

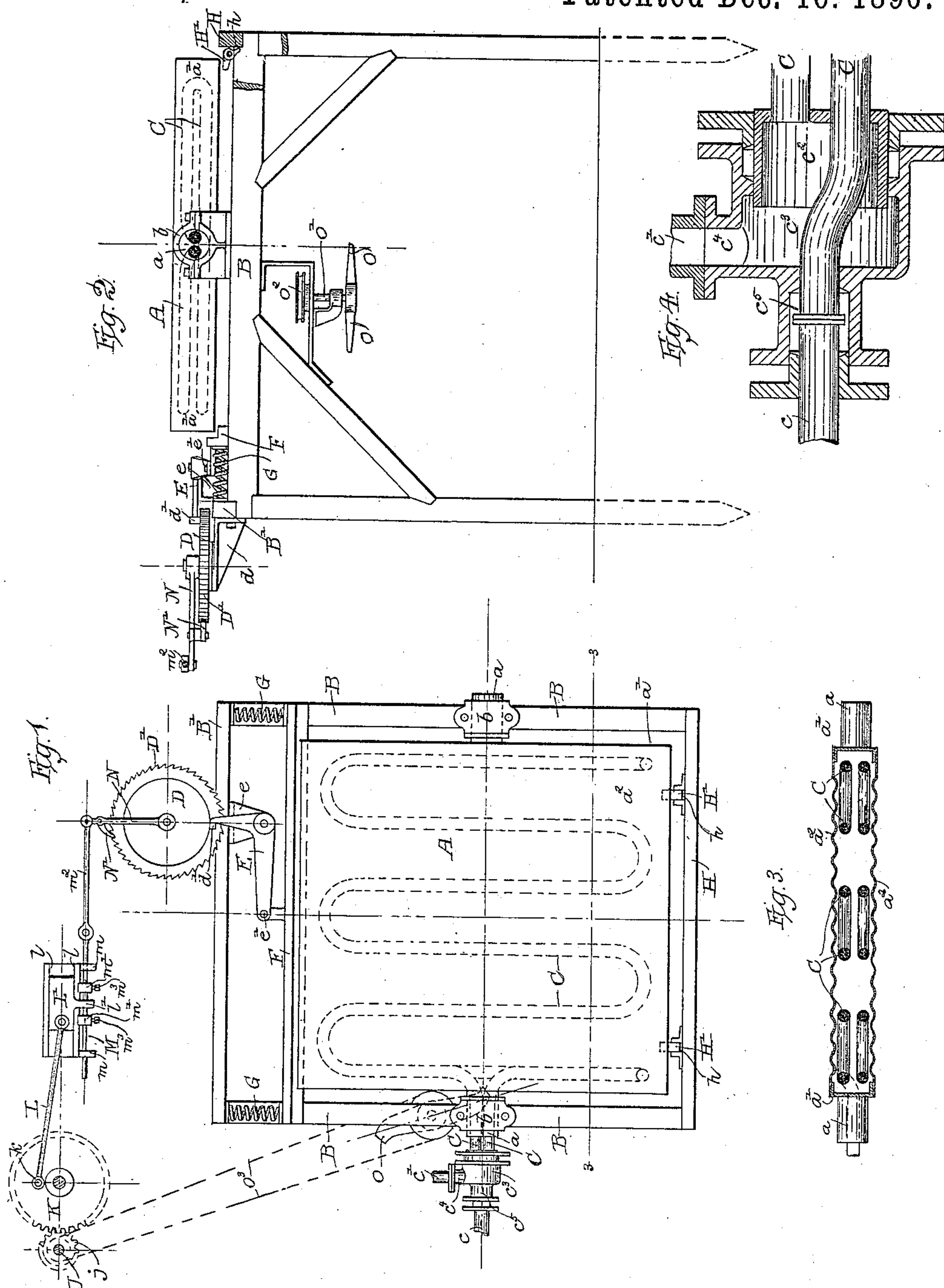
(No Model.)

3 Sheets—Sheet 1.

A. GUILLAUME.
DRYING APPARATUS.

No. 442,806.

Patented Dec. 16. 1890.



Witnesses:—
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Herbert H. Albani

Inventor:—
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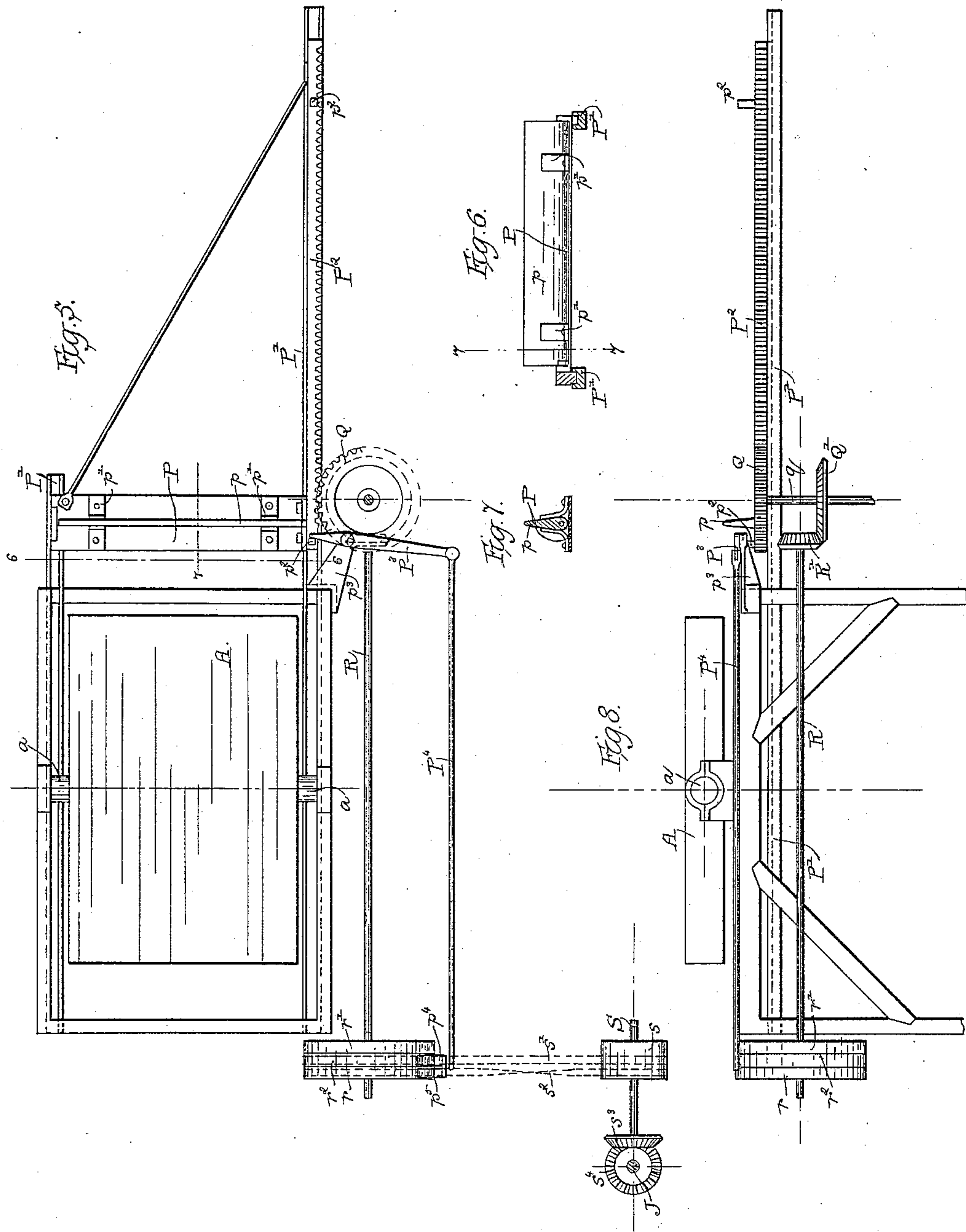
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3 Sheets—Sheet 2.

A. GUILLAUME.
DRYING APPARATUS.

No. 442,806.

Patented Dec. 16. 1890.



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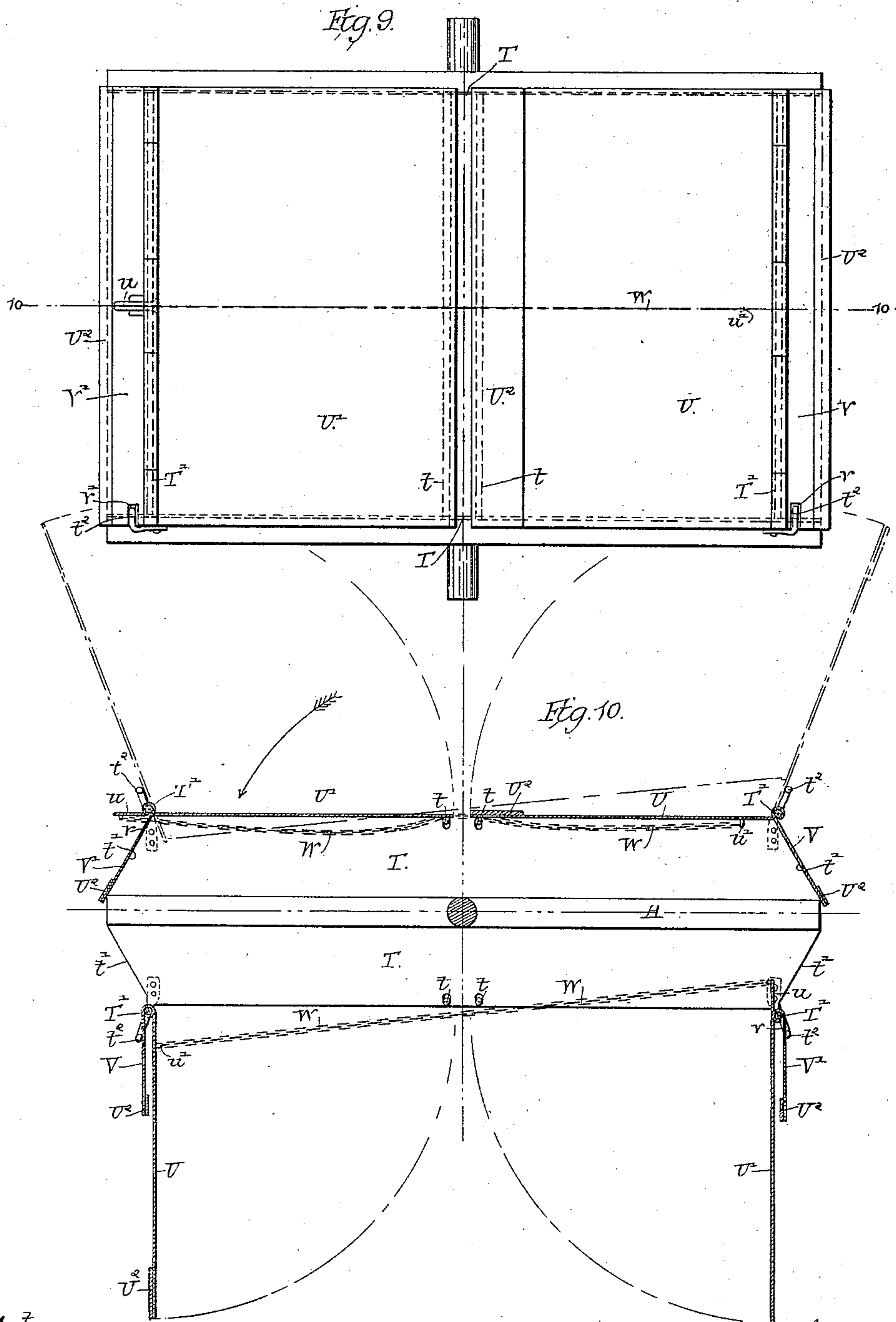
(No Model.)

3 Sheets—Sheet 3.

A. GUILLAUME.
DRYING APPARATUS.

No. 442,806.

Patented Dec. 16. 1890.



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UNITED STATES PATENT OFFICE.

ALFRED GUILLAUME, OF CHICAGO, ILLINOIS.

DRYING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 442,806, dated December 16, 1890.

Application filed June 7, 1890. Serial No. 354,548. (No model.)

To all whom it may concern:

Be it known that I, ALFRED GUILLAUME, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Drying Apparatus; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in drying apparatus adapted for drying ores, malt, fruit, and other materials, whereby the handling of the material is facilitated, the employment of hand labor in drying is lessened, and a greater uniformity of results in drying is obtained.

The invention consists in the matters hereinafter described, and pointed out in the appended claims.

In the accompanying drawings, illustrating my invention, Figure 1 is a plan view of a drying apparatus embodying the same. Fig. 2 is an end elevation of the parts shown in Fig. 1. Fig. 3 is a detail section taken upon line 3 3 of Fig. 1. Fig. 4 is an enlarged detail section of a part shown in Fig. 1. Fig. 5 is a plan view illustrating a scraping apparatus applied to the drier shown in Figs. 1 and 2. Fig. 6 is a detail section taken upon line 6 6 of Fig. 5. Fig. 7 is a detail section taken upon line 7 7 of Figs. 5 and 6. Fig. 8 is a side view of parts shown in Fig. 5. Fig. 9 is a plan view of the platform shown in Fig. 1, provided with an inclosure or cover. Fig. 10 is a sectional view taken upon line 10 10 of Fig. 9.

As shown in said drawings, A is a revolving platform or floor-section constituting the supporting-surface of the drier, upon which the material to be dried is placed. Said floor-section is made alike on both sides and is pivotally supported by means of bearings or trunnions a , located at opposite sides of the floor-section and mounted in bearings b upon supporting frame-pieces B B. The floor-section is preferably made of thin metal in hollow or box form and is provided in its interior with means for heating its opposite flat sides to facilitate the drying of the material placed thereon. In the particular construction illustrated the floor-section consists of a rectangular frame a' , Fig. 3, to the opposite

edges of which are riveted or otherwise secured metal plates a^2 a^3 , preferably of corrugated galvanized iron. Said plates a^2 a^3 , forming the opposite sides of the floor-section, are desirably made of corrugated metal, in order to form channels to facilitate the discharge of water from the material being dried. Whenever found necessary or desirable, the floor-section may be provided with ledges extending around three of its sides to prevent the material from falling therefrom.

As herein shown, the devices for heating the floor-section A consist of a pipe C of copper or other metal, which are placed in zigzag or coil form within the hollow interior of the floor-section and adapted for the circulation therein of steam or hot water. One of the trunnions a of the floor-section is herein shown as made of tubular form to allow the insertion through it of the ends of the pipe C. Said pipe C will be provided outside of the trunnion with any convenient form of joint or connection with the stationary supply and discharge pipes c c' , adapted to allow the floor-section to be turned. The connection herein shown, Figs. 1 and 4, consists of a cylindric plug c^2 , in which both ends of the pipe C are inserted, and a shell c^3 , in which the said plug turns and which is provided with a lateral outlet c^4 , with which the pipe c' is connected, and with a stuffing-box c^5 in alignment with the central axis of the plug c^2 , one end of the pipe C being arranged to open into the shell c^3 , so as to communicate with the outlet c^4 , and the other end of said pipe being carried through the shell and inserted in the stuffing-box, within which it is connected with the pipe C by means of annular contact-faces in the manner illustrated. The construction described in the floor-section A permits the latter to be given a half-rotation or reversed in position when desired, thereby accomplishing the discharge of the dried material resting upon the top of the floor-section and bringing the opposite side of the floor-section into position to receive a new load or charge.

D is a ratchet disk or wheel arranged horizontally near the floor-section A, said wheel being herein shown as mounted upon a bracket d , attached to a cross-beam B', which is attached to the frame-pieces B B.

E is a bell-crank lever which is pivoted upon a bracket *e*, also attached to the beam B', said bell-crank lever having one of its arms located in position to engage a stop *d'*, 5 secured to the ratchet-wheel D. The other arm of said lever is connected by a pivot *e'* with a horizontal sliding bar F, which rests upon the frame-pieces B B and is adapted to slide laterally toward and from the pivotal 10 axis of the floor-section A.

G G are springs applied to throw the said sliding bar F toward the floor-section, said springs being herein shown as made of coiled form and as placed between the ends of the 15 beam B' and the sliding bar F. Said bar F is so arranged as to rest normally in position to engage one end of the floor-section A when the latter is in its horizontal position, and to thereby prevent that edge of the floor-section 20 from being swung downwardly. At the side of the floor-section opposite the said bar F is located a horizontal beam H, to which are attached two movable stops or latches H' H'. Said latches consist of short arms pivoted at 25 their outer ends to the beam H and extending horizontally beneath the edge of the floor-section A when the latter is in its horizontal position. The latches H' H' are adapted to swing or yield upwardly, but are held from 30 swinging downwardly from their horizontal position by means of lugs *h h*, which rest against the beam H and prevent any movement of the free ends of the latches except in an upward direction.

It follows from the construction described 35 that the floor-section A will be held in a horizontal position and is prevented from swinging in either direction by the sliding bar F and the latches H' H', which engage 40 opposite edges of the said floor-section. Said sliding bar F is, however, adapted to be drawn laterally away from the floor-section, so as to allow the adjacent edge of said floor-section to swing downwardly past the bar, while the 45 latches H' H' are adapted to allow the edge of the floor-section to swing freely upward past them, so that the said floor-section can be turned in one direction only. The bar F is restored to its position for engagement with 50 the edge of the floor-section after the bar has been moved to release the same by the action of the springs G G as soon as the bell-crank lever is free from the stop *d'*, and the floor-section, after it has made a half-rotation, will 55 engage the bar and will be again held in its horizontal position by the said bar and by the latches H' H'.

In the operation of the apparatus the bar F is released at regular intervals by contact 60 of the said stop *d'* of the wheel D with the bell-crank lever E, and said ratchet-wheel may be rotated at a regular speed by any desirable or preferred form of driving-gear, instead of by the ratchet-gear illustrated. The 65 said wheel is, however, arranged to turn at such speed as to give a desired time for the drying of the material on the floor-section

before the latter is rotated to discharge the material.

Devices for turning said ratchet-wheel D 70 are herein shown as follows: J indicates a revolving shaft, on which is secured a spur-gear *j*, intermeshing with a gear-wheel K. Said gear-wheel K is provided with a wrist-pin *k*, which is engaged with one end of a connecting-rod L, the opposite end of which is con- 75 nected with a sliding block L', moving in guides or ways *ll*. Said sliding block L' is provided with a lug or projection *l'*, adapted to slide on a rod M. Said rod M is mounted 80 in guides *m m*, so that it may slide or move freely in a longitudinal direction, and is provided with two stops *m' m'*, which are secured to said rod M on opposite sides of the 85 lug *l'*. Said rod M is connected at one end by means of a pitman *m²* with an oscillating arm N, mounted concentrically with the ratchet-wheel D. Upon said arm N is mounted 90 a pawl N', which engages ratchet-teeth D' upon the periphery of the ratchet-wheel D. These parts are so arranged that in the reciprocatory motion of the block L' the lug *l'* is brought alternately into contact with the 95 stops *m' m'*, thereby moving the rod M and arm N backward and forward, and through the medium of the pawl N' and the ratchet-teeth giving a slow rotary movement to the ratchet-wheel D. The stops *m' m'* are secured by 100 set-screws *m³ m³* to the rod M, and by shifting said stops the arm N may be given a greater or less amplitude of oscillatory movement and the wheel may be turned faster or slower, as desired.

The side of the floor-section A nearest the sliding bar F will commonly be loaded somewhat heavier than the opposite side of the 105 floor-section, so that each time the said sliding bar is drawn back by the action of the ratchet-wheel D and bell-crank lever E the floor will turn on its pivot and thereby accomplish automatically the discharge of the 110 material on the floor-section at intervals of time determined by the speed of rotation of the wheel D.

The floor-section when allowed to rotate by 115 the withdrawal of the bar F in the manner described will not usually resume its horizontal position, and unless special devices are provided for moving automatically the floor-section until it has completed a half-rotation 120 it will be necessary to complete the turning of the same by hand. As herein shown, however, I have provided a special mechanism designed to catch the edge of the floor-section when the same has reached an approxi- 125 mately vertical position and throw it farther around until its upper edge is brought into contact with the sliding bar F. For this purpose O O indicate two radially-arranged revolving arms mounted upon a vertical shaft 130 O', said arms being so located that they will engage one of the side edges of that part of the floor-section which depends from the trunnions. When the floor-section is struck

by one of the revolving arms, said floor-section will be thrown forward with sufficient force to insure its being carried by its impetus into a horizontal position. The shaft 5 O' is located at that side of the central axis of the floor-section nearest the downwardly-moving side of the same, and inasmuch as the weight of the load will usually carry the floor-section into a vertical position, or nearly so, 10 when the load is dumped the depending part of the floor-section will commonly be swung at such time by the action of the load past the said shaft, so that one of the revolving arms will act upon the rear side of the floor-section to thrust the depending part of the 15 same forwardly and upwardly. It is obvious that if the floor-section, when swung downwardly by the weight of the load, were to stop opposite or in front of that one of the revolving arms which is moving toward the edge of the section at the time, the rotation of the arms might be stopped by the striking of the said arm against the edge of the floor-section; but this is unlikely to occur in the construction 25 illustrated by reason of the fact that the weight of the load swings the depending part of the floor-section forward of the shaft, so that the revolving arms will approach and act upon the rear surface of said depending part in the manner above set forth. The shaft O', supporting the arms O O, may be actuated in any convenient manner. As herein shown, said shaft is provided with a rope-pulley O², over which passes a wire rope O³, leading from a 35 pulley j' on the shaft J.

It follows from the construction described that at each rotation of the ratchet-wheel D the floor-section is released, caused to swing through a half-rotation, and is arrested after 40 such half-rotation by striking the sliding bar F, which, together with the latches H' H', hold the floor in its horizontal position until again released and rotated in the same manner.

In the use of a revolving floor-section, arranged as above described, in drying granular and non-adhesive materials the load upon the floor-section will slide or fall from the same as it is turned and will be received upon a surface or within a receptacle placed beneath the floor-section. If the material to be 50 dried is of an adhesive or glutinous nature, however, it is necessary to scrape the same from the surface of the floor-section after the latter has been reversed, and as a separate 55 and further improvement I provide, in connection with the revolving floor-section illustrated, a device for automatically scraping adhering material from the under surface of the floor-section.

This device is shown in Figs. 5 to 8, and is made as follows: P is a reciprocating plate or frame mounted on guides or rails P' P' and adapted to move back and forth beneath 60 and parallel with the floor-section A. Upon the said frame P is mounted a vertically-arranged scraper p, herein shown as consisting of a flat plate or blade pivoted at its lower

edge to the frame. The said scraper p is held in an upright position by means of springs p' p', which are secured to the frame P and 70 bear against opposite sides of the scraper, so as to hold the same in an upright position, while at the same time allowing it to swing or yield when it comes in contact with the under side of the floor-section in its reciprocatory movement. 75

Devices are herein shown for giving reciprocatory movement to the said scraper and its supporting-frame as follows: P² is a rack-bar attached to the scraper-frame P, preferably at one end of the same. Q is a gear-wheel intermeshing with the rack-bar P² and 80 mounted on a shaft q which also carries a beveled gear-wheel Q'. R is a shaft arranged at right angles with the shaft q and provided 85 with a beveled gear-wheel R', intermeshing with the gear-wheel Q'. Said shaft is provided with loose pulleys r r' and an intermediate pulley r², which is affixed to the shaft. S is a second shaft arranged parallel with the 90 shaft R and provided with a belt-pulley s, over which is trained straight and crossed belts s' s². The shaft S is shown as driven by means of beveled gears s³ s⁴ from the shaft J, hereinbefore described. The rack P² is 95 provided at its opposite ends with stops p² p². P³ is a lever which is pivoted to a bracket p³ with its shorter end in position to engage the stops p² p². The opposite end of the lever P³ is connected with a rod P⁴, which carries two 100 ordinary belt-shifters p⁴ p⁵, said belt-shifters being engaged, respectively, with the straight and crossed belts s' and s². The said stops p² p² operate in a well-known manner through the lever P³ and belt-shifters p⁴ p⁵ to carry 105 the crossed and straight belts alternately upon the fixed pulley r², and thus reverse the motion of the scraper at each limit of its movement.

While I have shown a rack and pinion for 110 the reversing-gear as a means of giving reciprocatory movement to the scraper p, yet the employment of an actuating device of this character is not essential, inasmuch as 115 any other well-known or preferred mechanism for giving reciprocatory movement to the said scraper may be employed with the same effect.

As far as the features of construction in the revolving floor-section are concerned, other 120 means than that described may be employed for heating said floor-section to facilitate the drying of the material thereon—as, for instance, steam, hot air, or hot water may be 125 passed through the spaces or passages in the floor-section made otherwise than as herein shown, or an electric heating device of any suitable kind may be located within the said floor-section to impart heat to the same.

In Figs. 9 and 10 I have shown a casing or 130 covering adapted to surround or inclose material placed upon the revolving floor-section A, so as to confine the heat of the floor-section within a small space adjacent to mate-

rial being operated upon, and to thereby facilitate the drying operation. As shown in Figs. 9 and 10, T T are side plates or flanges arranged at the side margins of the floor-section A and extending outwardly therefrom at right angles to the flat sides of the same. Attached to the side flanges are four transverse bars or rods T' T' *t t*. The bars T' T' are arranged near the ends of the floor-section and are secured at the corners or angles of the said plates or flanges T T, while the cross-bars *t t* are located adjacent to each other opposite the middle part of the floor-section. The edges *t' t'* of the flanges T T at the ends of said flanges are beveled or inclined inwardly from the ends of the floor-section, so that the distance between the rods T' T' is considerably less than the length of the floor-section. U U' are doors or flaps which are hinged to the cross-bars T' T' and which when closed are adapted to extend to the middle of the floor-section, but which are preferably arranged to form a space or slot between their meeting edges to allow the escape of moisture-laden air from the material being dried. The said flaps are preferably arranged to rest against the cross-bars *t t*, which are provided for the purpose of sustaining the inner edges of the same. V V' are other similar flaps or doors also hinged to the cross-bars T' T' and adapted to rest when closed against the end margins *t' t'* of the side plates or flanges T T, so as to close the spaces at the end of the floor-section. The said flaps U U' and V V' at each side of the floor-section when closed together form a casing or inclosure over the sides of the same, said flaps in the use of the apparatus being closed at the side of the floor-section which is uppermost to cover or inclose the material thereon and being open at the side of the floor-section which is lowermost.

In order to provide a construction in the said several doors or flaps whereby the flaps at each side of the floor-section will be automatically brought and held in their open position when the side of the floor-section to which they belong is brought uppermost, so that the floor-section will be in readiness to receive its load without manipulation of the flaps by hand, I provide the following construction: The door or flap U' on each side of the floor-section is provided adjacent to the bar T, upon which it is hinged, with an arm *u*, extending from the hinge of the door in the direction opposite the body of the same, said arm *u* being arranged to pass through a notch or recess *v*, cut in the adjacent door or flap V' in the manner shown. W W are chains attached to the ends of the arm *u* at one end and at the opposite end to the inner surface of the opposite door or flap U at a point *u'* which is at the same distance from the pivot of the door as the length of the arm *u*. Each of the flaps U U, to which the chains W W are connected in the manner described, are provided with weights U² U², or are otherwise

constructed, so that they are heavier than the doors U U'. Stops *t² t²* are secured to the side plates T T in position to engage the flaps V V' when the latter are open and swing slightly backward from a position at right angles to the face of the floor-section. Said stops consist of metal bars secured to the outer faces of said plates T T and bent inwardly at their outer ends into position for contact with the outer surfaces of the flaps V V', the flaps V V' being provided with notches *v v'* to allow the passage of the stops in the swinging of the said flaps V V', as clearly shown in the drawings.

The operation of the flaps constructed as described is as follows: The flaps above the platform or floor-section being closed, as shown in Fig. 10, when the floor-section is revolved in the direction of the arrow, Fig. 10, the flaps fall open by gravity when the floor-section has reached a vertical position or has passed somewhat beyond the same. Both of the flaps U and U' at the lower side of the floor-section being open, as shown in the lower part of Fig. 10, as the floor-section is reversed or turned on its pivot the flap U' will move upward and will tend to fall into a closed position; but, the flap U being heavier than said flap U' by reason of the weight U², said flap U' will be prevented from closing by the chain W, which connects the flaps in the manner described. Thus when the floor-section is vertical the flap which is then lowermost—to wit, the flap U—will on account of its superior weight hold the flap U' open as far as the latter can move or swing—that is to say, it takes the position shown in the dotted lines at the left-hand side of Fig. 10, being held from opening farther or swinging farther backward by the stop *t²*. It follows that when the floor-section has made a complete half-turn the flap U' will retain its outwardly-inclined position and the flap U will fall backward against the stop *t²*, thus slacking the chain W and bringing the parts into the position shown in the dotted lines in Fig. 10. The end flaps V V' having at this time closed by their own weight, the same are closed and the top doors left open ready for charging the floor-section. When the floor-section is charged, the top doors can then be closed by hand. When the doors are present and arranged in the manner described, the scraper for removing adhering substances from the lower surface of the floor-section will be arranged to operate through the space left open by the end doors or flaps V V'; but when it is not necessary to use a scraper said end doors may be dispensed with and the material discharged solely through the space afforded by the opening of the flaps U U'.

One important feature of my invention is embraced in a construction by which, in connection with the revolving floor-section illustrated, devices are provided for automatically turning or rotating said floor-section. The devices herein shown for this purpose consist

of the revolving arms O O acting to swing or throw the lower part of the floor-section upward after the latter has been released and caused to partially turn by the weight of the material on its descending side, in the manner above described. As far as this feature of the invention is concerned, however, I do not wish to be limited to such revolving arms as a means of turning the floor-section, inasmuch as a great variety of devices may be employed for the same purpose without involving a departure from my invention.

I claim as my invention—

1. A drying apparatus comprising a pivotally-supported reversible floor-section having opposite parallel exterior receiving-surfaces for the material to be dried.

2. A drying apparatus comprising a pivotally-supported reversible floor-section having opposite parallel exterior receiving-surfaces for the articles to be dried, and means for holding said floor-section in a horizontal position.

3. A drying apparatus comprising a pivotally-supported reversible floor-section having opposite parallel exterior surfaces to receive the material to be dried, and means within the floor-section for heating the same.

4. A drying apparatus comprising a pivotally-supported revolving floor-section, an upwardly-yielding catch or latch to engage one side of the floor-section, and a movable or shifting stop engaging the other side of the floor-section, substantially as described.

5. A drying apparatus comprising a revolving floor-section, a spring-actuated shifting or movable stop resting normally in position to engage the revolving floor-section, a revolving wheel carrying a pin or stud, and means connected with and moving said stop adapted to engage the said pin or stud of the wheel, substantially as described.

6. A drying apparatus comprising a revolving floor-section, a spring-actuated shifting or movable stop resting normally in position to engage the revolving floor-section, a revolving wheel carrying a pin or stud, means connected with and moving said stop and adapted to engage the said pin or stud of the wheel, and means for actuating said wheel, embracing an oscillating pawl and ratchet, a longitudinally-sliding rod connected therewith and provided with two adjustable stops, and a reciprocating block carrying a lug adapted to engage said stops, whereby the speed of rotation of the wheel may be changed as desired, substantially as described.

7. A drying apparatus comprising a pivoted reversible floor-section and a reciprocating scraping mechanism acting upon the under surface of said floor-section, substantially as described.

8. A drying apparatus comprising a pivoted reversible floor-section and a reciprocating

scraping mechanism embracing a vertically-arranged yielding scraper acting upon the under surface of said floor-section.

9. A drying apparatus comprising a pivoted reversible floor-section, a reciprocating scraper-frame, a vertically-arranged scraper hinged to the scraper-frame, and springs holding the said scraper in its vertical position, substantially as described.

10. A drying apparatus comprising a revolving floor-section having opposite surfaces to receive the material to be dried, means for heating the floor-section, and a casing or housing covering the sides of said floor-section and comprising doors or flaps which may be opened to allow the discharge of material from the floor-section, substantially as described.

11. A drying apparatus comprising a revolving floor-section having opposite surfaces to receive the material to be dried, means for heating the floor-section, and a casing or housing covering the opposite sides of the floor-section and embracing two doors or flaps at each side of the floor-section, said doors or flaps being hinged at opposite ends of the floor-section and connected by a chain, and one of the flaps being weighted for the purpose of holding open the other flap during the turning of the floor-section, substantially as described.

12. A drying apparatus comprising a revolving floor-section having opposite surfaces to receive the material to be dried, means for heating the floor-section, and a casing or housing covering both sides of the floor-section, and consisting of side plates or flanges attached to the floor-section, flaps hinged at their outer margins to said flanges near the opposite ends of the floor-section and closing inwardly, and other doors or flaps also hinged to the said flanges and adapted to close the spaces adjacent to the ends of the floor-section, substantially as described.

13. The combination, with a revolving floor-section having opposite parallel exterior receiving-surfaces and means for locking or holding said section in a longitudinal position, of means for rotating or turning the said floor-section in discharging the dried material therefrom, substantially as described.

14. The combination, with the revolving floor-section and means for holding the same in its horizontal position, of means for turning the floor-section, consisting of revolving arms arranged to engage the rear surface of the floor-section, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

ALFRED GUILLAUME.

Witnesses:

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GEORGE W. HIGGINS, Jr.