lever-arms are arranged. From one of the arms of each lever c one side of the shaking frame or plate a is suspended, while the other side of such plate or frame is supported and connected by means of a strong hinged or jointed link to the upper lever-arm of the spindle following next in succession. The said spindles b on one of the outer sides of the shaft or flue C are also provided with levers e , directed toward each other and terminating in slotted heads taking into pins mounted on a vertically-pushing rod f . The said rod f is guided, as shown at g , and is coupled by a connecting rod or link h , which is adjustable on the crank i , mounted on a rotating shaft on the top of the kiln. Owing to this adjustability the extent of motion of the shaking-frames (when the shaft is rotated) may be varied, and consequently the amount and quality of the work to be performed by the kiln, according to the amount of moisture to be removed from the material to be dried and the time required for drying it. The peculiar manner in which the inner double lever-arms are adapted to move to-

ward each other and the arcs of circles which the operative points or portions of such lever-arms describe serve to impart to the plates or frames both an up-and-down reciprocating motion and a lateral motion. Owing to the simultaneous movement of the plates inward and outward, the momentum is, moreover, properly balanced, so that any oscillation of the kiln itself is avoided, and a smooth and even operation is insured, which is perfectly safe from any interruption through concussion shocks or jerks, so that the masonry and other parts of the kiln are protected from wear. The up-and-down motion of the plates or frames has the effect of breaking up or loosening the material to be dried, whereby the action of the hot gases is assisted and more fully taken advantage of than has been possible hitherto.

Owing to the hot gases circulating round the inclined chute F by means of channels K, this portion of the apparatus can be utilized for collecting considerable quantities of

material, so that such material may be subjected in bulk in such inclined channel to a final drying stage before it is allowed to drop out of the kiln by the removal of the sliding door *k*.

Having now particularly described and ascertained the nature of my invention, what I claim is—

In a vertical kiln for drying granular materials on alternately-inclined shaking-plates the combination of spindles *b* with levers *c*, carrying the plates, and with levers *e* actuated by crank *i*, connecting-rod *h* adjustable on the crank and rod *f* essentially as described and shown.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

LUDWIG KLIPPERT.

Witnesses:

CONRAD SCHIPPMANN,
RICHARD SCHMIDT.