



No. 750,262.

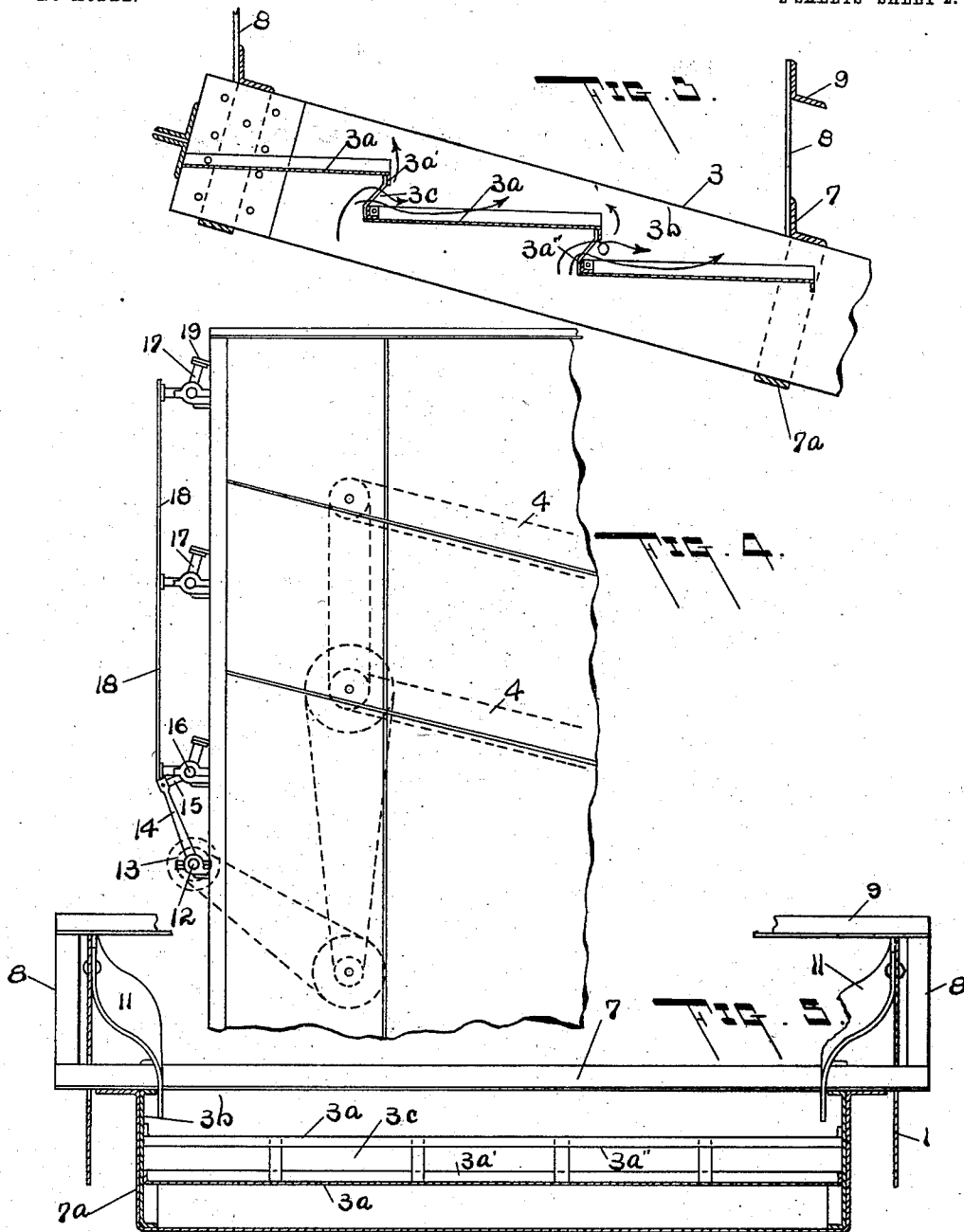
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VIBRATORY DRIER.

APPLICATION FILED MAY 11, 1903.

NO MODEL.

2 SHEETS—SHEET 2.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

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## VIBRATORY DRIER.

SPECIFICATION forming part of Letters Patent No. 750,262, dated January 26, 1904.

Application filed May 11, 1903. Serial No. 156,714. (No model.)

*To all whom it may concern:*

Be it known that I, MORTIMER E. COOLEY, a citizen of the United States, residing at Ann Arbor, in the county of Washtenaw and State of Michigan, have invented certain new and useful Improvements in Vibratory Driers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This is a machine for drying peat or other materials by repeatedly subjecting the material while being agitated or vibrated to the action of numerous currents of heated air. The mechanism by which the material is repeatedly agitated and cascaded during the drying process and the devices whereby heated air is deflected against the agitated particles, so as to contact with every part thereof, together with certain constructions hereinafter described, comprise the subject-matter of this invention.

The drier is illustrated in the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section. Fig. 2 is an end view. Fig. 3 is a vertical longitudinal section of a part of one of the shakers. Fig. 4 is a side view of the driving-gear. Fig. 5 is an enlarged cross-section, broken away in part, through one of the shakers.

The apparatus comprises a housing or drying-chamber 1 of any suitable material, but preferably of sheet metal, covered with a layer of non-conducting material 2, such as mineral wool, inclosing a series of parallel downwardly-inclined shakers 3. Ascending belt conveyers 4 (indicated by dotted lines in Fig. 1) are arranged between successive shakers. The shakers 3 consist in a series of slightly-inclined pans or plates 3<sup>a</sup>, arranged in echelon and supported at their ends between two inclined side plates or channels 3<sup>b</sup>. The ends of successive plates 3<sup>a</sup> overlap, and each plate has a downwardly-turned flange 3<sup>c</sup> along its lower edge and an upwardly-turned flange 3<sup>c'</sup> along its upper edge. These flanges prevent the loss of peat through the openings 3<sup>c</sup> between the pans, and the space between them

forms a passage through which the hot gases pass. The peat receives heat in two ways: first, directly from the pans 3<sup>a</sup> as it is slowly passed over them by the vibration of the shaker and, second, by direct contact with the currents of hot air as it drops or cascades from pan to pan. The flanges 3<sup>c</sup> and 3<sup>c'</sup> impart a downward swirling motion to these currents of air and cause them to envelop each particle as it cascades. The flanges also deflect the air-currents over the upper surfaces of the pans before they rise to the shaker above, as shown by arrows in Fig. 3, thereby remaining longer in contact with the dancing particles on the vibrating pan. The last pan 3<sup>a</sup> in the lowest shaker is slanted downwardly to let the peat slide easily over it to the conveyer below.

To the shakers 3 are secured transverse bars 7, fastened by straps 7<sup>a</sup>. The angles 7 preferably project outside the housing and are there suspended by flat spring suspension-straps secured at their upper ends to suitable cross-bars 9, carried by the housing. The suspension-straps 8 are rigidly secured to both the bars 7 and 9, but are adapted to yield transversely to permit the back-and-forth vibration of the pans.

Deflectors or baffle-plates 10 are provided at the ends of the drying-chamber, and side baffles 11 (shown in Fig. 5) are secured to the housing along the sides of each shaker. The hot gases cannot reach the stack 1<sup>c</sup> without flowing through the openings 3<sup>c</sup> between the pans of each shaker. The material is still further subjected to the drying action of the hot gases while passing upward on the conveyers 4. The under or slack side of the conveyer may be supported at intervals by rollers 4<sup>a</sup>. These conveyers are of any suitable form adapted to catch the material as it leaves the lower end of one shaker and deposit it on the upper end of the next shaker. In the drawings I have shown a drier employing a series of three shakers and two conveyers; but a greater or less number may be used, as circumstances require.

In the operation of the machine material to be dried is received through an opening 1<sup>a</sup> in the top of the housing and passing over

the successive shakers is discharged through an opening 1<sup>b</sup> in the lower part of the casing into a suitable conveyer-trough 5. The shakers are preferably driven from a revolving main shaft 12 by eccentrics 13, connecting-rods 14, lever-arms 15, a main rocking shaft 16, bell-crank levers 17, upright driving-bars 18, and shaker driving-bars 19. The main shaft 12 also drives the conveyers 4 by means of the belts shown by dotted lines in Fig. 4. The upright driving-bars 18 are flat springs rigidly secured to the horizontal arms of the bell-crank levers, and the shaker driving-bars 19 are also flat spring-bars, each rigidly secured at one end to the upright arm of one of the bell-crank levers and at its other end to one of the shakers. The spring-bars yield transversely to their plane of motion and are superior for this purpose to pivoted links, for they run smoother and with less noise. The resilience of bar 18 cushions the shakers at the end of each vibration. To further take up the inertia of the vibrating shakers and assist in reversing and accelerating their motion, thereby relieving the eccentrics of a portion of their load, I provide springs 20 of coil or other shape at the opposite ends of the shakers. Each spring is fixed at one end to the shaker, and a screw 20<sup>a</sup> for putting the spring under initial tension is provided at the other end. By adjusting the tension of the springs the period of vibration of the shaker can be regulated so as to minimize the effort on the eccentrics.

Small shakers may be operated by a single bell-crank, while for larger shakers two or three levers may be used. In the machine illustrated I have shown three levers and three upright driving-bars for each shaker.

Heated air may be used for drying the material, or waste furnace-gases may be employed. The gases are received in an air-chamber 6 in the lower part of the housing through a duct 6<sup>a</sup> or in any other manner and are admitted to the drying-chamber at several points under the lowest shaker by openings 6<sup>b</sup> and ducts 6<sup>c</sup> and 6<sup>d</sup>, that extend different distances under the shaker. The hottest and driest air is contacted with the material that is already nearly dry, thus absorbing its remnant of moisture before it is discharged from the machine. After reaching the top of the chamber 1 by passing repeatedly through the cascades of material falling from pan to pan and after thoroughly intermingling with the particles as they dance on the vibrating pans the gases are discharged through the stack 1<sup>c</sup>.

What I claim as my invention, and desire to secure by Letters Patent, is as follows:

1. A drier comprising in combination series of inclined chutes adapted to vibrate longitudinally; each chute comprising a plurality of inclined pans arranged in echelon, a downwardly-projecting flange on the lower edge of

each pan, an upwardly-projecting flange on the upper edge of the next succeeding pan and underlapping the flange of the first pan; a plurality of bell-crank levers arranged in vertical series and adapted to oscillate; a vertical transversely-yielding bar-spring connecting the horizontal members of said levers and rigidly secured to each; a transversely-yielding bar-spring for each lever, having one end rigidly secured to the vertical member of the lever and the other end secured to the chute; conveyers adapted to carry material from the foot of one chute to the top of the next chute; a housing inclosing said chutes and conveyers; means for discharging heated gases into said housing simultaneously at several points below the lowest chute; suitable baffles, and means for actuating said chutes and conveyers.

2. A drier comprising in combination series of inclined chutes adapted to vibrate longitudinally, each of said series comprising a plurality of pans arranged in echelon and having successively overlapping flanged edges arranged to leave openings for the passage of air between the pans and to deflect the air downward against the upper surfaces of the pans; means for supporting and vibrating said pans; conveyers adapted to carry material from the foot of each chute to the top of the next chute; a housing inclosing said shakers and conveyers; means for admitting heated gases into said housing simultaneously at several points below the lowest chute; baffles adapted to guide the gases through and over the series of pans; means for discharging gases from above the upper chute; and means for actuating said chutes and conveyers.

3. In a drier having a series of vibrating pans arranged in echelon and provided with means for operating them; a downwardly-projecting flange on the lower edge of each pan; an upwardly-projecting flange on the upper edge of the next succeeding pan and underlapping the flange of the first pan, said flanges being arranged to interrupt ascending currents of air and to deflect them downward with a swirling movement against the upper surfaces of the pans.

4. In a drier having vibrating shakers; means for vibrating the shakers, comprising a plurality of bell-crank levers arranged in vertical series and adapted to oscillate; a vertical transversely-yielding bar-spring connecting the horizontal members of said levers and rigidly secured to each; a transversely-yielding bar-spring for each lever, having one end rigidly secured to the vertical member of the lever and the other end secured to the shaker.

5. In a drier having vibrating shakers; means for vibrating the shakers, comprising a plurality of bell-crank levers arranged in vertical series and adapted to oscillate; a vertical transversely-yielding bar-spring connecting the horizontal members of said levers and rig-

idly secured to each; a transversely-yielding  
bar-spring for each lever, having one end rig-  
idly secured to the vertical member of the le-  
ver and the other end secured to the shaker;  
5 together with cushioning-springs secured to  
said shakers and means for adjusting the ten-  
sion in said springs.

In testimony whereof I affix my signature  
in presence of two witnesses.

MORTIMER E. COOLEY.

Witnesses:

JAMES H. WADE,  
GEORGE D. WILLCOX.