July 5, 1938. F. G. LOUGEE 2,122,800

MATRIX DRYING MACHINE

Filed Dec. 21, 1935 4 Sheets-Sheet 1

Fig. 1.

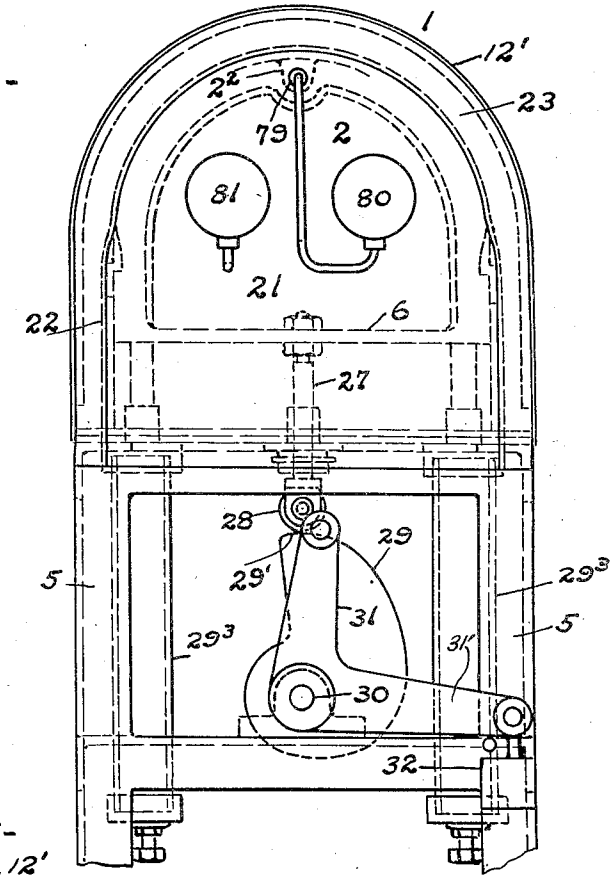


Fig. 4.

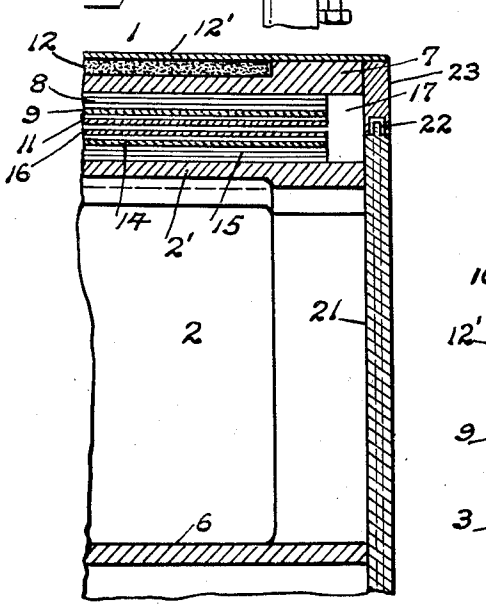
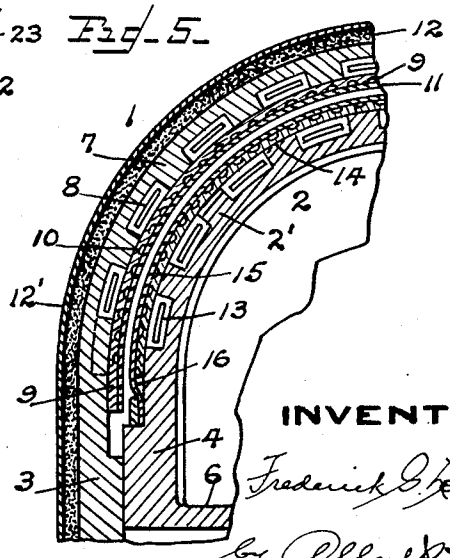


Fig. 5.



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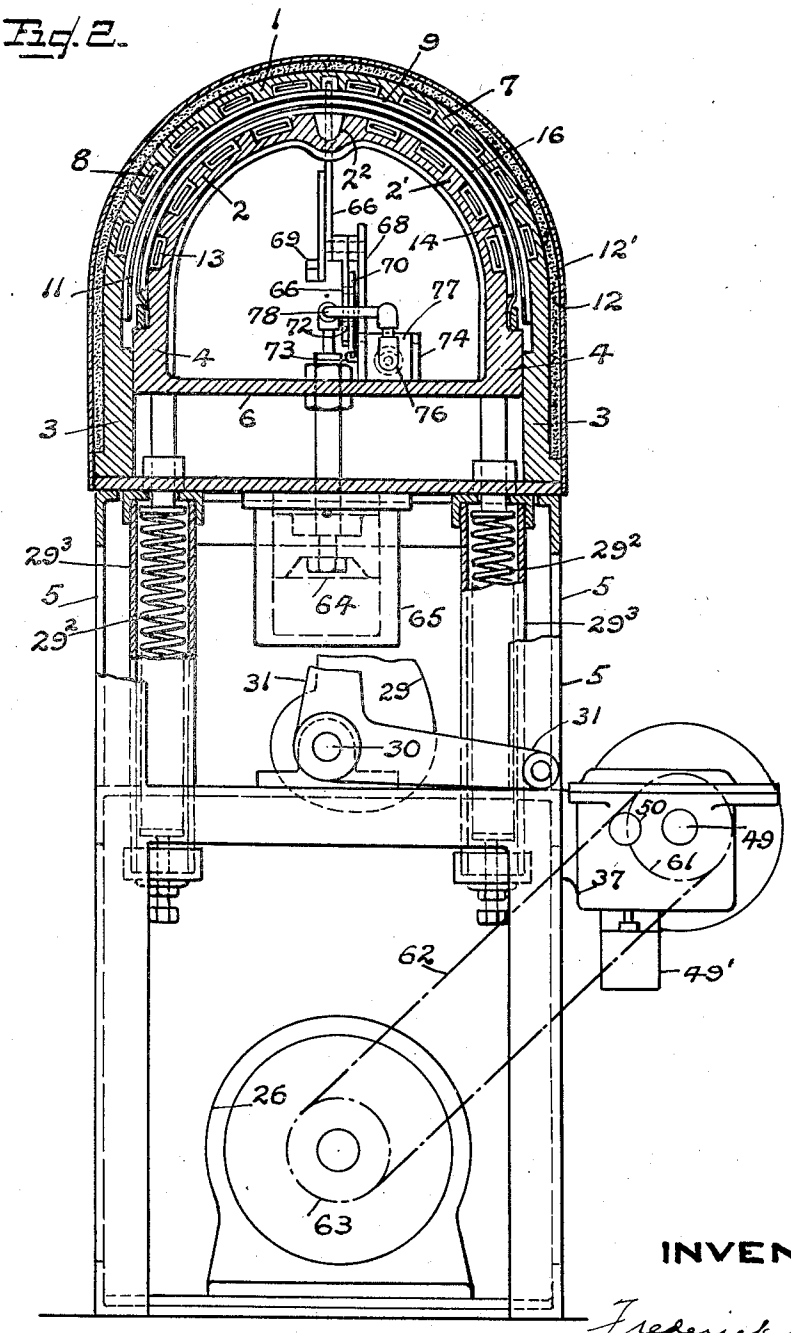
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July 5, 1938. F. G. LOUGEE 2,122,800

MATRIX DRYING MACHINE

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Fig. 2.



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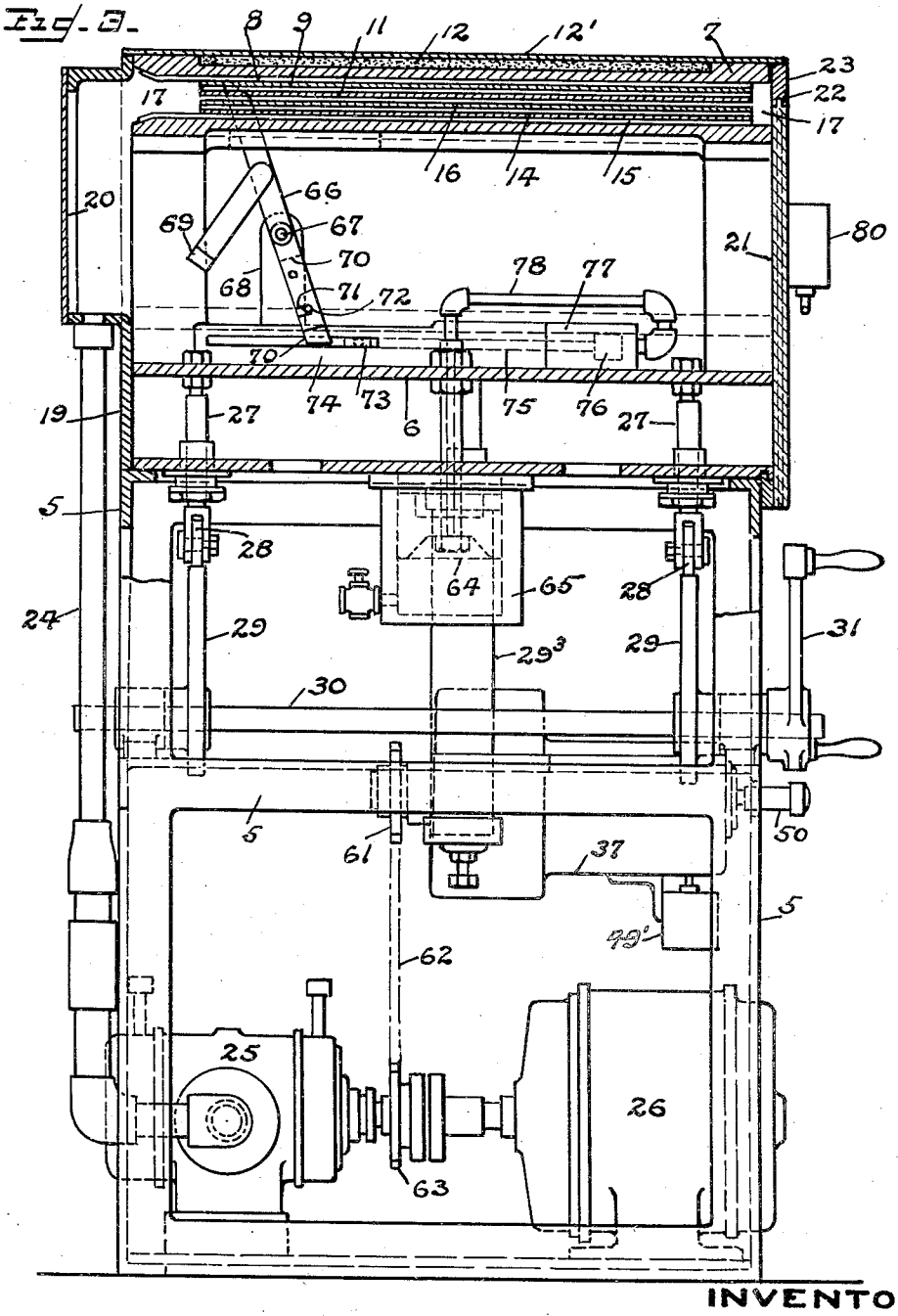
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MATRIX DRYING MACHINE

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Fig. 3.



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July 5, 1938. F. G. LOUGEE 2,122,800

MATRIX DRYING MACHINE

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Fig. 6.

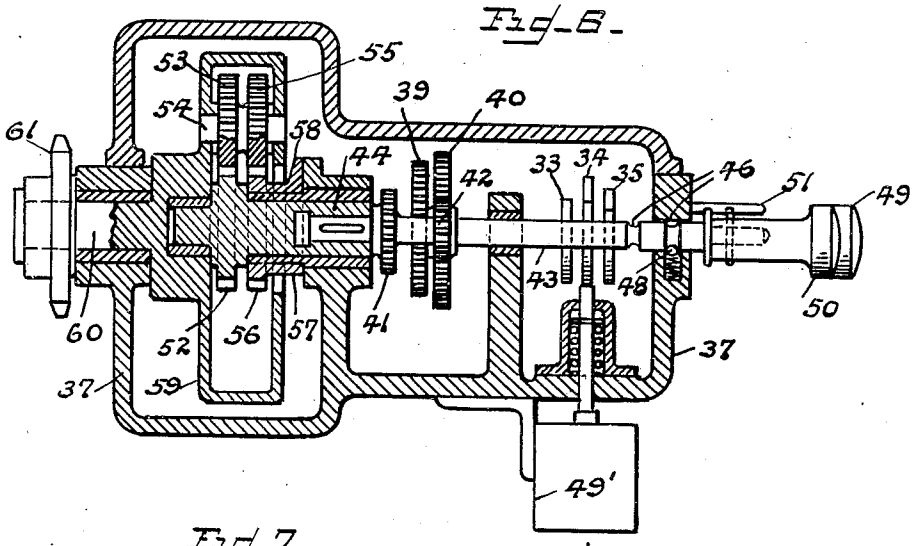
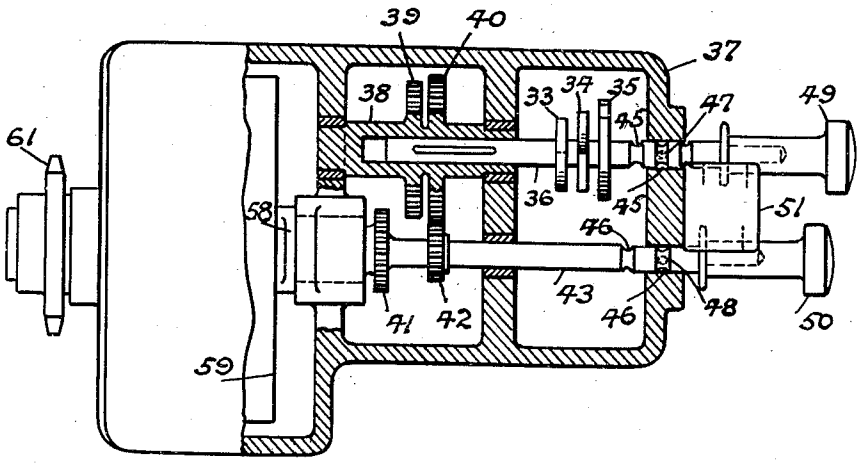


Fig. 7.



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Patented July 5, 1938 2,122,800

UNITED STATES PATENT OFFICE

2,122,800

MATRIX DRYING MACHINE

Frederick Grafton Lougee, London, England, assignor to R. Hoe & Co., Inc., New York, N. Y., a corporation of New York

Application December 21, 1935, Serial No. 55,634
In Great Britain December 22, 1934

8 Claims. (Cl. 34—16)

This invention relates to a new or improved matrix drying machine, i. e. a machine for use in drying matrices employed in the production of printing plates for printing machines. Matrices, for the above use, are first rendered soft by moisture to receive an impression of the matter to be printed and are then dried and baked to remove moisture as completely as possible before the matrices are employed as moulds for casting the plates.

One of the objects of this invention is to provide an improved matrix drying machine;

Another is to provide in a matrix drying machine improved means for more thoroughly drying matrices and in substantially obviating the possibility of distorting the impressions thereon;

Still another is to provide in a matrix drying machine, heated means to simultaneously engage each side of a matrix and means simultaneously urge each side of the matrix into close engagement with the heated means adjacent thereto, while removing the moisture therefrom.

It is also an object of this invention to provide a matrix drying machine of generally improved construction, whereby the device will be simple, durable and inexpensive in construction, as well as convenient, practical, serviceable and efficient in its use.

With the foregoing and other objects in view, which will appear as the description proceeds, the invention resides in the combination and arrangement of parts, and in the details of construction hereinafter described and claimed.

The invention is illustrated in the accompanying drawings as applied to a machine for use in drying matrices from which semi-cylindrical printing plates are to be cast. In the drawings Figure 1 is an end elevation, Figure 2 an end elevation partly in section, Figure 3 a side sectional elevation, Figures 4 and 5 detail sections at right angles to one another and Figures 6 and 7 detail sectional elevations.

There are provided two members denoted generally by the references 1, 2, each being inverted U shape in cross section, and consisting of a semicircular portion from the ends of which extend short parallel portions 3, 4 respectively, the parallel portions 4 being slidable between the parallel portions 3 which are secured to a stationary supporting frame 5. The curvature of the semicircular inner (or concave) periphery of the member 1 is sensibly equal to that of the printing plate to be produced from the matrix to be dried in the machine and the outer (or convex) periphery of the member 2 conforms to the semicircular inner periphery of the part 1, the member 2 having a base portion 6 extending between its parallel portions or limbs 4. The lengths of the members 1, 2 are somewhat greater than the length of the matrix to be dried.

The member 1 comprises a main portion 7 which is recessed to receive electrical heating elements 8, a plate 9 which is formed with longitudinal passages 10 and a perforated sheet or plate 11 extending over the passages, this plate 11 being that against which the matrix to be dried is held. The portion 7 is also recessed on its outer periphery to receive heat insulating material 12 such as asbestos which is enclosed by an outer cover 12'. The member 2 comprises a main portion 2' which is recessed to receive electrical heating elements 13 and a plate 14 which is formed with longitudinal passages 15 over which extends either a polished sheet of metal or as shown a sheet 16 of asbestos cloth or the like perforate material. The main portions 7, 2' of the two members are extended at each end somewhat beyond the associated parts so as to provide between the two members a clearance space 17, into which open the ends of the passages 10 and 15. The stationary member 1 is provided at one end with an end cover plate 19 on which slides one end face of the main portion 2' of the slidable member 2. The end plate 19 is shaped at 20 to provide an enlargement of the clearance 17 at one end. The movable member 2 is provided at its end opposite to the plate 19 with a plate 21 having a tongue or bead 22 upon its periphery, which (when the movable member 2 is moved as hereafter described into operative position) enters a recess in the edge of a U-shaped plate 23 secured to the corresponding end of the stationary member 1, the plate 21 in this manner, closing one end of both members 1 and 2.

It will now be seen that there is provided a chamber which includes the clearance 17 and is bounded by the stationary parts 7, 19, 20, 23 and the movable parts 6, 21, and that this chamber is sealed when the movable parts are raised into the position shown in the drawings to cause the tongue 22 to enter the recess in the stationary plate 23. This chamber is placed by a pipe 24 into communication with a suction or evacuating pump 25 arranged to be driven by an electric motor 26.

When the pump 25 is in operation a certain degree of vacuum will be created in the chamber, and this is utilized not only to draw off vapour evaporated from the matrix by the heating elements 8, 13 but also to hold the movable parts

against their weight in the raised position, so that when the pump is stopped, the degree of vacuum in the chamber will diminish until it is insufficient to hold the member 2 which will thereupon fall to its inoperative or loading position. In the loading position the chamber is opened by the tongue 22 on the plate 21 leaving the recess in the plate 23 and providing an opening through which a matrix to be dried can be introduced and placed on the sheet 16. It will be apparent that by reason of the vacuum effect transmitted through the passages 10 to the perforations in the plate 11 the matrix will be held firmly against this plate.

In order to enable the movable member to be raised from its loading position to the operating position shown, the base 6 of the movable part has secured to it posts 27 carrying rollers 28 engaging cams 29 on a shaft 30 journalled in the frame 5 and provided with a two armed operating lever 31. The cams 29 are shaped so that by turning the lever 31 in a clockwise direction the movable part 2 is raised against its weight. If now the motor 26 be started, the movable member 2 will be held, independently of the cams 29, by the aforementioned vacuum effect. To enable the movable member to fall when the motor 26 is stopped, it is necessary that the movable part 2 should not be held by the cams 29, and to enable this to be effected, the cams 29 and the operating lever 31 could be biased so that, when the lever is released by the operator they will return to their inoperative position. It may be preferred however to arrange this mechanism so that it requires a definite manual operation to return it to the inoperative position, and this may be effected as shown herein, by providing the cams 29 with portions 29' concentric with the axis of the shaft 30, these portions moving under the rollers 28 when the movable member has been raised so that the weight of the movable member (and its associated parts) will hold the cams in position until the shaft 30 is rocked by the manual application of pressure to the operating lever 31, this being effected as soon as it is judged that the vacuum effect has developed sufficiently in the chamber to hold the movable member against its own weight. The matrix will thus be tightly held between the plate 11 and the sheet 16 and the moisture evaporated out of the matrix by the heat generated by the heating elements 8 and 13 will be drawn off through the perforations in the plate 11, through the sheet 16 and through the passages 10, 15 into the spaces 17 and exhausted therefrom by the pump 25 through the pipe 24. To assist in the raising of the movable member the weight thereof may be partially opposed by springs 29^2 contained in spring boxes 29^3 and interposed between the base 6 and the stationary framework 5.

The motor 26 is arranged to be started by the operation of a switch 32 which can as shown be arranged to be operated by one arm 31' of the lever 31 when this reaches the position in which it has raised the movable member 2 to its operative position, see Figure 1.

When the motor 26 is stopped, the degree of vacuum will, as previously stated, become less and finally the movable member 2 will fall under its own weight and thus permit the movement of the dried matrix away from the perforated plate.

The period of the drying operation may be under the control of a timing mechanism, shown more particularly in Figures 6 and 7, which mechanism is capable of being set to stop the motor 26 at the end of different time intervals. The mechanism comprises a switch 49' the operation of which causes the circuit of the motor to be de-energized (and in consequence permits the movable member 2 to fall to its inoperative position as already described). The switch 49' is arranged to be operated by any one of a plurality of cams 33, 34, and 35 having different numbers of operating faces or teeth, and which are secured to a shaft 36 slidably and rotatably supported near one end thereof in an end wall of a casing 37 and which is slidable but not rotatable at its other end in a bore formed in a shaft 38 journalled in supporting members provided in the casing. The shaft 38 is provided with two gear wheels 39, 40 of different diameters and these gear wheels are adapted to mesh respectively with gear wheels 41, 42 on a shaft 43 which is rotatably and slidably supported in the casing 37, the inner end of the shaft 43 being slidable but non-rotatable in a bore in a shaft 44.

The two shafts 36, 43 extend beyond the casing 37 and are respectively provided with three and two grooves 45, 46 into which spring loaded balls 47, 48 can snap. These balls and grooves are disposed so that, considering that the shaft 36 is located longitudinally in one of three positions, one or other of the cams 33, 34, 35 is in line with a plunger 49 for operating the switch 49', and considering that the shaft 43 is located longitudinally in one of two positions, one of the two gear wheels 41, 42 is in mesh with one of the two gear wheels 39, 40, whereby rotation of the shaft 43 at a certain speed will be transmitted at a certain ratio to the shaft 36 and the time intervals between which the teeth on the various cams 33, 34, 35 operate the plunger 49 will depend upon the particular cam in line with the plunger. It will be apparent that with the arrangement shown any one of six different time intervals can be chosen, one group of three when the gear wheels 39, 41 are in mesh and a further set of three when the gear wheels 40, 42 are in mesh. To facilitate the setting of the mechanism, the ends of the shafts 36, 43 are provided with operating knobs 49, 50 which move against a plate 51 having calibrated marks thereon to indicate the time intervals corresponding to the various positions of the shafts 36, 43. The shaft 43 is arranged to be driven from the electric motor 26 through a reduction gearing comprising a pinion 52 on the shaft 44 in mesh with a pinion 53 on a spindle 54 having on it a second pinion 55 in mesh with a pinion 56 formed on a sleeve 57 in which the shaft 44 is rotatable and which is secured against rotation by providing on the sleeve a flange 58 secured to the bearing for the shaft 43. The two pinions 53, 55 have a slightly different number of teeth (e. g. a difference of one tooth) and the spindle 54 is mounted in a cage 59 having a shaft extension 60 which is journalled in the end wall of the casing 37 and is bored to form a journal for the shaft 44. The extension 60 has secured to it a chain wheel 61 around which passes a chain 62 which is driven by a chain wheel 63 secured to the spindle of the motor.

It will be apparent that when the motor 26 is started drive will be transmitted to the cage 59 the rotation of which will cause the pinion 55 to roll on the stationary pinion 56 and by reason of the difference in the number of teeth on the two pinions 55, 53 rotation will be transmitted from the pinion 53 to the pinion 52 at a rate which is considerably less than that of the cage

59. This rotation is transmitted as described to the cams 33, 34, 35 which will be set in conjunction with the change speed gears 41, 42 to produce the required time interval between the operation of the switch 32 to start the motor 26 and the operation by one of the cams 33, 34, 35 of the switch 49' to stop the motor 26.

In order to damp the rate at which the movable member 2 is allowed to descend this member carries one part 64 of a pneumatic ram and cylinder dashpot, the other part 65 of which is carried by the stationary framework 5. The rate of descent of the movable member 2 is regulated by the rate at which air is allowed to be displaced from the ram and cylinder. The air displaced from the ram and cylinder is utilized to partially eject the matrix from the machine and to effect this there is provided a lever 66 which is pivotally carried at 67 on a support 68 secured to the base 6 of the movable member 2. The lever 66 is biased by a weight 69 to move in an anti-clockwise direction as viewed in Figure 3 and its lower end has pivotally mounted on it an arm 70 which is provided with a slot 71 to receive a pin 72 on the lever 66, the arm 70 extending beyond the lower end of the lever 66 into the path of a striking member 73. The upper end of the lever 66 extends through slots formed in the parts 2', 14, 16, 11, 9 and 7 and is normally just beyond the inner edge of the matrix adjacent the wall 18. The member 73 is slidable in guides 74 and is connected through a rod 75 to the ram 76 of a second pneumatic ram and cylinder arrangement, the cylinder 77 of which is secured to the base 6 and is fed through a pipe 78 with the air under pressure discharged from the first ram and cylinder 64, 65. The pin and slot 72, 71 are so disposed that as the movable member 2 descends, the air discharged from the dashpot and taken to the second ram and cylinder causes striking member 73 to move from right to left and in so doing to engage the arm 70 and rock the lever 66 in a clockwise direction until when the striker clears the arm 70 the lever 66 is freed and allowed to be returned by the weight 69 to its original position. The clockwise movement of the lever results in its upper end being moved into engagement with the edge of the matrix and then partially ejecting the matrix through the gap which is formed, by the descent of the movable member 2, between the plate 21 and the plate 23 secured to the stationary member. When the movable member 2 is next raised into its operative position, air will be transferred from the cylinder 77 to the cylinder 65 of the ram and cylinder dashpot and the striking member 73 will therefore move from left to right. When near the end of this retracting movement the striking member 73 engages the arm 70 which has as described been returned with the lever 66 to its original position and will rock the arm 70 on the lever 66 in an anti-clockwise direction, whereby the slot 71 will leave the pin 72 until the member 73 clears the arm 70 whereupon the arm will drop back into position to be actuated by the striking member 73 when it is next moved from right to left.

In order to provide an indication of the temperature to which the matrix is subjected the part 2' is shaped to provide a channel 2^2 in which a heat responsive device 79 is located and which is arranged to operate an indicating instrument 80. The pressure condition within the chamber may also be indicated by a pressure gauge 81.

It will be understood that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and it is therefore desired that the present embodiment be considered in all respects as illustrative and not restrictive, and it will be further understood that each and every novel feature and combination present in or possessed by the mechanism herein disclosed forms a part of the invention included in this application.

What I claim is:—

1. A matrix drying machine comprising two members, means supporting one member against movement, means supporting the other member for movement into and out of position to hold a matrix between itself and the other member, means biasing the movable member to move to its inoperative position, means creating a vacuum between the two members and holding the movable member against its bias in operative position, means whereby the vacuum effect can be discontinued to permit the movable member to be returned by its biasing means to its inoperative position, a member to partially eject a matrix, a fluid dashpot device, connections between the device and the movable member, a fluid operated device, means transferring fluid displaced from the dashpot device to the fluid operated device, and connections between the fluid operated device and the matrix ejecting member.

2. In combination, two members disposed to receive between them a matrix to be dried means supporting one member against movement, means supporting the other member for movement into and out of co-operative position with respect to the stationary member, means biasing the movable member into its inoperative position, means applying vacuum between the two members, and holding the movable member against its bias in the operative position, a timing mechanism controlling the vacuum applying means and rendering the said means ineffective after a predetermined time interval, a member to partialy eject a matrix, a displaceable device movable by the movable member during its movement to its inoperative position, and connections between the displaceable device and the matrix ejecting member.

3. In a matrix drying machine, a pair of members having corresponding recesses at one end thereof, one member being movable toward and away from the other and adapted to guide the other during such movements, and a plate having a perforate sheet thereon carried by each member, said sheets being formed to engage opposite faces of a matrix disposed therebetween when the members are closed together to join the recesses to form a common chamber at the end thereof, the face of each plate adjacent the face of the matrix having grooves to permit vapor to pass lengthwise therethrough, the grooves of both plates being in connection with the common chamber, means to heat each plate, and means in connection with the grooves of each plate to draw vapor from both sides of the matrix into and through the common chamber.

4. In a matrix drying machine, a pair of members having opposed recesses and being adapted to be closed together, said members having co-operating guiding surfaces therebetween, each member having a plate thereon, a perforate sheet on each plate to engage a face of a matrix disposed therebetween, said plates having lengthwise grooves therein, said members being adapted to join the recesses to form a chamber when in closed position and which is in connection with the grooves in each plate, and means to exhaust

the vapors from the chamber to create a vacuum therein and at the face of each plate to remove vapor from each face of the matrix substantially simultaneously and to maintain the adjacent faces of the matrix and the perforate sheet on the respective plate in close contact with each other.

5. In a matrix drying machine, a pair of telescoping U shaped members having the faces of their closed tops curved and their sides in sliding contact, a recess formed in the opposing curved faces of said members, a plate having longitudinal grooves in its face disposed in the recess in each member and being spaced from each end of said member, means to slide one member relatively to the other to engage a matrix between said plates and to engage one member with the other at their ends to register the recesses and form a closed chamber, the grooves in said plate being in connection with said chamber, and means to exhaust the chamber to draw vapor from the matrix through the grooves in said plates.

6. In a matrix drying machine, a pair of members having recesses in their opposed surfaces, a plate in the recess in each member, said plates having grooves formed in their opposing surfaces, means to move one member toward the other to clamp a matrix between said plates and to form a closed chamber at one end of said members by the registering of the recesses in the opposed surfaces thereof, the grooves in said plates being in connection with said chamber, and means to exhaust the chamber to draw vapor from each side of the matrix into the grooves of the plate adjacent thereto.

7. In a matrix drying machine, members movable into closed position to form a common chamber therebetween, a plate on each member having vapor receiving grooves in their opposed surfaces which are directly in connection with the common chamber formed by said members when they are moved into closed position to clamp a matrix between the opposed grooved surfaces of the plates, and means to exhaust the chamber to equally draw vapor from the matrix from both sides thereof through the grooves in the opposed surfaces of said plates.

8. In a matrix drying machine, a pair of closable telescoping members adapted at one end to form a common closed chamber therebetween when they are in closed position, a plate carried by each member, each plate having a perforate sheet on one of its surfaces to engage a matrix between their opposed sheet covered surfaces, each plate having openings in its surface adjacent the matrix, which openings are in connection with the closed chamber so formed, and means to exhaust the chamber to draw vapor from each side of the matrix through the openings, the openings in each plate being arranged whereby a substantially equal pull is imposed upon each side of the matrix when the exhausting means is in operation.

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