

S. C. DAVIDSON.
 APPARATUS FOR DRYING TEA, COFFEE, GRAIN, OR OTHER SUBSTANCES.

APPLICATION FILED MAR. 18, 1908.

Patented May 11, 1909.

4 SHEETS—SHEET 1.

921,206.

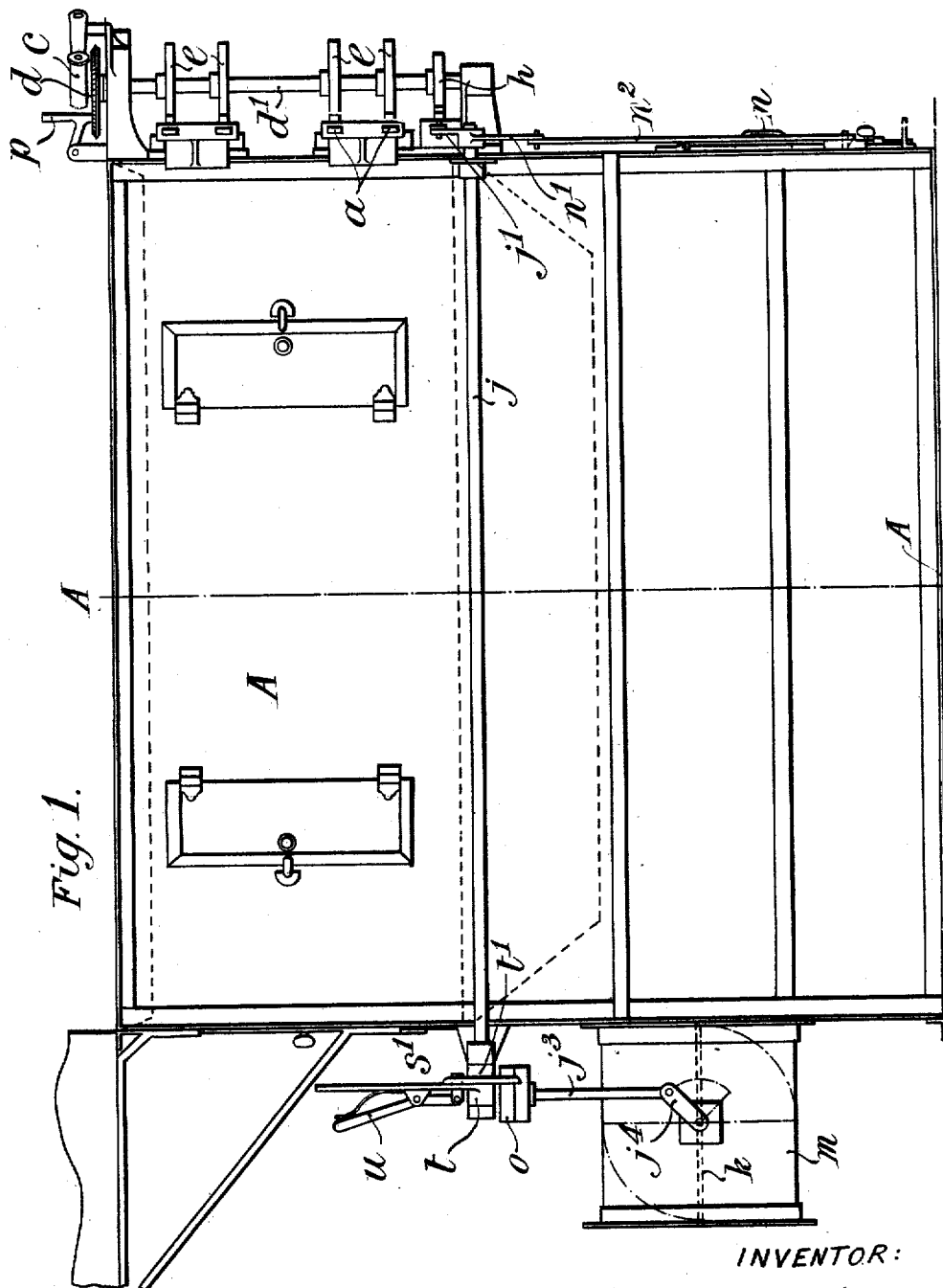


Fig. 1.

WITNESSES:

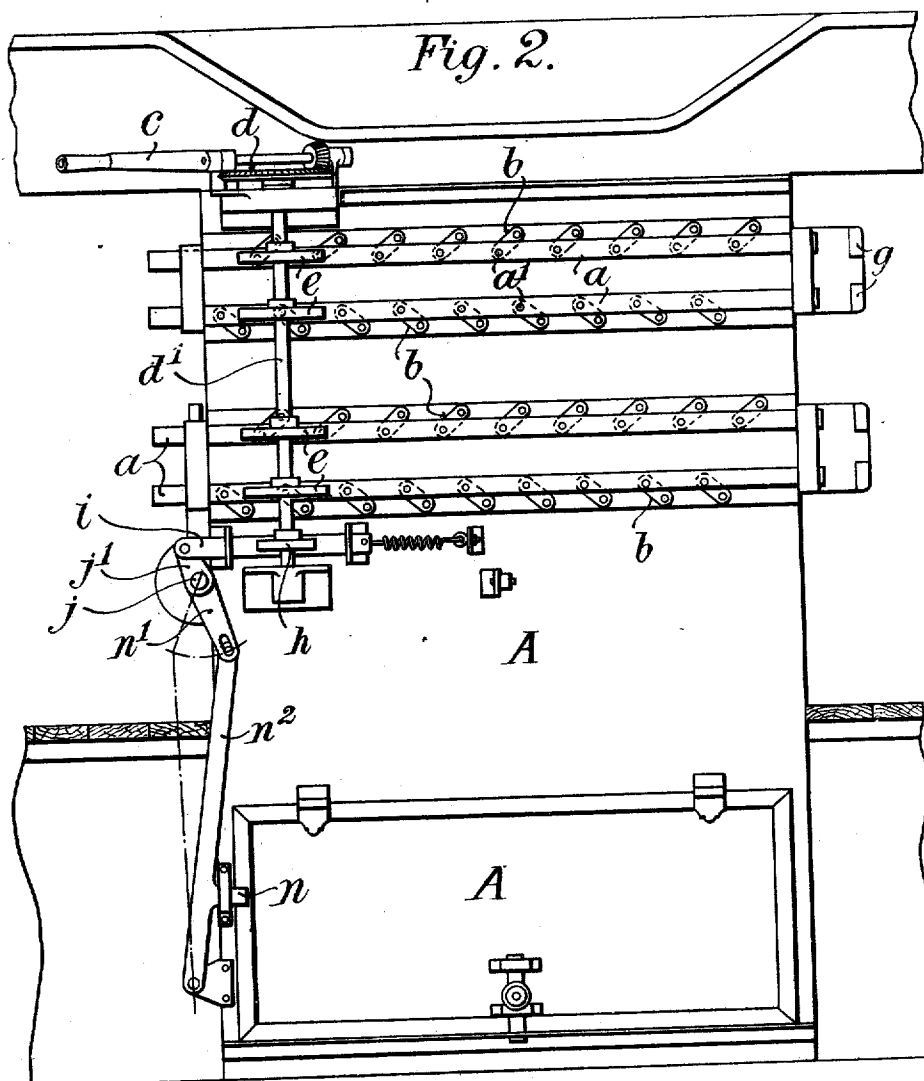
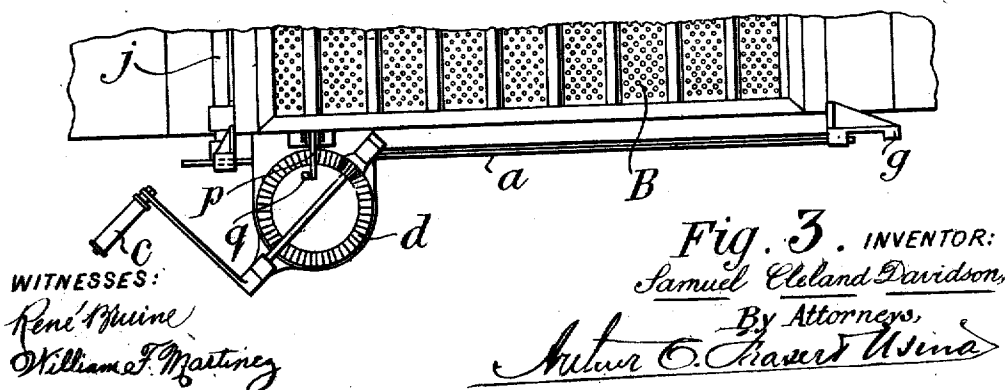
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WITNESSES:

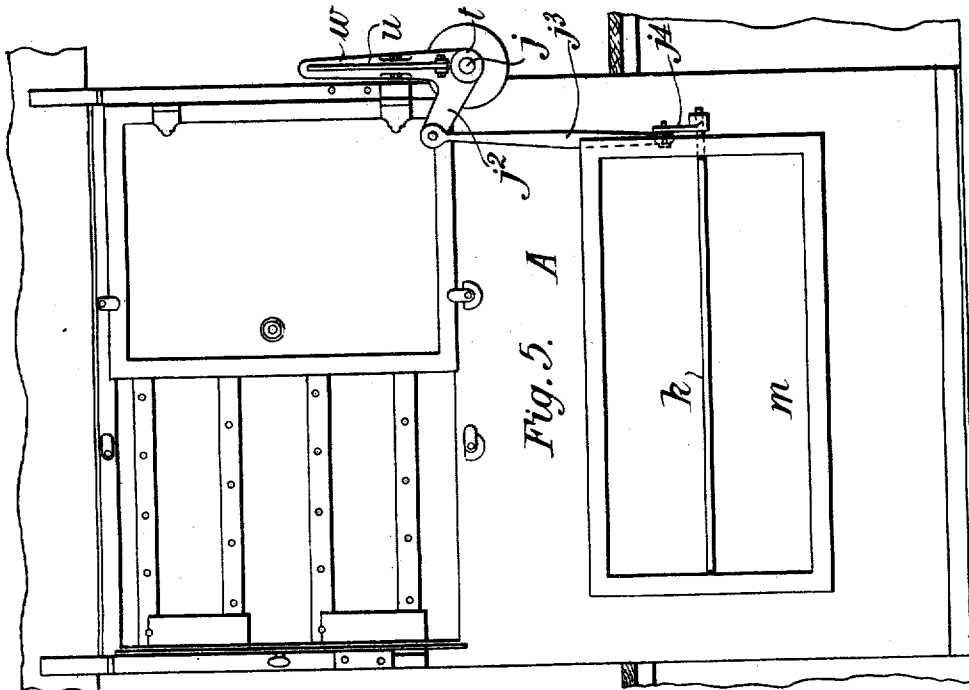
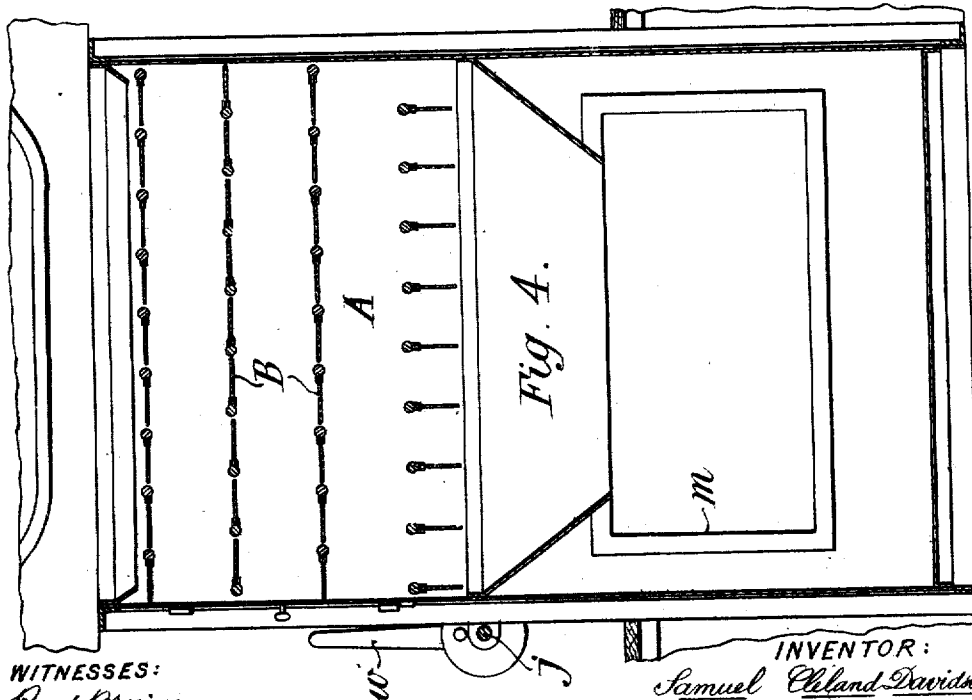
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4 SHEETS—SHEET 3.



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4 SHEETS—SHEET 4.

Fig. 6.

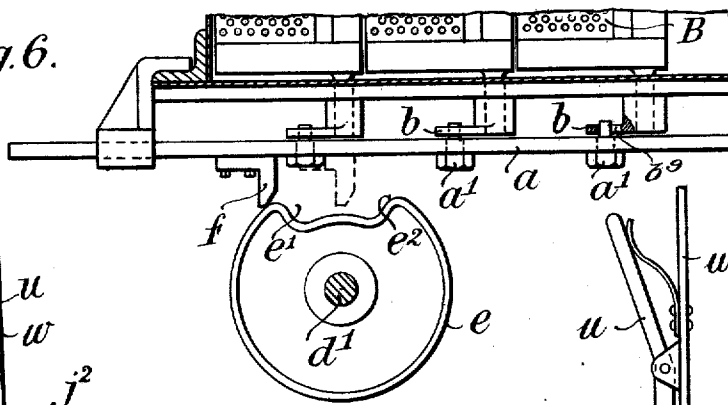
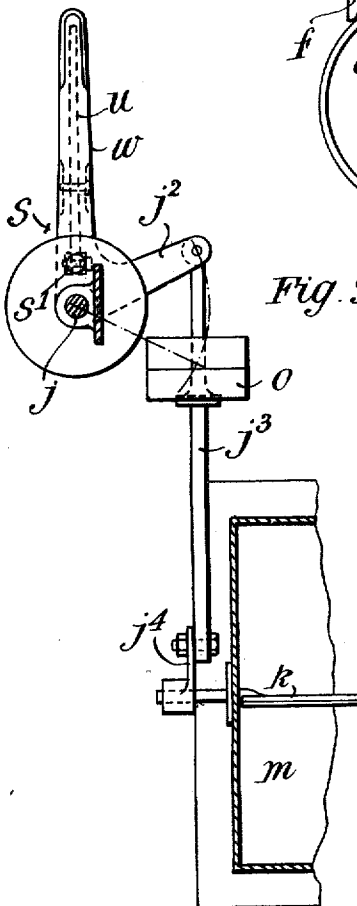


Fig. 9.

Fig. 8.

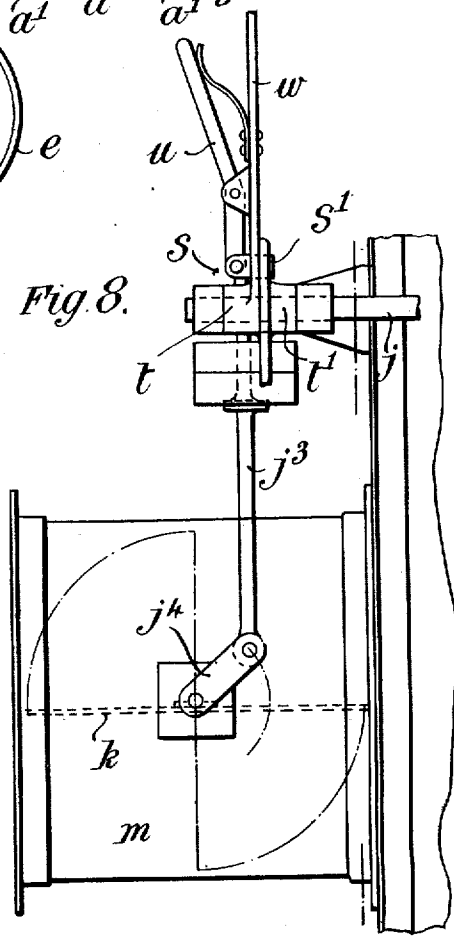
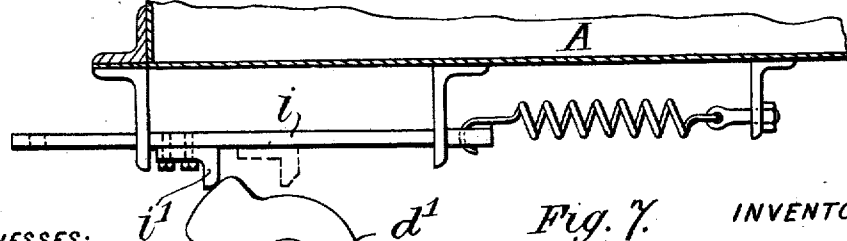


Fig. 7.

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UNITED STATES PATENT OFFICE.

SAMUEL CLELAND DAVIDSON, OF BELFAST, IRELAND.

APPARATUS FOR DRYING TEA, COFFEE, GRAIN, OR OTHER SUBSTANCES.

No. 921,206.

Specification of Letters Patent.

Patented May 11, 1909.

Application filed March 18, 1908. Serial No. 421,950.

To all whom it may concern:

Be it known that I, SAMUEL CLELAND DAVIDSON, of Sirocco Engineering Works, Belfast, Ireland, merchant, have invented certain new and useful Improvements in or Relating to Apparatus for Drying Tea, Coffee, Grain, or other Substances, of which the following is a specification.

My invention has for its object to provide an improved construction of drying apparatus, the invention being particularly applicable to the known type of drying apparatus wherein vegetable or other material is exposed to the action of a permeating current of heated or desiccated air through same when spread in layers upon superimposed horizontal surfaces and inclosed within a suitably constructed chamber, each of said surfaces being formed of long narrow trays of perforated sheet metal or other foraminous material, the trays in each series being longitudinally parallel to one another with their edges contiguous when in a horizontal position, each tray being pivoted at both ends and the pivots at one end fitted with cranks which engage into a sliding crank bar which at one end of its movement holds the trays in the horizontal position and at the other end of its movement tilts them over to a vertical position and thus drops the material thereon through to the next lower surface of trays, or into a receptacle or discharge chute in the base of the chamber, as the case may be.

In apparatus of the above described construction, the material to be treated is firstly spread on the top line of trays, and after remaining there a sufficient length of time, the trays are tilted whereby the material drops through to the next lower line of trays. Fresh material is then spread upon the top line, and after a further sufficient interval the lower line is then firstly tilted and brought back to the horizontal position which leaves these trays empty, after which the line of trays immediately over the same is tilted as previously described. This operation is similarly repeated according to the number of superimposed surfaces employed the lower line of trays being always tilted first. The material thus passes from the top to the lowest line of trays, and thence into a collecting or discharge receptacle in the base of the chamber inclosing the trays.

According to this invention, in such apparatus I employ in combination with the sliding crank bars or equivalent means for coup-

ling the trays together a series of rotary circular cams or disks one for each line of trays said circular cams or disks being formed with a gap and so arranged that the body or edge of the cam or disk normally holds the trays in horizontal position against their overhanging weight, or the pull of an applied weight or spring and the gap first releases the trays which fall with a jerk or concussive drop to vertical or tilted position the continued rotation of the cam and the following end of the gap therein serving to restore the tray to the horizontal position. Such means are provided for operating said cams as will automatically insure and effect the tilting of each line of trays in proper consecutive order, and with a jerk or free and concussive drop to effectively clear the trays of any material which otherwise might adhere to them. Means are also provided whereby the supply of heated or desiccated air is automatically cut off and prevented from passing through the trays and material thereon, during one cycle of their tilting operation, so that the material may fall from one line to the other in still air, and means also serving to re-admit the air supply as soon as the top line of trays resume their horizontal position after tilting. Further a clutch appliance is provided by the movement of which the attendant can cut off the air supply independently of any movement of the tray tilting mechanism to enable said attendant to at any time inspect, without the occurrence of any outblast of air, the material on the bottom or any other of the intermediate line of trays, through doors provided thereof in the side of the drying chamber, and, in addition, as the door through which the dried material is removed from the collecting receptacle in the base of the drying chamber must not be opened while the air supply is under pressure therein, a locking appliance is connected up to the above referred to tray tilting mechanism, whereby while the air pressure is on, said discharge door is locked, but when the tray tilting cycle is in operation, and the air pressure is off, said locking device is drawn back, so that the door can then be opened and the material drawn out of the receptacle in still air.

Reference to the accompanying drawings will more fully explain the nature of my invention and how same is carried into effect.

Figure 1 shows an outside front elevation of a machine of the type herein described

having my invention applied thereto. Fig. 2 is an outside end elevation of Fig. 1. Fig. 3 is a part plan view. Fig. 4 is a sectional end elevation through A—A on Fig. 1. Fig. 5 is an outside end elevation showing the opposite end of the machine from Fig. 2 and with one of the doors on same open; Fig. 6 is an enlarged sectional plan showing the circular shaped cams for tilting the lines of trays; Fig. 7 shows an enlarged sectional plan of the cam for operating the opening and closing of the valve in the air supply duct; Fig. 8 is an enlarged view of the clutch device and cranks for closing the air supply valve independently of the arrangement provided in the cycle of operations; and Fig. 9 is a side elevation of Fig. 8.

In the drawings A is the drying chamber in which the several superimposed rows of tilting perforated trays B are disposed. The trays B are mounted at each end upon pivots which are extended out of the casing at one side and provided with cranks b.

a are the sliding crank bars (one for each line of trays) to which the respective cranks b are coupled, and which are actuated in successive order by the turning of a handle c which, through gearing d, gradually rotates a vertical shaft d' carrying a series of cams e each provided with a gap e' the gaps on the several cams being arranged in such order that the rotative movement firstly releases one of the crank bars a which owing to the weight of the trays B acting thereon through cranks b then flies back and allows one line of trays to tilt to a vertical hanging position, and thus discharge the material thereon into the collecting receptacle in the base of the drying chamber A, and the further rotation of the shaft d' and cams e draws back said crank bars A and thereby raises the said first line of trays up again to a horizontal position before tilting the next line above, then the gap e' of the next upper cam e comes into position to let its line of trays tilt and deposit their material on to the lower trays, and, immediately this second line of trays is drawn up to the horizontal position, the next upper cam lets the third line of trays tilt and so on to the top line.

The cranks b on the end of each pivoted tray B are mounted in the ordinary way on the pivot, and have slots b^o (see Fig. 6) at their other ends into which pins a' project from the sliding crank bars a. Each crank bar a moves horizontally and when it is at one end of its travel the trays are in a horizontal position and when at the other end in a vertical hanging position (as shown in Fig. 4).

The projecting tooth or stud f on each crank bar a is held in contact with the circumference or its own cam e by the down pull due to the overhanging weight of the trays B from their pivots, so that when the gap e' in

the cam comes around to it, the crank bar a flies back with a concussive tap against a stop g provided at its other end, which tap effectually shakes the material off the trays, and on to the next line of trays below, and the further revolution of the cam brings the other side of the gap e' into contact with said tooth or stud f and gradually pushes the crank bar a back, bringing the emptied trays again to the horizontal position. To raise the lines of trays from the vertical to the horizontal position, a gradual push forward against the down pull of the hanging trays is imparted to the tooth f by means of the trigger like projection e² on the circular shaped disks or cams at the trailing end of the gap e' cut into their circumference, and which engages the projecting tooth or stud f on the crank bar a. The whole series of disks e are so mounted on their vertical carrying shaft d' that one revolution of same causes the successive operation of each of the crank bars, and the gearing d from the operating handle c to the shaft d' is so arranged that one turn of the handle c operates one crank bar a, so that as many turns of the handle as there are crank bars tilts all the lines of trays as one complete cycle, beginning with the bottom line first.

In addition to the already described cams e, another cam h hereinafter called the "air controlling cam" is mounted at the lower end of the vertical shaft d', which operates a spring or weight returned sliding bar i through a tooth or stud i' in the same way as that already described in respect of the crank bars a. Said sliding bar i is connected to and operates a crank j' mounted on the end of a horizontal shaft j which is provided at its other end with a second crank j² for operating, through suitable links and cranks j³ j⁴, the valve k in the air supply duct m leading into the base of the drying chamber A. Said crank j' in addition to operating the shaft or spindle j also serves to operate through pivoted arms n' n² a locking bar device n on the discharge door A² in the base of the drying chamber A simultaneously with the closing of the air supply valve k, and said door A² can then be opened and the material withdrawn in still air. The thrust of the stud i' of the sliding bar i against the air controlling cam h may be provided by a spring as shown in Fig. 7 but preferably by a weight o mounted as shown in Figs. 8 and 9 on the air valve connecting link j³ so applied that when the thrust on the cam h is released the valve closes with sufficient strength to operate the other items of this mechanism.

The gearing d from the handle c to the vertical shaft d' is provided with a pawl p which, at the end of each complete revolution of the vertical shaft d' engages with a stop q on the large gear wheel, and prevents the starting

of the next cycle of tilting, until this pawl *p* is disengaged.

In my improved apparatus as hereinbefore described, the trays are so pivoted as to fall from the horizontal to the vertical position by their own weight when released, but I do not confine myself to trays so pivoted as they may, be pivoted otherwise, if desired.

s is the clutch device on the horizontal shaft *j* by means of which the air supply valve *k* may be closed independently of the means provided for the tilting cycle. *s'* is the pin for connecting the loose part *t* of the clutch to the part *t'* fixed upon the shaft *j*. The pin *s'* is kept in position by a spring acting on the lever *u*. By pressing the lever *u* toward the handle *w*, the pin *s'* is withdrawn and the handle *w* may then be freely turned for closing the valve.

What I claim and desire to secure by Letters Patent is:—

1. In drying apparatus of the type referred to, the combination of superimposed lines of tilting trays, a crank for each tilting tray, sliding crank bars one for each line of trays and coupling the several cranks thereof together, a series of rotary circular cam devices one for each line of trays, a projecting tooth fixed on the side of each sliding crank bar and engaging with the cams, the formation and arrangement of said cams being such that when operated each cam acts in succession first to hold the tooth with the crank bars and tilting trays in horizontal position, then to release the tooth and allow the trays to move to tilted position, and then to reengage the tooth and restore the trays to horizontal position, and means for operating said cams.

2. In drying apparatus of the type referred to the combination of superimposed lines of tilting trays, a crank for each tilting tray, sliding crank bars one for each line of trays and coupling the several cranks thereof together, a series of circular cams having gaps in their periphery disposed in different position in each cam, one cam being provided for each sliding crank bar and line of trays, projections on the sliding crank bars engaging the cams, the arrangement of said gaps in the cams and the projections on the crank rods being such that when operated they act in succession to successively tilt from and restore to horizontal position the several lines of trays, means for operating said cams.

3. In drying apparatus of the type referred to, the combination of superimposed lines of tilting trays, a crank for each tilting tray, sliding crank bars one for each line of trays and coupling the several cranks thereof together, a series of rotary circular cam devices one for each line of trays, projections upon the sliding crank bars engaging the cams, the formation and arrangement of said cams being such that when operated

they act in succession to successively tilt from and restore to horizontal position the several lines of trays means for operating said cams, an air admission valve in the drying apparatus an additional air controlling cam coupled to said valve, said air controlling cam serving to close the air valve while the trays are being tilted and open said air valve when all the said trays have returned to horizontal position, means for operating said additional air controlling cam in unison with the others.

4. In drying apparatus of the type referred to, the combination of superimposed lines of tilting trays, a crank for each tilting tray, sliding crank bars one for each line of trays and coupling the several cranks thereof together, a series of rotary circular cam devices one for each line of trays, projections upon the sliding crank bars engaging the cams, the formation and arrangement of said cams being such that when operated they act in succession to successively tilt from and restore to horizontal position the several lines of trays, a shaft common to all said cams, means for operating said shaft, an air admission valve in the drying apparatus, and an additional air controlling cam coupled to said air valve said air controlling cam serving to close the air valve while the trays are being tilted and open said air valve when all said trays return to horizontal position, means for operating said additional air controlling cam in unison with the others.

5. A drying apparatus of the type described, consisting of the combination of a drying chamber, a series of superimposed lines of pivotally mounted tilting trays therein, sliding crank bars one for each line of trays, rotary circular cam devices for releasing said sliding crank bars in succession and restoring cams to normal position for holding said trays horizontally a cam for closing the valve in the air supply duct during the operation of tilting all the lines of trays and for opening said valve when tilting operation is completed, manually operated means for operating said cams, a clutch appliance for operating the closing and opening of the valve in the air supply duct independently of the cam appliance, all substantially as hereinbefore described and represented.

6. A drying apparatus of the type described, consisting of the combination of a drying chamber, a series of superimposed lines of pivotally mounted tilting trays therein, sliding crank bars one for each line of trays, rotary circular cam devices for releasing said sliding crank bars in succession and restoring cams to normal position for holding said trays horizontally a cam for closing the valve in the air supply duct during the operation of tilting all the lines of trays and for opening said valve when tilting

operation is completed, means for operating said cams from handle or hand wheel, a clutch appliance for operating the closing and opening of the valve in the air supply duct independently of the cam appliance, a locking device for preventing the discharge door being opened while the air supply is on, all substantially as hereinbefore described and represented.

7. In drying apparatus of the type referred to, the combination of superimposed lines of tilting trays, a crank for each tilting tray, sliding crank bars one for each line of trays and coupling the several cranks thereof together, a series of rotary circular cam devices one for each line of trays, projections upon the sliding crank bars engaging the cams, the formation and arrangement of said cams being such that when operated they act in succession to successively tilt from and restore to horizontal position the several lines of trays, means for operating said cams, a catch for locking the operating means at the end of the cycle of movements comprised by one complete operation of all the several crank bars.

8. In drying apparatus of the type re-

ferred to the combination of superimposed lines of tilting trays, a crank for each tilting tray, sliding crank bars one for each line of trays and coupling the several cranks thereof together, a series of rotary circular cams having gaps in their peripheries disposed in different position in each cam, one cam being provided for each sliding crank bar and line of trays, projections on the sliding crank bars engaging the cams, the arrangement of said gaps in the cams and the projections on the crank rods being such that when operated they act in succession to successively tilt from and restore to horizontal position the several lines of trays, means for operating said cams, a catch for locking the operating means at the end of the cycle of movements comprised by one complete operation of all the several sliding crank bars.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

SAMUEL CLELAND DAVIDSON.

Witnesses:

JOHN CLEAVER,
SAMUEL WOOD.