(No Model.)

3 Sheets—Sheet 1.

P. DILLON.

DRYING MACHINE.

No. 448,181.

Patented Mar. 10, 1891.

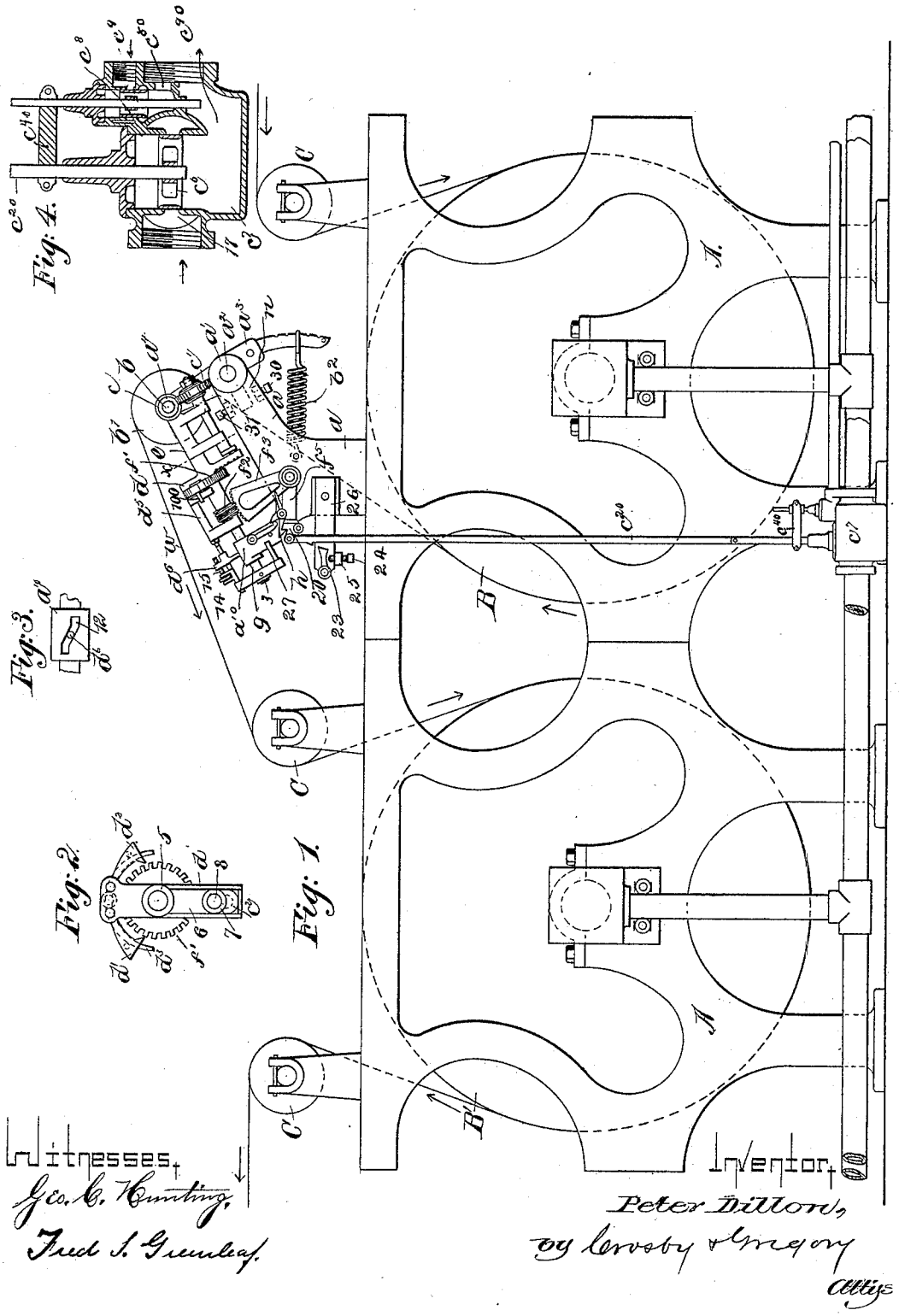


Fig. 1.

Fig. 4.

Fig. 3.

Fig. 2.

Witnesses,
Geo. C. Cunting.
Fred. S. Greenleaf.

Inventor,
Peter Dillon,
by Crosby & Gregory
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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 3 Sheets—Sheet 2.

P. DILLON.

DRYING MACHINE.

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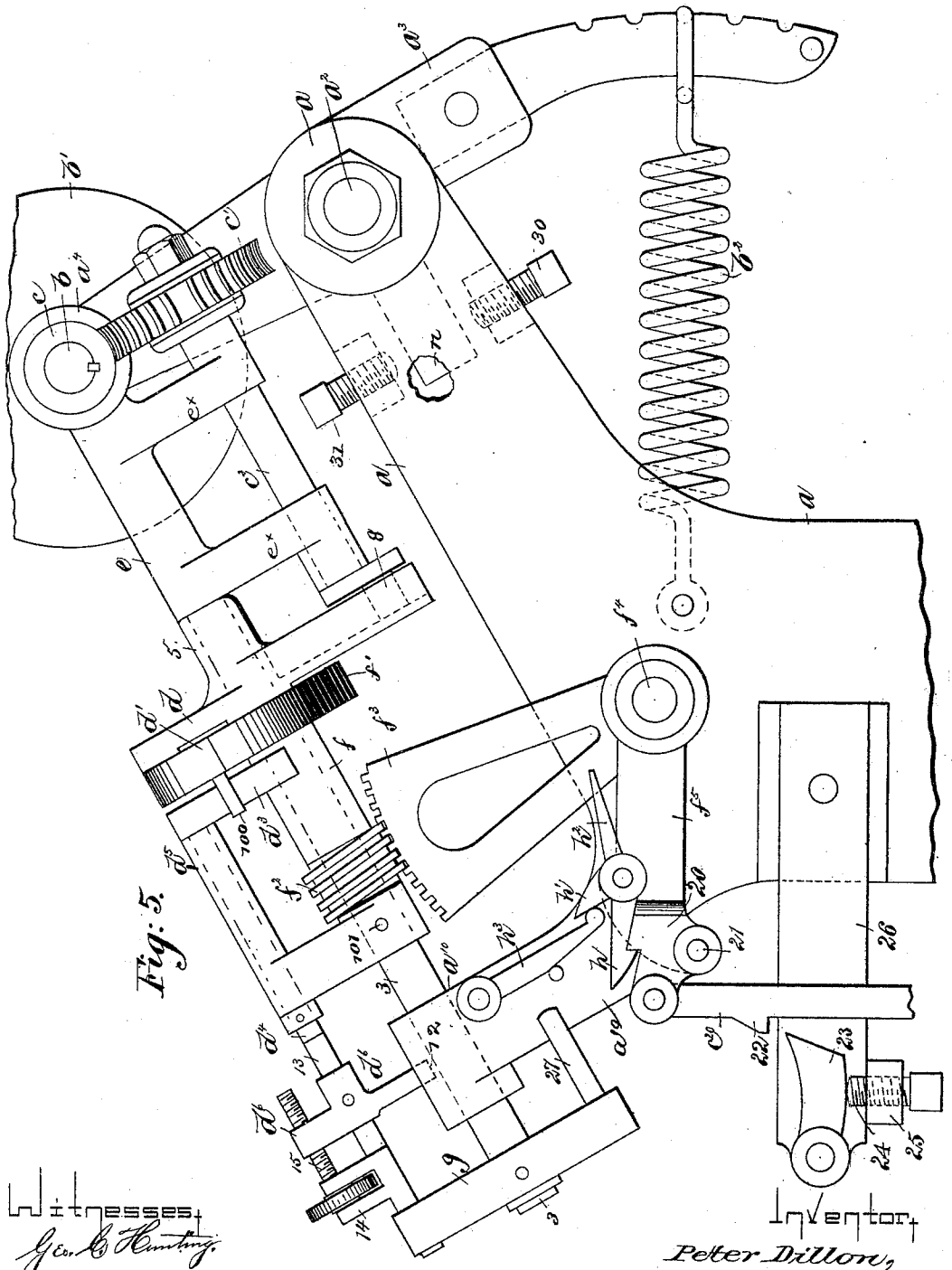


Fig. 5.

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(No Model.) 3 Sheets—Sheet 3.

P. DILLON.

DRYING MACHINE.

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Fig. 6.

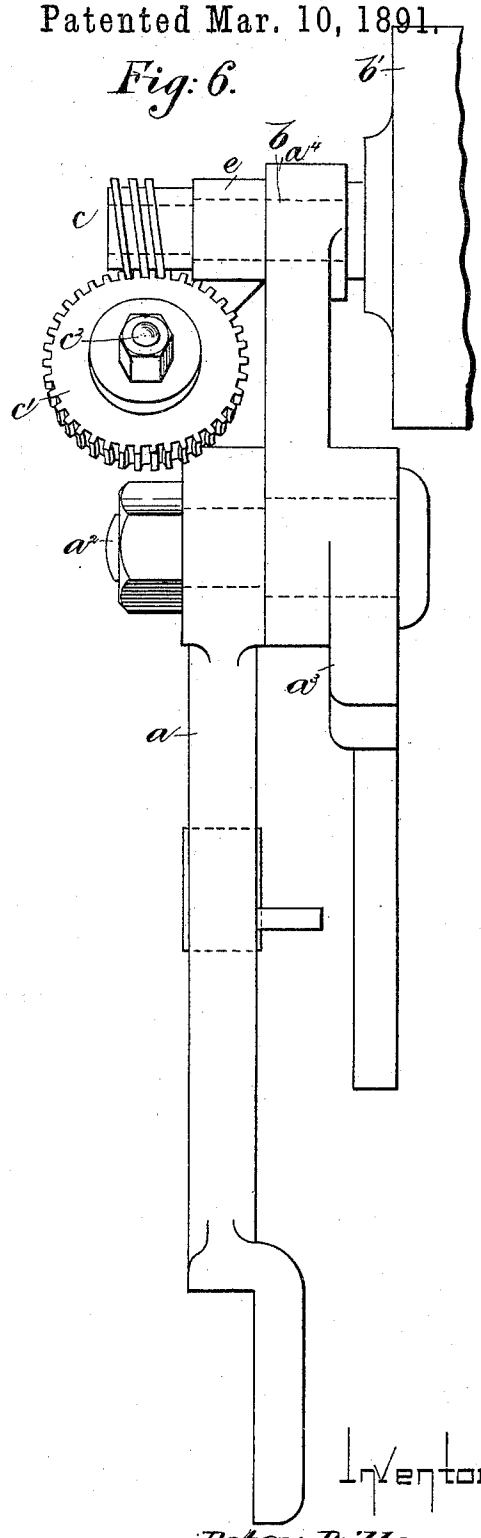
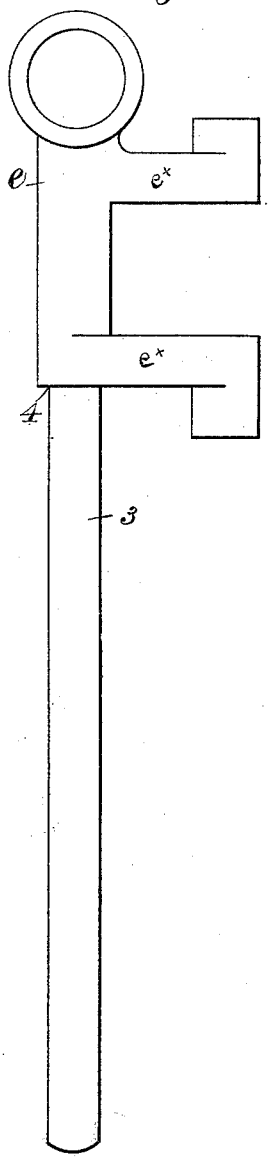


Fig. 7.



Witnesses,
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Inventor,
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by Crosby & Gregory Attys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

PETER DILLON, OF LAWRENCE, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO JOHN HENRY HOME, OF SAME PLACE.

DRYING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 448,181, dated March 10, 1891.

Application filed September 19, 1890. Serial No. 365,524. (No model.)

To all whom it may concern:

Be it known that I, PETER DILLON, a subject of the Queen of Great Britain, but at present residing at Lawrence, county of Essex, State of Massachusetts, have invented an Improvement in Drying-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention in drying-machines has for its object to provide a machine having steam-heated cylinders, with means for automatically regulating the admission of steam into the said cylinders to heat the same more or less, according to the condition of the material being passed over the said rolls and dried, the said material varying in length due to the quantity of moisture in it, so that it is made to draw with more or less force on a roll or support, the movement of which by the strain of the material on it is effective in opening or closing a valve, the valve being closed as the material is contracted by the dispelling of moisture.

Figure 1 is a partial side elevation of a drum or cylinder drying-machine; Figs. 2, 3, and 4, details to be referred to, Fig. 2 being a partial section to the left of the dotted line x, Fig. 1; Fig. 5, a much enlarged side elevation of part of the machine shown in Fig. 1; Fig. 6, an enlarged detail showing part of the stand a with one of the levers supporting one end of the roll b and some of the operative gearing, and Fig. 7 is a detail showing the frame e detached.

The frame-work A, alike at each side of the machine, the steam-heated drying drums or cylinders B B′, and the guide-rolls C C are and may be all as usual in drying-machines, such as commonly employed for drying paper and other articles.

In accordance with my invention I have erected upon each side frame a suitable stand a, each having at its front end a suitable bearing a' for the reception of a stud a^2, upon which is mounted a roller-carrying lever a^3, the upper end of each lever, one near each side of the machine, having a suitable bearing a^4, the said bearings receiving the journals b at the opposite ends of the supporting-roll b', the said roll being preferably a smooth-surfaced hollow or tubular roll.

The lower end of each lever a^3, carrying the roll b', referred to, has connected to it a suitable spring b^2, which spring acts normally to move the said roll to the right, viewing Fig. 1, so as to exert a pull on the web w of paper led from the cylinder B up over the said roll b' and then over roll C to the drum or roll B′. The connection of the said springs with the said arms will be such as to enable the said springs to be adjusted on the said arms, the latter for such purpose being shown as curved and provided with a series of notches, with any one of which the said spring may be engaged, the spring being shifted according to the class of paper being dried, the heavier the paper the greater the stress desired to be exerted by the spring, and vice versa.

One journal of the roll b'—as, for instance, the one shown in Fig. 1—has near its outer end a worm c, which engages a worm-gear c', mounted on a shaft c^2, adapted to rotate in bearings of suitable arms $e^\times$, depending from a frame e, having at one end a hub, (see Fig. 6,) which surrounds loosely that journal of the roll b' which is provided with the worm c, referred to, the said hub being between the regular bearing for said roll and the said worm. This frame is of suitable shape to contain portions of the different parts or devices employed to operate the valve-rod c^{20}, as will now be described. This frame e (shown separately in Fig. 7) is rounded for part of its length, as at 3, leaving a shoulder 4, against which shoulder bears the hub 5 of a rocker-lever d, mounted loosely on the said frame and having, as shown, a groove 6 (see Fig. 2) in its longer arm, which receives loosely a slide block or roll 7, entered by a crank-pin 8 of the rotating shaft c^2. The rocker-lever d at its upper end has pivoted upon it two pawls d' d^2, each pawl having a like pin 100 (see Fig. 5) to rest on the convexed surface of a shield d^3, fast upon the end of an oscillating shaft d^4, having its bearings in an L-shaped arm d^5, pinned at one end by pin 101 to the frame e or its rounded end 3. The round part of the frame e receives upon it

loosely a sleeve f, having at one end a ratchet-wheel f' and at its other end a worm f^2. The oscillating shaft d^4 is squared, as at 13, for part of its length and has a depending finger d^6, which enters a cam-slot 12 in a hub-like part a^{10} of the stand a. The said shaft d^4 also has an upwardly-extended lug 14 near that one of its ends which takes bearing in the arm g, fast on the outer end of the part 3 of the frame e, and this lug receives an adjusting-screw 15, which enters a part of the said finger d^6, so as to adjust the same longitudinally on the said rock-shaft, and thus place the finger d^6 in such part of the said cam as to enable the said cam to normally keep the shield in such position as to hold both of the pawls d' d^2 out of engagement from the said ratchet-wheel f', such position of the said parts being desired when the paper is being properly dried, any variation, however, in the drying of the paper resulting in sliding the frame, and the rock-shaft d^4 with it, to cause the finger d^6 to travel in one or the other direction in the cam-slot 12 to enable one or the other pawl d' or d^2 to engage the ratchet f' and turn the sleeve f and cause its worm f^2 in engagement with the sector-lever f^3 to move the said lever about the stud f^4 and cause its arm f^5 in connection with the valve-rod c^{20} to raise or lower the valve-piston c^6 (see Fig. 4) to more or less cover or uncover the inlet-port 17 of the valve-case c^7. The piston c^6 of the valve (shown by its movement) controls the entrance of exhaust-steam into the pipes leading into the drums or cylinders B B', the exhaust-steam usually affording sufficient heat. Should such be not the case, however, an auxiliary valve c^8 is provided, its piston normally closing the live-steam inlet c^9, the lap of the piston c^8 being greater than that of the piston c^6. The stems of both are connected by the cross-piece c^{40} and to the valve-rod c^{20}, as shown. The port c^{90} is the outlet-port for both live and exhaust steam.

From the forgoing description, in connection with Fig. 4, it will be seen that when the rod c^{20} is raised the pistons c^6 and c^8 will be lifted and the port 17 opened. Usually, however, owing to the greater lap of piston c^8, the port c^9 will not be opened, and only exhaust-steam will pass through the outlet c^{90}. Should the rod c^{20} be lifted still higher, however, the piston c^8 will then uncover the live-steam inlet c^9, and live steam will enter and pass through into the outlet-port c^{90} by way of the opening c^{80}. When the rod c^{20} is lowered, the port c^9 is closed first, and will remain closed until and after the port 17 is entirely closed, such position of the pistons being shown in Fig. 4.

The arm f^5 has pivoted on it at 21 a catch 20, to which is jointed the valve-rod c^{20}, and the arm f^5 carries a latch h, (see Fig. 5,) having an ear h' and an extension h^2, the said latch normally engaging the said catch and keeping the valve-rod up. The valve-rod is shown as provided with a shoulder 22, and below it is pivoted a stop 23, made adjustable by a set-screw 24 in an ear 25 of a plate 26, connected to the stand a. A radius-bar h^3 is pivoted to the stand and lies in the plane of movement of a pin 27, extended from the bar g.

In practice the rotation of the shaft c^2 vibrates the pawl-carrying lever d and works its pawls over the shield d^3; but the latter at required times permits one or the other of the said pawls to engage and turn the ratchet-wheel f' and the sector-lever f^3 f^5 to thus gradually open or close the valve for the entrance of more or less steam into the drying-cylinders as needed to bring them into the proper heated condition, as the state of the paper or material being dried requires.

In practice let it be supposed that the finger d^6 has been adjusted into its normal position, as in Figs. 3 and 5, or substantially midway in the inclined part of the slot referred to. Now, if the temperature of the cylinder changes and becomes, for instance, higher, then let it be supposed that paper is being acted upon. The paper, by being dried too rapidly or over-dried, causes the roll b', acted upon by the paper between the two rolls B and B', to be moved against the stress of springs b^2, and in such movement the frame e is also moved by the roll b', so that the worm f^2 in engagement with the teeth of the sector-lever f turns the said lever slightly to lower the valve-rod, and at the same time the movement of the finger d^6 in the slot 12, referred to, slightly rocks the shaft d^4, so that the shield d^3 permits the pawl d' to engage the ratchet f' and rotate the worm f^2 to continue the closing movement of the said valve.

In case the cylinders are too cool and the paper becomes too moist between the rolls B B', so that the roll b' is moved by the stress of the springs b^2, then the rock-shaft d^4 in the movement of the frame e, as described, will be turned by the cam-slot 12 in the opposite direction to thus cause the pawl d^2 to act and open the valve. In case the web of paper should break then the roll b', not being at all restrained, will be moved by the springs b^2 sufficiently to bring the pin 27 in contact with the radius-bar h^3 and cause it to be moved to strike the lug h' and turn the latch h to release the catch 20 and let the valve-rod drop until the shoulder 22 thereon meets the stop 23. The arms a^3 have each a projection n, (shown by dotted lines, Fig. 1,) which stands between two adjusting-screws or limiting-stops 30 31, the position of which determine the extent to which the arms a^3, carrying the roll b', may move in either direction.

This invention is not limited to the exact construction of the parts described, as the same might be variously modified in shape without departing from my invention, the gist of which is to automatically control by or through the changing conditions of the article being dried the admission of more or less heat into the drying-cylinders.

It will be noticed in operation that variations in the material or the speed at which it is dried acts to give an initial movement to the roll and frame *e*, so that it by sliding in one or the other direction determines which of two pawls *d'* d^2 shall work and actuate the devices for admitting more or less steam, as desired. The shoulder 22 prevents the valve-rod c^{20} from dropping so low as to fully cut off the flow of steam.

I claim—

1. A drying apparatus containing the following instrumentalities, viz: a steam-heated drum, a valve to control the admission of steam thereto, a roll over which the article being dried is passed, a spring to control the said roll and move it in opposition to the strain of the material on the roll, and intermediate devices between the said roll and the said valve, comprising a guide-frame, sleeve and attached worm, a toothed sector, a ratchet-wheel and pawls to rotate it, and devices connecting the toothed sector and valve to automatically control the admission of steam in quantity as needed to keep the drying operation uniform, substantially as described.

2. The steam-heated drum, a valve to control the admission of steam thereto, the roll *b'*, the levers in which it has its journal, the worm *c*, and the worm-gear *c'*, the shaft c^2, crank-pin carried thereby, and the frame *e*, rocker-lever having two pawls, the sleeve *f*, having a ratchet-wheel *f'*, and a worm f^2, and the sector-lever f^3, and mechanism intermediate said sector-lever and steam-valve to control the latter, combined with an oscillating shaft d^4, having a pawl-controlling shield to permit one or the other of the said pawls to engage the ratchet-wheel, substantially as described.

3. The steam-heated drum, a valve to control admission of steam thereto, the roll *b'*, its pivoted bearings, the guide-frame *e*, the sleeve *f*, mounted loosely thereon and having a ratchet-wheel and a worm-gear, the sector-lever f^3, valve operating mechanism intermediate said valve and sector-lever, the rocker-lever *d*, having pawls *d'* d^2, and the oscillating shaft d^4, having the finger d^6, combined with the stand having a slot to co-operate with the said finger, whereby the longitudinal movement of the frame *e* causes the said rock-shaft to be turned to permit one or the other of the said pawls to engage the said ratchet-wheel, according as it is desired to rotate the said worm f^2 in one or the other direction, substantially as described.

4. The steam-heated drum, a valve to control admission of steam thereto, the roll *b'*, its pivoted journal-bearing levers, the guide-frame *e*, the sleeve *f*, mounted loosely thereon and having a ratchet-wheel and a worm-gear, the sector-lever f^3, valve-operating mechanism intermediate said valve and sector-lever, the rocker-lever *d*, having pawls *d'* d^2, and the oscillating shaft d^4, having the finger d^6, combined with the stand having a slot to co-operate with the said finger, whereby the longitudinal movement of the frame *e* causes the said rock-shaft to be turned to permit one or the other of the said pawls to engage the said ratchet-wheel, according as it is desired to rotate the said worm f^2 in one or the other direction, and with means to adjust the said finger on the said rock-shaft, substantially as described.

5. The steam-heated drum, a valve to control the admission of steam thereto, the roll *b'*, the levers in which it is journaled, the worm *c*, the worm-gear *c'*, the shaft c^2, a crank-pin carried thereby, and the frame *e*, rocker-lever having two pawls, the sleeve *f*, having a ratchet-wheel *f'* and a worm f^2, the sector-lever f^3, having the catch 20, the valve-rod, and the latch *h*, combined with an oscillating shaft d^4, having a pawl-controlling shield to permit one or the other of said pawls to engage the ratchet-wheel to open or close the valve, substantially as described.

6. The steam-heated drum, a valve to control the admission of steam thereto, the roll *b'*, the levers in which it is journaled, the frame *e*, the sleeve *f* thereon, having a worm f^2, the toothed sector-lever f^3 in engagement therewith, its arm f^5, and the catch 20, pivoted thereon and to the valve-rod, the valve-rod, combined with the latch *h*, the part 3 of the frame, its arm and pin 27, and means between it and the said latch to operate the latter to release the catch 20, substantially as described.

7. The steam-heated drum, a valve to control the admission of steam thereto, the roll *b'*, the levers in which it is journaled, the frame *e*, the sleeve *f* thereon having a worm f^2, the toothed sector-lever f^3 in engagement therewith, its arm f^5, having the pivoted latch, and the connected valve-rod having a shoulder or projection 22, combined with the latch *h*, means, including a part 3 of the frame, arm, and pin, to operate the latch to release the catch, and with the stop 23 for the valve-rod, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

PETER DILLON.

Witnesses:
GEO. W. GREGORY,
EMMA J. BENNETT.