(No Model.) 3 Sheets—Sheet 1.

J. W. OSBORNE.

MEANS FOR DAMPING LITHOGRAPHIC PRINTING SURFACES.

No. 338,769. Patented Mar. 30, 1886.

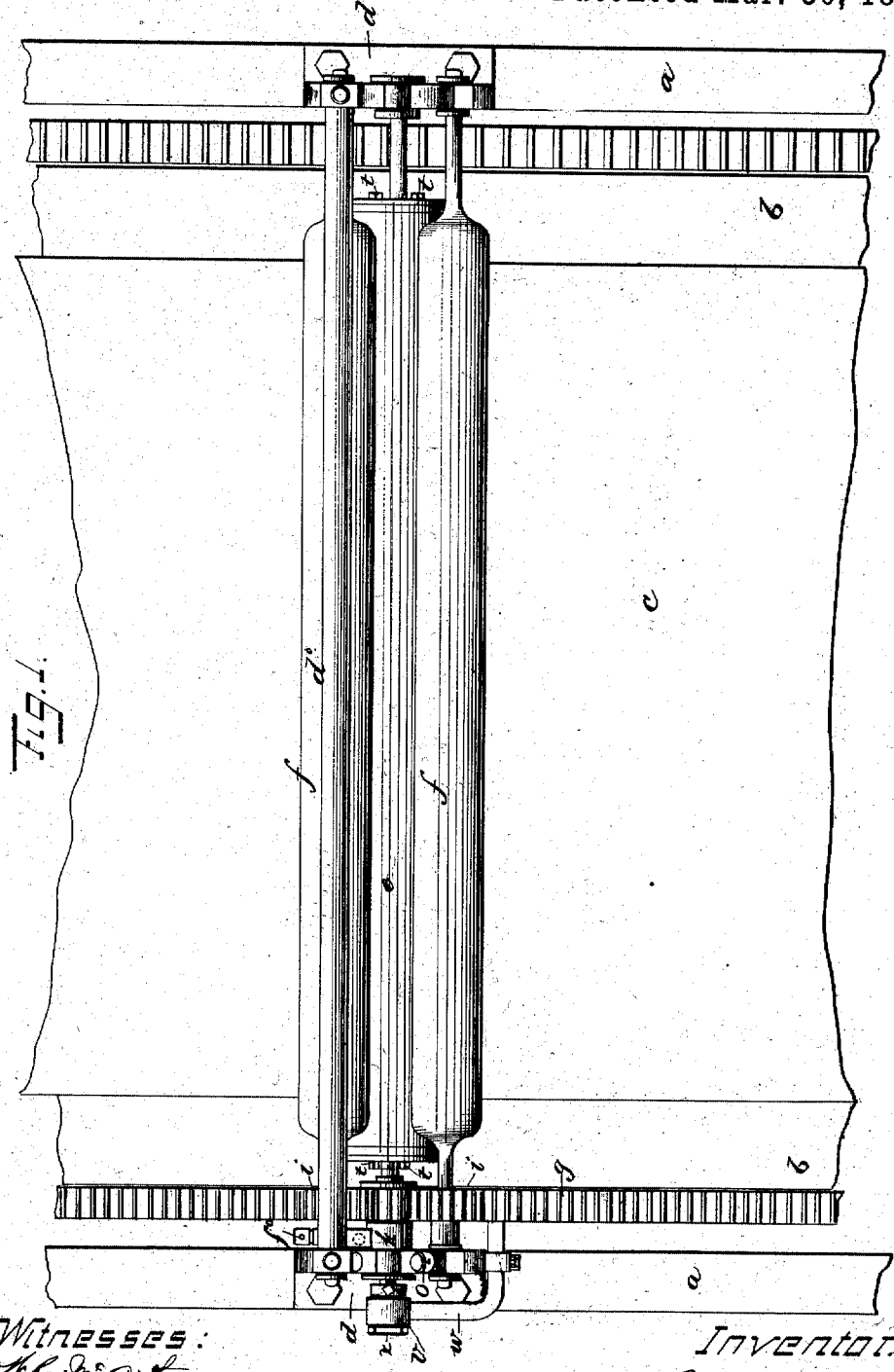


Fig. 1.

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(No Model.) 3 Sheets—Sheet 2.

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Fig. 1.

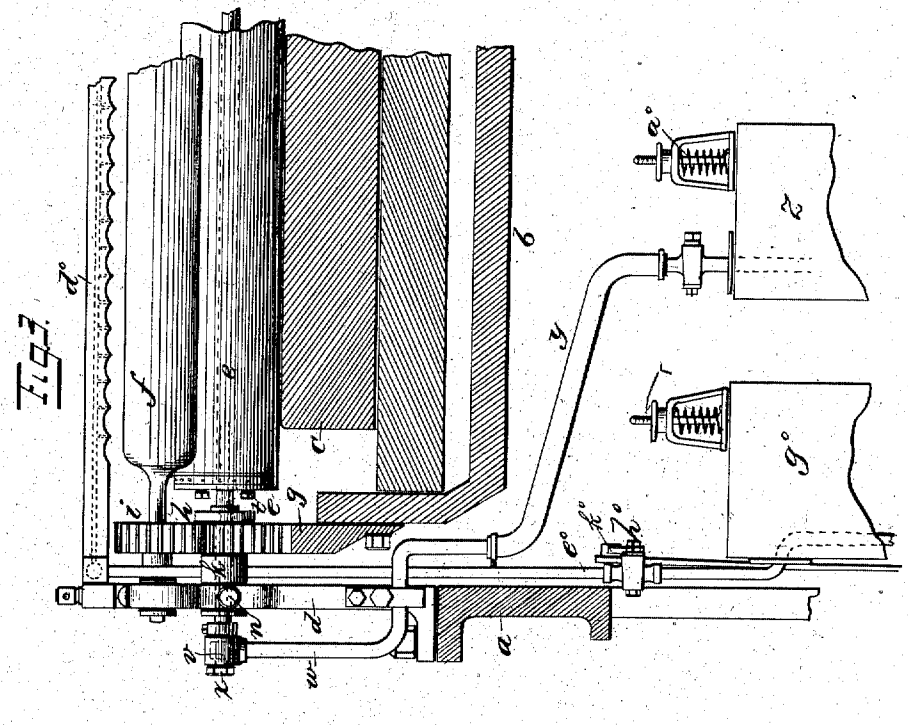
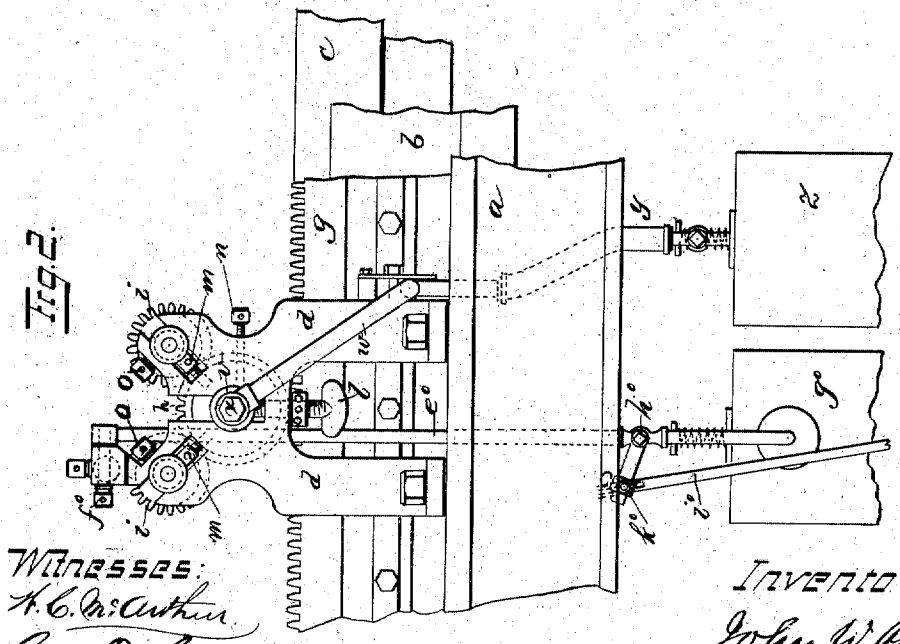


Fig. 2.



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Fig. 4.

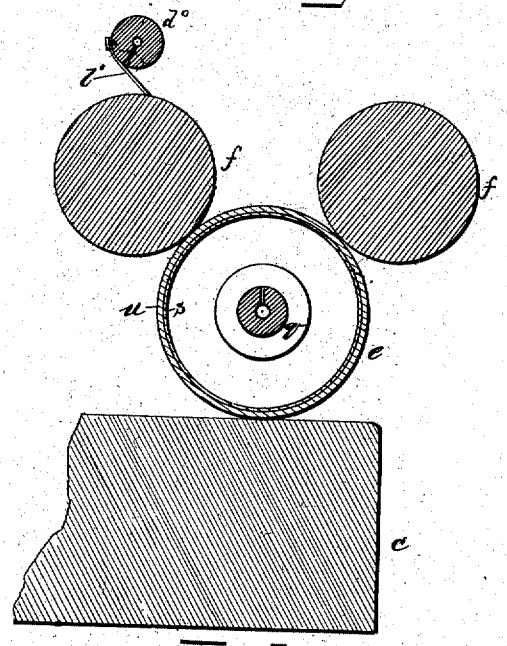


Fig. 5.

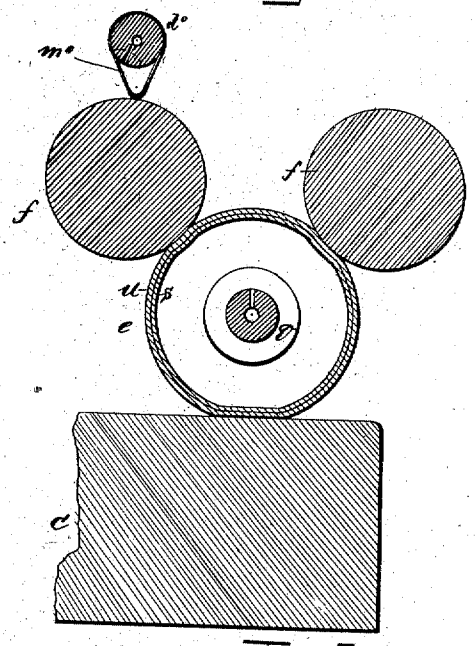


Fig. 7.

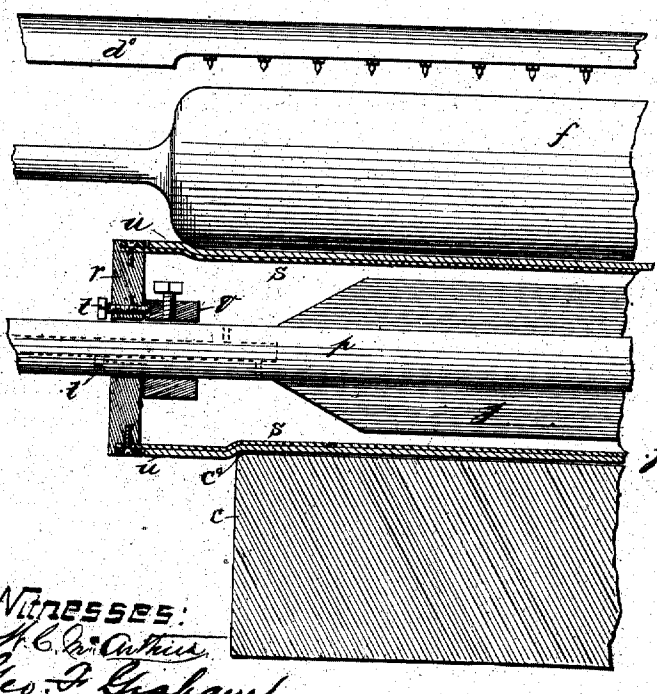
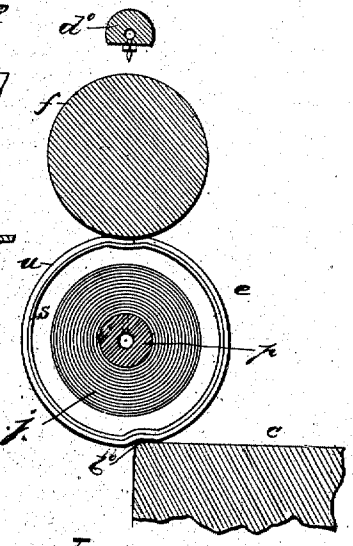


Fig. 6.



Witnesses:
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Geo. F. Graham

Inventor.
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UNITED STATES PATENT OFFICE.

JOHN W. OSBORNE, OF WASHINGTON, DISTRICT OF COLUMBIA.

MEANS FOR DAMPING LITHOGRAPHIC-PRINTING SURFACES.

SPECIFICATION forming part of Letters Patent No. 338,769, dated March 30, 1886.

Application filed September 16, 1881. Serial No. 42,139. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. OSBORNE, of Washington, District of Columbia, have invented a new and useful Improvement in the Means for Damping Surfaces Prepared for Printing in the Lithographic Manner, of which the following is a specification.

My invention is related to the devices now in use for the deposition of an even film of water upon lithographic stones and zinc or calligraphic plates, which is necessary before such surfaces can be inked and printed from, and to the manner of making such deposition; and it is especially applicable in power-presses for lithographic and similar printing. In presses of this kind the damping of the printing-surface in the actual practice of the art at the present day is almost universally performed by rollers constructed for the purpose. These rollers are generally held in stationary bearings, and having received the necessary quantity of water from a suitable fountain, or in some other way, they transfer it to the printing-surface as they roll over the same, when, in the working of the press, it passes beneath them. Damping-rollers for this use are made by covering a suitable spindle with several folds of some fibrous material till the desired thickness is obtained, over which an outside covering of cotton or linen cloth is sewed. Such rollers are inherently defective in operation, because when wet, and especially after having been used for a short time, they become very hard and unyielding, and subject the printing-surface to an undesirable amount of rough treatment, and because it is practically impossible with them to damp the edges of the stone or other printing-surface so as to insure those parts against taking ink from the inking-rollers, as all other non-printing parts are insured. If to attempt the damping of the front and back edges of a lithographic stone as it lies on the carriage of a reciprocating press the rollers are lowered so that their surfaces are tangents to a plane below that of the face of the stone the edges of the latter strike the rollers a heavy blow at the moment of their contact with it, and they have to rise instantly out of the way. The tendency of such a blow is to stop the rotation of the rollers to a greater or less extent, and, conjoined with the sudden rise, (for which provision must be made in the roller-bearings,) it produces an amount of jar and vibration which is detrimental, so that in practice it is an expedient which is used but very slightly for the reasons given, and because the damping of the edges so accomplished is by no means as effective and certain as that of the flat surface which receives no blow and on which the roller travels at the proper surface-speed. Furthermore, this expedient, inefficient and unreliable as it is well known to be as far as the front and back edges are concerned, is quite useless as a means for protecting the side edges, there being no way to get enough of water upon them by roller-damping of which I am aware, excepting, perhaps, that of using a great and damaging excess on the surface generally. Accordingly incessant attention is demanded on the part of the workman, and frequent hand-dampening of the edges when a sheet is printed which overhangs the stone, if its margin is to be kept clean. I overcome the imperfections in damping here indicated by applying the water to the printing-surface through the intervention of a roller which remains at all times elastic and soft, and which reaches all the edges of that surface very efficiently. In general terms I construct such a roller by inflating a long cylinder of pliant, impervious material of such character that it does not appreciably stretch or elongate under any strains encountered in practice with air or other fluid, covering the same with absorbent cloth of a suitable kind to hold and apply the water, and causing the whole to revolve upon a suitable axis over the printing-surface to be damped; and my invention further consists in an improved means for supplying such an apparatus for lithographic, zincographic, or calligraphic damping with the requisite increments of water to keep it charged with a constant amount, so as to compensate for that which is removed at every revolution of the press. This operation, when made automatic in lithographic power-presses, is usually accomplished by taking the water by means of a vibrating roller from the surface of a revolving fountain-roller to that of a rider upon the damping-rollers. The apparatus for this purpose occupies considerable space, and several movements and adjustments have to be accomplished. In my apparatus I deposit

the exact quantity of water from a tube provided with a large number of orifices directly upon the damping apparatus in a manner to be more fully set forth in the following.

In the drawings, forming part of this specification, Figure 1 represents in plan a portion of a reciprocating lithographic power-press in which the stone is shown in position with an inflated roller crossing it and the tube from which the supply of water is obtained. Fig. 2 is an elevation of the damping apparatus with parts of the press and the stone. Fig. 3 is a side elevation of the same. Fig. 4 is a cross-section of the damping-roller and rider and of the water tube or fountain in relative positions. Fig. 5 is a similar cross-section with damping-roller and riders depressed, showing their relation to the stone. Fig. 6 shows a cross-section of a distorted damping-roller with a single rider and water tube or fountain. Fig. 7 is a longitudinal section of the same damping-roller, showing its construction and its relation to the stone with the rider and water-tube in elevation.

In Fig. 1 the full width of the press is shown. In the other figures this is unnecessary, both sides of the press and the damping apparatus being the same, except that the rack and gearing which drives the rollers are only required upon one side, which is that represented. The scale of Figs. 4, 5, 6, and 7 is double that of those preceding them.

In all the figures, *a* represents the side framing of the press; *b*, the reciprocating carriage, and *c* a lithographic stone. The brackets *d d*, which support the damping apparatus, are bolted to the side framing.

In Figs. 1 to 5, inclusive, the damping apparatus, as shown, consists of one damping-roller and two riders. In the other figures one rider only is used, but the principle is the same.

In Figs. 1, 2, and 3 *e* is the damping-roller; *f f* are the riders. The latter are driven by the rack *g* through the intermediate wheel, *h*, gearing into the wheels *i i*, and by the friction of the riders lying on the roller *e*, that also is driven. It will be seen that the intermediate wheel, *h*, runs free upon the outside of the sleeve *k*, which forms a bearing for the damping-roller *e;* but, if it is desired, wheel *h* may be made fast upon the spindle of that roller, and the same may then be driven directly, as well as the riders, the sleeve *k* in that case acting as a bearing for roller *e* only, and extending inside the bracket *d*, just enough to form its flange.

In Fig. 2 the relative positions of the damping-roller, rider, and stone are assumed to be those shown in Fig. 4. The diameter of the riders is the same as that of the pitch-line of the gears *i i* which drive them, and therefore the surface-speed of the roller *e* will be the same as that of the printing-surface over which it rolls; but when the roller *e* and its riders are in the relative positions shown in Fig. 4, the pitch-lines of the rack and intermediate wheel, *h*, and of that wheel and the wheels *i i* on the riders, are somewhat apart. If all the rollers be now lowered till the pitch-lines coincide, the roller *e* will take the form shown in Fig. 5, but its surface-speed will still be the same as that of the stone *c*—that is, its riders will drive its distorted periphery at their own surface-speed, which is that required to cause the damping-roller to perform its office without drag or slip. The proper adjustment of the roller *e* is controlled by the set-screw *l;* that of rolls *f f* by screws *m m*. When in their proper places, the roller-bearings are clamped fast by the screws *n* and *o o*, respectively, as in my invention, no provision is required for a jump or rise of these rollers. This advantage is due to the peculiar construction of the damping-roller *e*, one end of which is shown in longitudinal section in Fig. 7. The spindle *p* has the collar *q* clamped upon it in suitable position, outside which is the disk *r*, of the full diameter which the roller is to have. A parallel tube of strong, pliant, yet non-extensible material, *s* (such as oil-cloth or printer's blanket made of cloth and rubber) is fastened to the recessed edge of the disk *r* by means of metal segments retained by screws, as shown, or in other suitable manner. The other end of this roller is a duplication of that described, and when the pliant tube is fast to both disks they are forced asunder by means of the three set-screws *t t t* in either end, so as to strain the tubular part tight and give it its true cylindrical shape. The extremities of these set-screws, turned smooth, fit into and enter three corresponding cavities in the collar *q*, whereby the disk *r* is prevented from turning on the spindle *p*. The diameter of the flexible tube so strained is somewhat less than that of the finished roller to admit of its being covered with several folds of absorbent material, *u*—such as canton-flannel, &c.—to hold the water used for damping. This is sewed on in the usual way, and it is best applied before the flexible tube is made to the disks, when it can be supported inside by a temporary mandrel. One end of the spindle *p* is bored through its length for some distance past the collar *q*, where cross-openings connect the tube so formed with the inside of the roller. When the latter is in position, the outside end of the spindle (pierced with radial holes) has slipped over it the recessed annular bearing *v*, which terminates the tube *w*, and this is held in place by the bolt *x*. In this way the hollow interior of the roller *e* is at all times in tubular connection through tube *w*, and the flexible hose *y*, with the receiver *z*. This receiver is a closed vessel, in which air at a constant pressure is maintained by means of a pump or suitable blower, the adjustable valve *a°* serving to regulate the same by lifting whenever the desired pressure is exceeded, which may take place at every revolution of the press. A very small pump is sufficient for this purpose, and it may be conveniently connected with some moving

part of the press. All that is necessary is to supply the small quantity of air which leaks from the roller or its imperfect connections. The pump may also be made to accomplish the constant distention of the roller without the interposition of the receiver *z*; but I prefer the large supply of compressed air, and it is particularly convenient to effect the inflation of the roller in the first instance. Obviously the receiver *z*, though shown with the press, and the pump which supplies it may be placed at any desired distance, and one such receiver can be readily made to inflate all the damping-rollers of a large number of presses. The pressure in the roller holds its flexible surface distended, and effects the general distribution of any local force calculated to distort its cylindical form—as, for instance, the contact of the stone—which necessarily flattens a part of its periphery, in the manner shown in Figs. 5 and 6. The effect of the increased air-pressure inside the roller is also to cause it instantly to resume the cylindrical form when the cause of distortion has been removed. Thus, when the front edge of the stone reaches the roller the latter is perfectly cylindrical, and, being below the level of the printing-surface, it strikes a little below the edge with a soft blow. As the stone proceeds it flattens upon its face, and when the roller leaves the back edge it instantly expands and damps that edge also.

Fig. 6 illustrates at *b*° what takes place at the time of contact with either edge. The side edges of the stone are likewise touched by this damping-roller, because beyond the flattened part in contact with the printing-surface the cylindrical form of the roller on each side is restored, and in doing so it expands to some distance downward on those edges, as shown in Fig. 7 at *c*°.

In place of air other fluids can be employed in a damping-roller, as herein described—as, for instance, water. The roller being once filled with water it is kept full under pressure by introducing water into the lower part of the receiver *z*, and continuing the pipe or hose *y* from the tube *w* downward inside that vessel, as indicated by dotted lines, so that the pressure of the air shall force the water to ascend. This modification accomplishes results similar to those already described. With a roller so filled it is possible and advantageous in some cases to work without a rider, for the weight of the water causes the flexible tube forming the working part of the roller to lie very closely and evenly in contact with the printing-surface.

In damping by the method I have invented the fact that the water is applied from a flat surface which is successively stationary for an appreciable interval of time on every part of the surface to be damped is an important advantage, giving the water abundant opportunity to pass over, which is not the case when the usual solid rollers are used. As a consequence one roller will be found in most cases quite sufficient, though obviously two or more may be employed.

The function of the rider or riders in my invention is to communicate motion directly to the pliant surface of the damping-roller and hold it in contact with the printing-surface. The pressure they exert upon the inflated roller also tends to increase indirectly the pressure on the stone, and the distortion they effect tends to increase the depression of the lower convex surface when the roller is off the printing-surface, and to increase the size of the flattened segment on its lower side when it is over the work. These results are effected when one rider only is used, as in Figs. 6 and 7; but they become greater when two or more are employed, and increase also as the distortion produced by lowering them upon the damping-roller is increased. In this way it is possible to produce with the riders alone the depression of the under surface of the damping roller, (without dropping the same,) which is necessary to effect the proper damping of the edges of the printing-surface. This is important when the damping-roller is driven directly, for in that case its diameter should be exactly that of the pitch-line of the wheel that drives it, and under those circumstances to drop it involves either crossing the pitch-lines of the rack and wheel or lowering the former, which is undesirable, because the same rack is commonly used to drive the inking-rollers. It is also a practical and serviceable method when the damping-roller and its rider or riders are driven not by gearing, but by friction rollers or trucks running on smooth bearers in place of a rack, as is done in many forms of lithographic press.

The weight of the rider or riders used in the method of damping I have invented is not a matter of importance, because their bearings are clamped fast; but riders with loose bearings may be used should they be conveniently available without essentially modifying the principle involved, their weight then, of course, affecting the result. With fixed bearings the riders may be as light as is consistent with strength and stiffness, which is a convenience in handling and in other ways. Under these circumstances noise and vibration are prevented, and the pressure exerted on the printing-surface is quite under control, being adjustable altogether by increasing or decreasing the tension of the spring in the valve *a*°, it being the air or other fluid in the roller which exerts the pressure directly on the printing-surface and not the weight of the roller or the rider upon it, although the latter furnishes a line of resistance and reacts against the force from within. It will also be found that with a constant pressure in the receiver that upon the printing-surface will be the same per unit of width whether that surface be large or small, whereas where one and the

same rider is used on ordinary damping-rollers it is inversely proportional to the width, increasing as the latter becomes less.

It may further be said with regard to the construction of the damping-roller that the principle involved can be very well carried out by making the flexible envelope of thin metal, as copper or brass; also, that material not quite impervious to air can be used for the same purposes—as, for instance, closely-woven canvas, which, when wet, will be found impervious enough to allow of the maintenance of considerable pressure within it, while the leakage which takes place is easily supplied from the receiver. Nor do I wish it to be understood that the inside of the roller must be left empty. On the contrary, to save the flexible envelope from the injury caused by accidental blows and careless handling the inside may be loosely filled about the spindle with wool or hair or similar substance, as shown in Figs. 6 and 7 at *j*; but this must be so as not to interfere with the free distortion of the envelope to the required extent and its immediate restoration to the cylindrical form when the disturbing cause ceases to act; nor should it hinder in the least the free movement of the air or other fluid with which the roller is held distended, or the immediate propagation of the force emanating from the receiver or pump to all parts of the inner surface.

For the purpose of maintaining the necessary amount of water in the absorbent covering of the damping-roller when it is in use I empty the water tube or fountain d°. This tube crosses the press over the damping apparatus, usually over and parallel to a riding-roller. It is made of a heavy brass bar for the sake of strength, and is bolted to the brackets at each side. The bore of this tube is small. It is stopped at one end, and at the other is in communication with the tube e°, which is held tightly to it by means of the hollow bolt f°. The whole length of the water-tube d° in the part which crosses the rider is pierced radially by a close row of exceedingly-minute holes, (seen in cross-section in Figs. 4, 5, and 6,) the diameter of the holes being so small that the water will be retained therein by atmospheric pressure and capillary attraction until forcibly ejected. This is a feature of importance, in that it prevents the tube from being drained or emptied, the tube remaining constantly filled, so that it responds instantly at the proper time, in consequence of which a uniform and definite quantity of moisture is delivered at each action of the apparatus. These holes are directed downward, and between them the metal may be filed away in the manner seen in Fig. 2; or each little hole may be bored in a separate nipple and screwed into the water-tube in the manner shown in Figs. 6 and 7, the object being to prevent the running together of the ejected water into large drops, which result may also be accomplished by forcing the water out under considerable pressure. The tube e° communicates with a closed receiver g°, and it descends inside nearly to the bottom, as indicated by the dotted lines in Fig. 2. Into the receiver g° (which is constructed like receiver z) a quantity of water is introduced, over which an air-space is left, where a sufficient pressure is maintained by a small air-pump to force the water to ascend through the tube e^{0}.

It will be seen that as the construction of the receivers g° and z are the same, one receiver can be very well made to answer both purposes—namely, the ejection of the water and the inflation of the roller; but I prefer in practice to use two, because it is not always desirable to have the same pressure for both operations. One pump, however, can be very well employed, letting the escaping air from the receiver in which the greater pressure is required enter the other. The amount of water which passes upward through the tube e° and is ejected in little drops from d° through the openings over the rider is very small for each revolution of the press. It is controlled by the cock h°. This is opened and closed periodically and automatically in any convenient manner, and for it a suitable valve may be substituted, if desired. In the drawings the lever of the cock is connected by a movable joint with the rod i° from a cam. The point of attachment and the length of the cam-rod are adjustable while the press is running, and can be clamped fast in any position by the set-screws at k°. In this way the duration of the flow of water (which in all cases is very short) is under control, and as the water-tube remains always full precisely the quantity of water which passes the cock h° is thrown out upon the roller. It is advisable, unless the water used for damping is very pure, to filter it at each filling of the receiver, so as to prevent the lodging of any impediments in the minute openings of the water-tube. I wish it also to be understood that while I regard the use of a receiver containing water under pressure as the most convenient way of ejecting the required water on the damping apparatus I do not regard that device as indispensable, for it is plain that a small force-pump with variable stroke may be directly connected with the water-tube d°, whereby the prompt and decisive ejectment of the proper quantity may be accomplished; but my experience convinces me that in most cases the elastic pressure exercised by compressed air, as herein set forth, is simpler and preferable to that and other methods of obtaining the requisite force.

The water as it issues in minute streams from the orifices in the water-tube d° may be received directly upon the rider, as in Fig. 6; or it may be allowed to fall upon the roller, or upon a small flap of cloth attached to one side of the water-tube and extending down to the rider, which is shown in section at l° in Fig. 4, or upon a loose covering of the same material, embracing the tube, as m° in Fig. 5, and which may be regarded as a double flap, both of

which devices tend to effect a distribution of the water before it reaches the rider by the capillary action which takes places in the cloth, an action which is also very decided in the absorbent covering on the roller itself, and which the pressure of the riders still further promotes.

With regard to distribution, it may also be said that the best time to project the water upon the damping apparatus is immediately after a damping has been effected, as a considerable interval then elapses before the damping-roller is again called upon to perform its function, during which capillary distribution takes place.

By the terms "surface" and "printing-surface," herein employed, is meant a lithographic stone or bed, a zinc bed, or equivalent bed prepared for printing in the lithographic manner, this being the common meaning of these terms as used in the art at the present day.

Having thus described my invention, what I claim, and wish to secure by Letters Patent, is—

1. In a lithographic machine, the combination, with a bed or surface for printing in the lithographic manner, of a pliant damping-roller containing air or other fluid under pressure, and mechanism, substantially as described, to cause said roll to act forcibly upon the printing-surface.

2. In a lithographic-printing machine, the combination of a bed carrying a stone or surface adapted for printing in the lithographic manner, a pliant damping-roll filled with air or other fluid under pressure, and one or more riding-rolls, substantially as described.

3. In a lithographic-printing machine, the combination of a horizontal tube provided with minute orifices adapted and arranged to retain water by capillary attraction and to deliver the same upon the surface, and means, substantially as described, for effecting the forcible and positive ejection of the water from said orifices at suitable intervals.

4. In a lithographic-printing machine, the combination of the water-tube d°, provided with a row of minute openings, the rider, and an intermediate flap, l°, whereby the uniform distribution of water is secured.

JOHN W. OSBORNE.

Witnesses:
L. BACON,
H. C. HUNTEMANN.

Corrections in Letters Patent No. 338,769.

It is hereby certified that in Letters Patent No. 338,769, granted March 30, 1886, upon the application of John W. Osborne, of Washington, District of Columbia, for an improvement in "Means for Damping Lithographic-Printing Surfaces," errors appear in the printed specification requiring correction, as follows: In lines 11 and 91–2, page 1, the word "calligraphic" should be stricken out and the word *collographic* inserted; in line 36, page 4, the word "empty" should be stricken out and the word *employ* inserted; and that the Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 6th day of April, A. D. 1886.

[SEAL.]

H. L. MULDROW,
Acting Secretary of the Interior.

Countersigned:

M. V. MONTGOMERY,
Commissioner of Patents.