(No Model.) 3 Sheets—Sheet 1.

W. H. FORBES & J. W. OSBORNE.

ART OF AND MACHINERY FOR LITHOGRAPHIC PRINTING.

No. 300,242. Patented June 10, 1884.

Fig. 1.

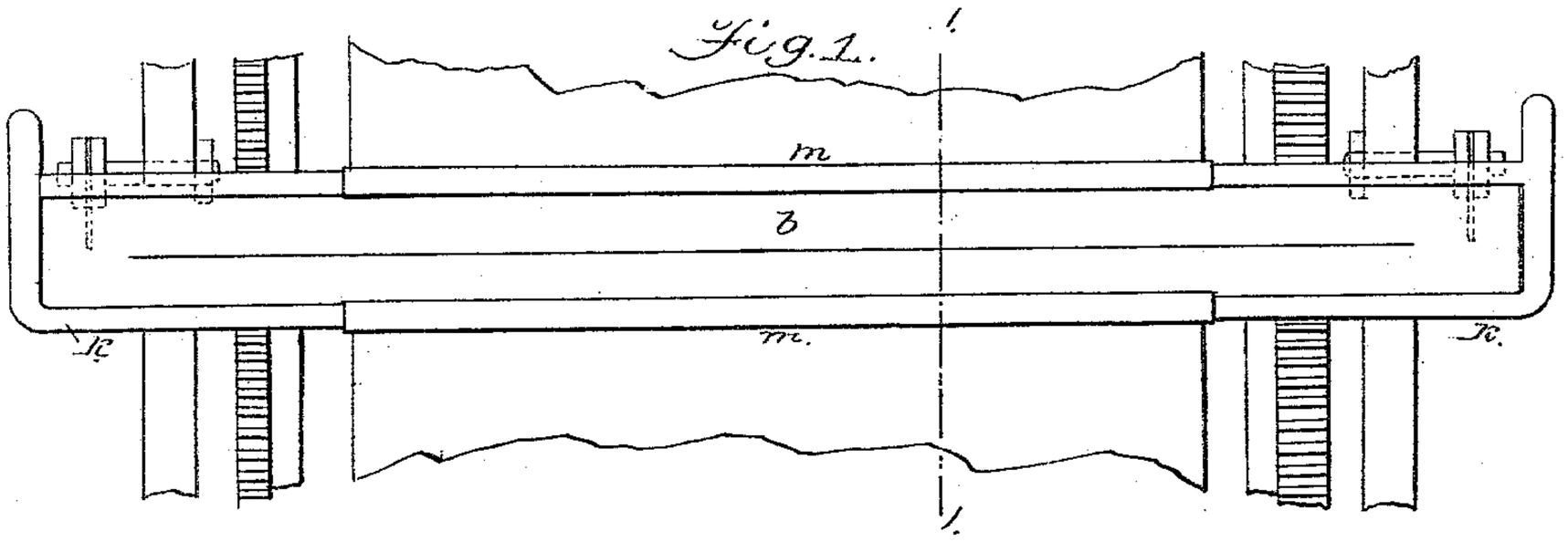
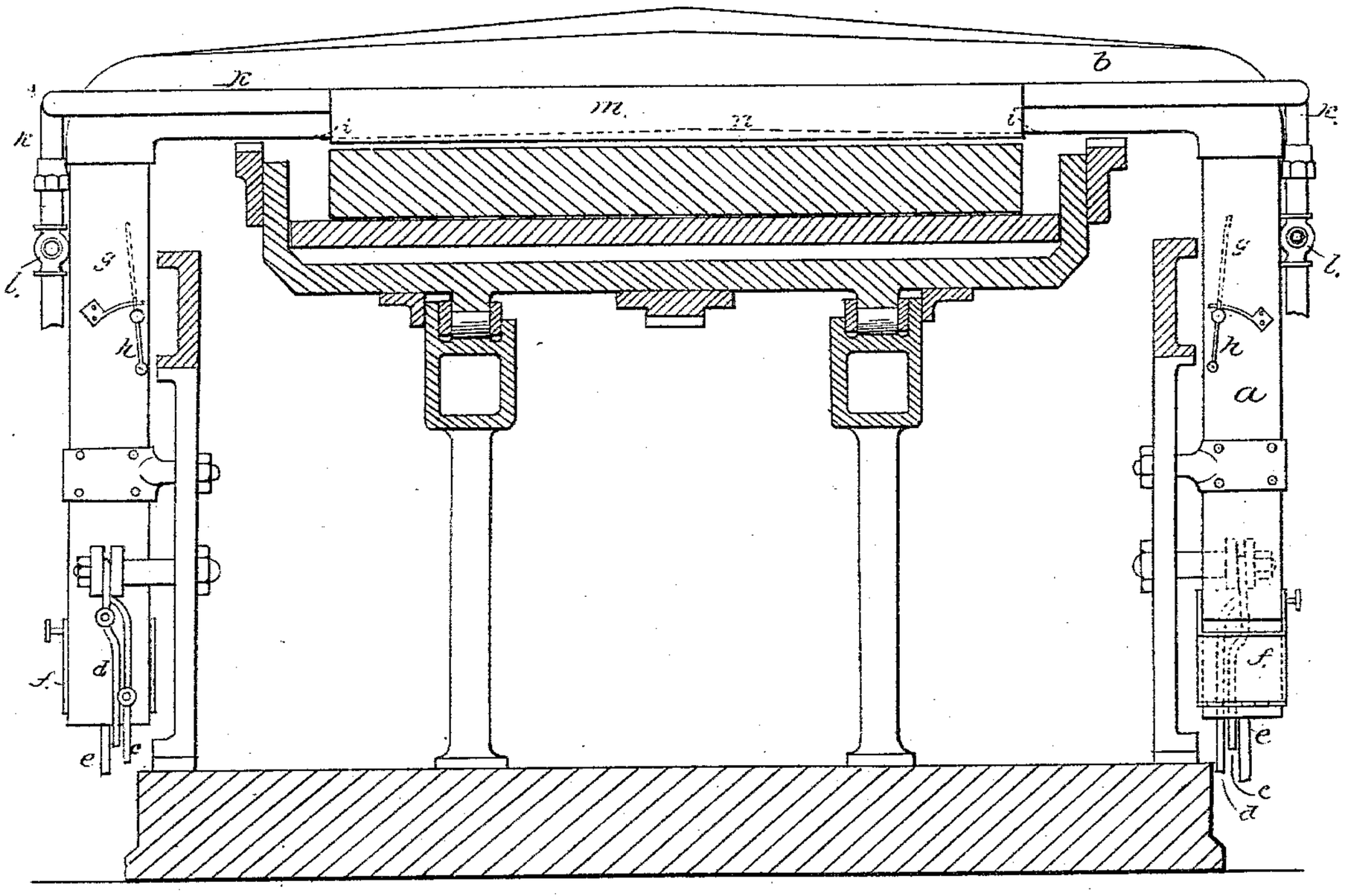


Fig. 2.



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Wm H. Forbes

John W. Osborne

by their attorney - John W. Osborne

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 3 Sheets—Sheet 2.

W. H. FORBES & J. W. OSBORNE.

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Fig. 3.

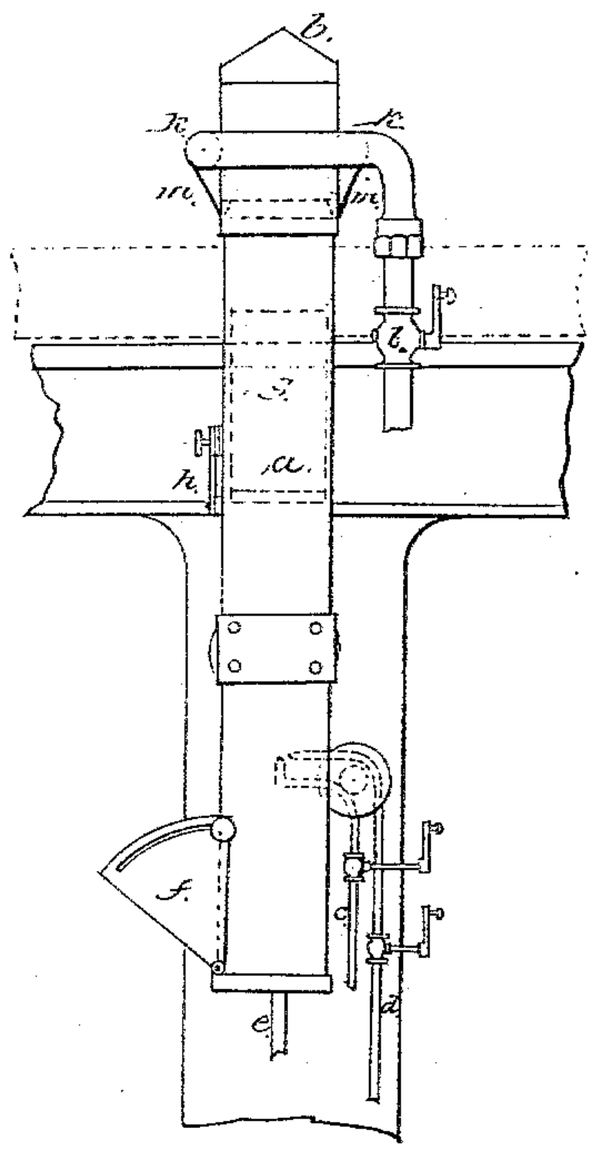


Fig. 4.

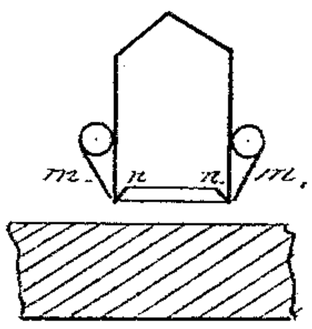


Fig. 10.

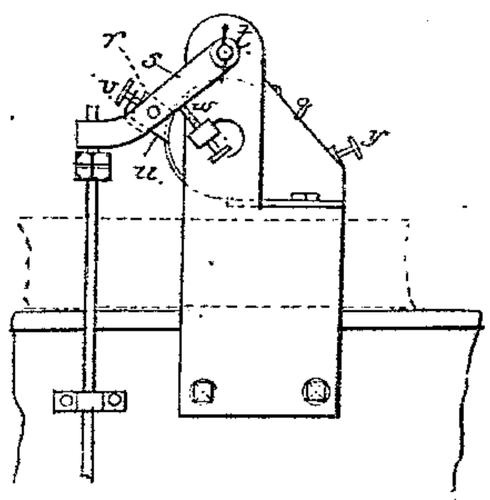


Fig. 5.

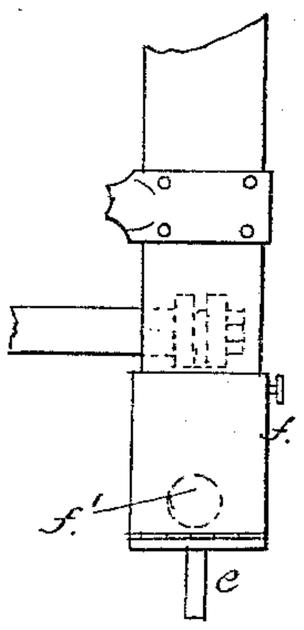


Fig. 6.

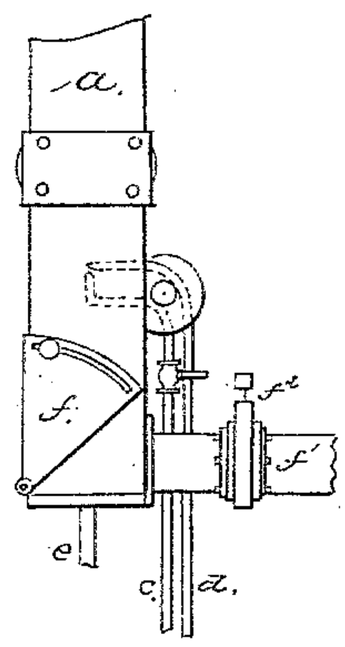
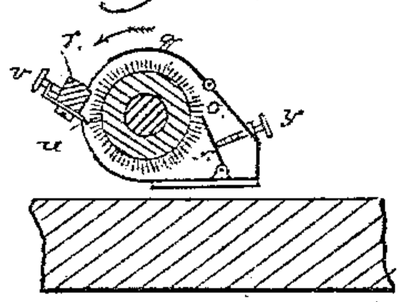


Fig. 11.



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(No Model.) 3 Sheets—Sheet 3.

W. H. FORBES & J. W. OSBORNE.

ART OF AND MACHINERY FOR LITHOGRAPHIC PRINTING.

No. 300,242. Patented June 10, 1884.

Fig. 7.

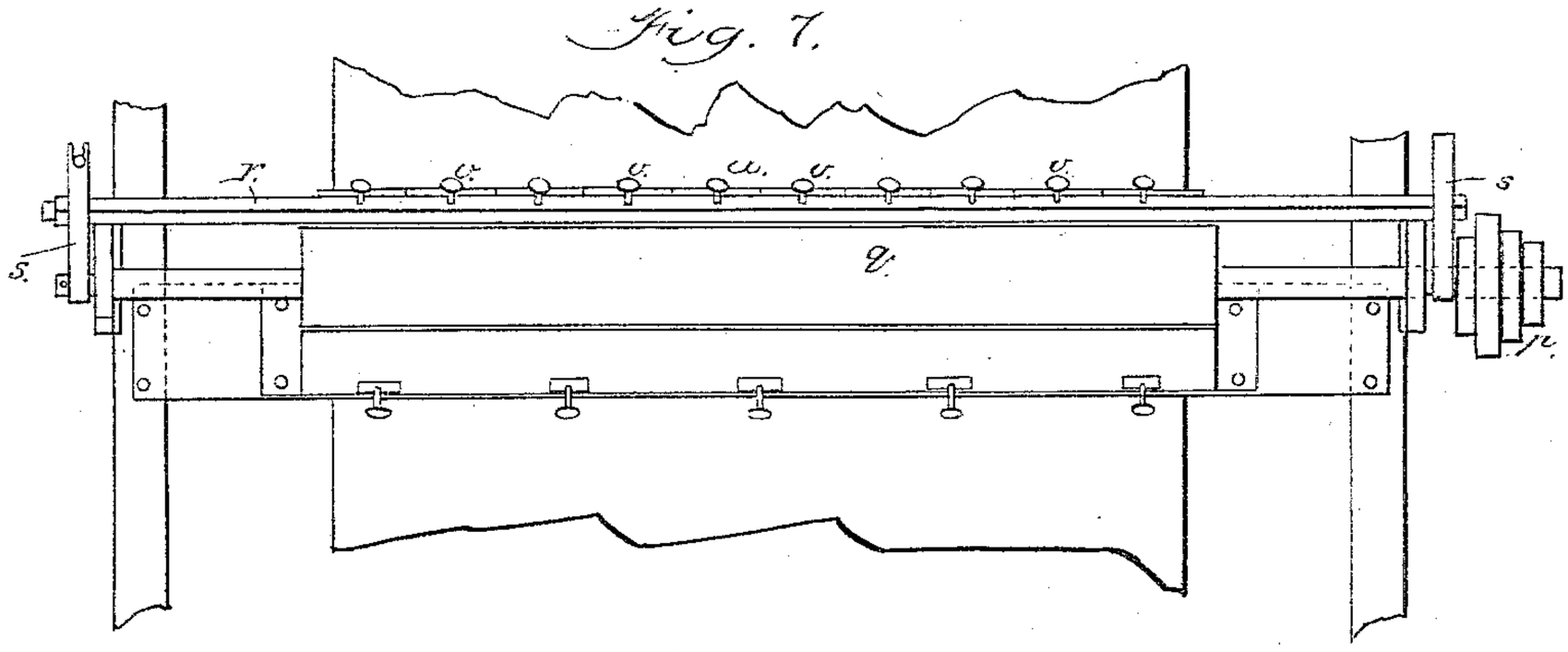


Fig. 8.

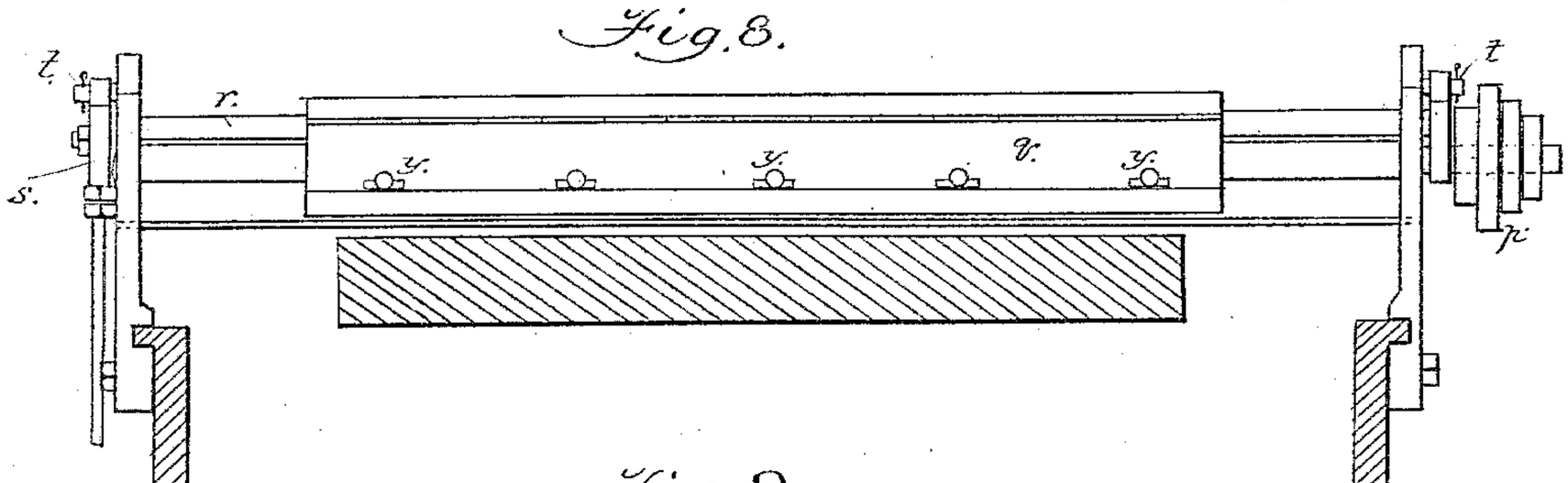


Fig. 9.

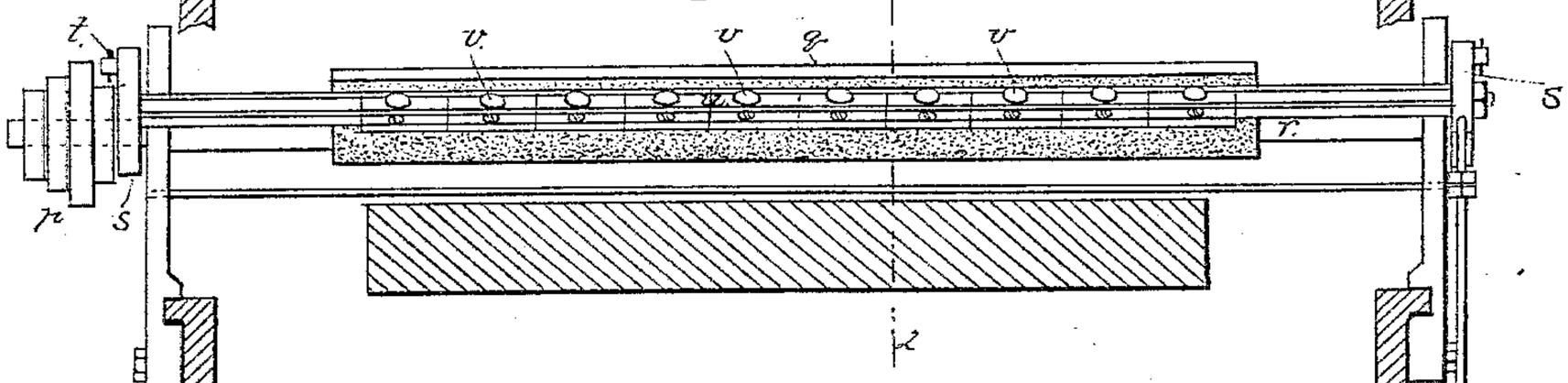


Fig. 12

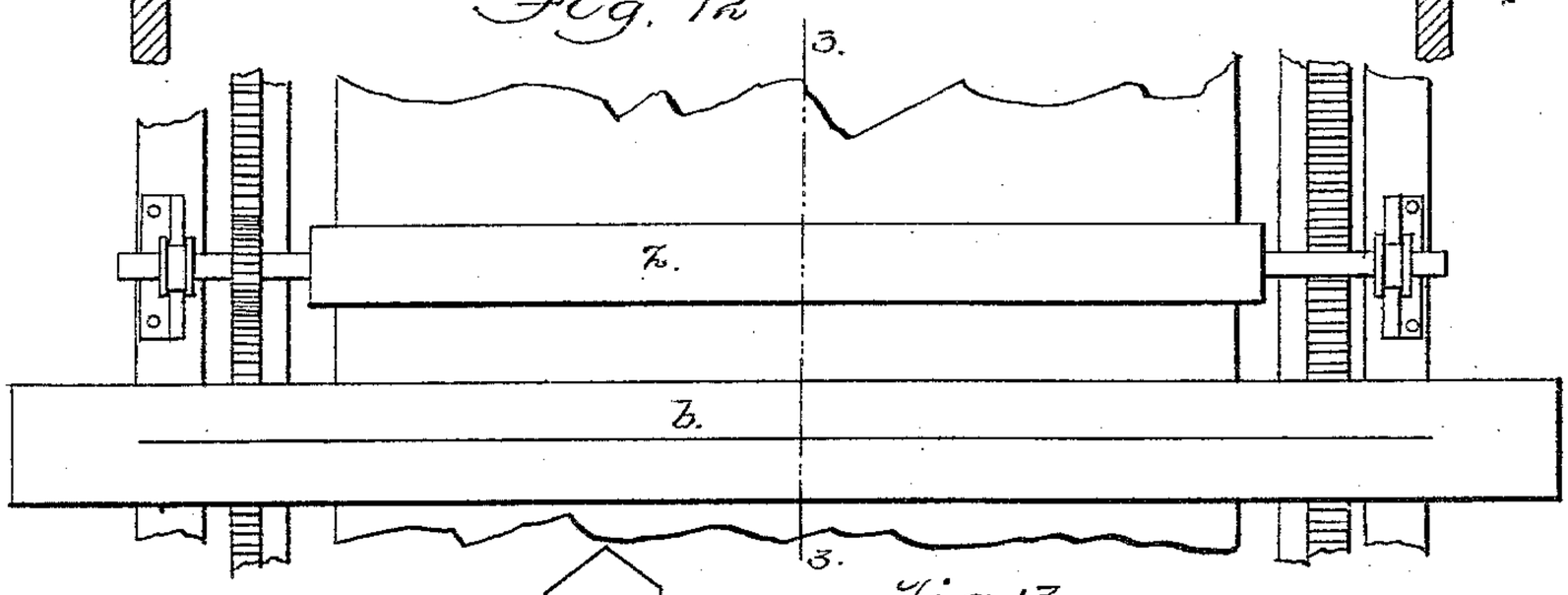
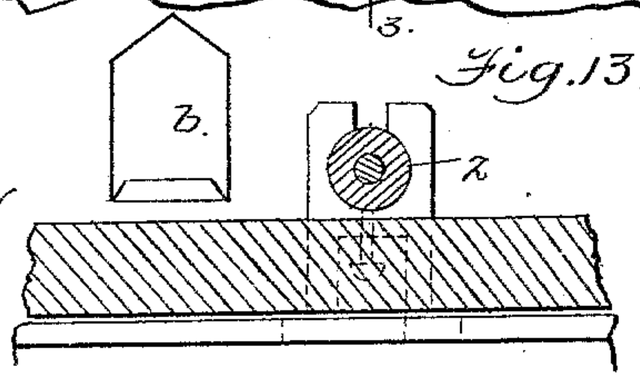


Fig. 13.



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Inventors,
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John W. Osborne
by their Attorney - John W. Osborne

UNITED STATES PATENT OFFICE.

WILLIAM H. FORBES, OF BOSTON, MASS., AND JOHN W. OSBORNE, OF WASHINGTON, D. C.; SAID OSBORNE ASSIGNOR TO SAID FORBES.

ART OF AND MACHINERY FOR LITHOGRAPHIC PRINTING.

SPECIFICATION forming part of Letters Patent No. 300,242, dated June 10, 1884.

Application filed April 20, 1881. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM H. FORBES, of the city of Boston, county of Suffolk, and State of Massachusetts, and JOHN W. OSBORNE, of the city of Washington, District of Columbia, have invented a new and useful Improvement in the Art of and Machinery for Lithographic Printing, of which the following is a specification.

This invention relates to the methods in use for printing from stone, zinc, or gelatine surfaces bearing drawings or designs from which impressions can be made with ordinary lithographic-printing ink, and is especially applicable when such printing is done in a power-press. Before inking a stone or plate prepared in the lithographic or collographic manner by means of a roller charged with printing-ink it is necessary to damp the surface generally to prevent the adhesion of the ink to those parts of said surface on which no design appears. Our invention bears directly upon the way in which the damping is accomplished, and is an important improvement on that employed at the present time. In most lithographic power-presses as at present constructed the bed of the press carrying the stone or zinc plate is made to reciprocate under the impression-cylinder. On one side of this cylinder the inking-rollers are placed in stationary bearings, and on the other side water is brought upon the printing-surface through the intervention of rollers which are supplied by a suitable fountain. These damping-rollers are made of some absorbent material, and are usually covered with linen. They are also weighted with a heavy metallic riding-roller, upon which the carrying-roller from the fountain deposits its water. As the stone reciprocates horizontally under and in contact with these rollers, it receives the necessary water and goes forward to be inked. In our invention we remove the water-fountain and the damping-rollers connected with it, and substitute in their stead one or more atomizers in suitable position, from which a fine cloud-like spray of water is allowed to fall upon the stone, or is impelled against it by a current of air. The atomizer used may be of any construction which effects the fine subdivision of the water, using compressed air, steam, or other mechanical or physical means for that purpose. The drawings which form part of this specification will make clear how the damping in this manner may be effected.

Figures 1, 2, 3, 4, 5, 6, 12, and 13 illustrate a case in which the subdivision of the water is effected by compressed air or steam; Figs. 7, 8, 9, 10, and 11, one in which the same is accomplished by recoil of the elastic fibers in a brush of suitable form. Fig. 1 represents in plan a portion of a lithographic power-press in which the stone is passing under the damping apparatus. Fig. 2 is an elevation of said apparatus, looking toward the impression-cylinder, (which is not shown,) with portions of the press in section. Fig. 3 is an elevation from the side of the press, looking across it. Fig. 4 is a cross-section on line 1 1. Figs. 5 and 6 are front and side elevations of the lower part of the same apparatus, showing an additional attachment. Fig. 7 represents in plan a damping arrangement in which a cylindrical brush is used. Fig. 8 is a side elevation of the same, looking toward the impression-cylinder. Fig. 9 is a side elevation, looking from the impression-cylinder. Fig. 10 is an end elevation, looking across the press. Fig. 11 is a cross-section on line 2 2, Fig. 9. Fig. 12 is a plan showing the combination of the damping apparatus with a distributing-roller. Fig. 13 is a cross-section of the same on line 3 3.

In the drawings, *a* is a perpendicular tube or trunk made of thin metal, placed near the side of the press, and communicating with the horizontal trunk *b*, which crosses the same. Within *a*, and near its lower end, the atomization is effected at the junction of the tubes *c* and *d*, the former furnishing compressed air or steam, and the latter water. The lower end of the trunk *a* is closed; but the tube *e* carries off any waste water collecting in it. In the side of *a* a door or valve, *f*, is provided, which covers, when closed, an opening for the admission of the air which the ascending atomized spray draws after it. This draft of air performs an important function in carrying the finely-divided water particles over the

stone, and as the valve *f* swings upon a hinge below and can be clamped in any position by the set-screw at its side the quantity of air which enters the trunk *a* is under control.

The valve or screen *g* inside the trunk *a* (shown in dotted lines in Figs. 2 and 3) is hinged below, and can be clamped in any position it can take by means of the set-screw in the outside arm, *h*. By means of this valve any desirable reduction can be made in the quantity of water blown up into the trunk *b* without altering the discharge from the atomizer below. When fully open, it lies flat against the side of the trunk and offers no impediment. The horizontal trunk *b* crosses the press parallel to the surface of the stone and as near to it as is convenient. Under this the stone reciprocates, and from it the cloud of atomized water descends upon the printing-surface and effects the damping. For this purpose the under side of *b* is open for the whole width of the stone, all other parts being closed. From the edge of the stone to the outside edge of the press-framing the trunk *b* is complete, and at *i* the under side of it is slightly raised across its width, so as to cause any water falling upon that side to find its way back into *a*, where it finally escapes by the tube *e*.

Along the sides of the horizontal trunk *b* are two tubes, *k k*, which unite outside the press, and communicate through the cock *l* with an exhaust-pump or exhaust-fan, (not shown in the drawings.) Over the stone these tubes communicate with hollow wedge-shaped extensions *m m*—one on each side of the trunk *b*—directed downward to within a short distance of the stone. Each of these extensions is provided with a long slit opening at its lowest angle, into which the air rushes to the exhaust-pump whenever the cock *l* is open. The current of air thus established removes any excess of watery particles blown upon the stone, which would spread laterally from under the trunk *b*, and will also, if strong enough, suck up any drainage from the inside surfaces of the same which may form in large drops, so as to prevent it falling upon the stone or other printing-surface. The latter result, however, we mainly accomplish by forming two little channels, *n n*, along the inside of the walls of the open part of the trunk *b*. These channels collect the large drops and discharge at *i*, a very slight fall from the center of the press outward being given them for that purpose. As the channels *n n* will be found very efficient, the tubes *k k* and all they involve may be dispensed with, if the excess of air containing atomized water which issues from under the horizontal trunk be disregarded.

The cock *l* and those on the tubes *c* and *d* are connected with a cam or other suitable device on some moving part of the press, by the action of which they are opened while the stone passes the trunk *b*, and closed as soon as it has passed. This may be made to take place twice—that is, while the printing-surface moves both ways; but our experience leads us to the conclusion that it is preferable to damp only while the stone is advancing toward the inking-rollers.

The atomized spray thrown upward through the trunk *a* is composed of a mixture of relatively large and small particles of water. It is desirable to eliminate the former, and use for damping only that portion of the spray which consists of particles so small that they remain a long time suspended in the atmosphere, and can be wafted wherever a gentle current of air takes them, whereby a uniform result is obtained. The apparatus above described effects this, for the larger particles do not receive sufficient impulse from the compressed air or steam to carry them the whole distance. They fall back or strike the sides or the bottom before reaching the raised lip *i*, and it is only the fog-like mist fine enough to be moved by the current entering at *f* (which current is also under control) that is deflected and carried forward beyond *i* and blown gently down upon the stone.

It should be explained that we also make an attachment to the trunk *a* closing the valve *f*, and introducing, instead of an induced current of air by that entrance, a positive and independent one by means of the tube *f'*, as shown in Figs. 5 and 6, leading from a fan or other blowing-engine. This current may be started and stopped by the valve *f''*, to be opened and closed automatically by the press, as are the cocks of the atomizer and exhaust. This addition of an independent current has certain advantages which will in many cases more than counterbalance the cost of the blowing-engine and connections. The force of the current of air which moves forward the finer part of the cloud of atomized water is then under control independently of the force or quantity of the atomization which takes place, and it is not limited by or necessarily proportional to that force. The independent current of air will, for instance, if properly adjusted, carry forward the subdivided water when the atomizer is placed at a much greater distance from the surface to be damped than that which is shown in the drawings, and can even be made to do so when the atomized spray is directed squarely against the incoming independent current.

In the foregoing description the several parts of the apparatus have been spoken of as extending from one side of the press only, and for small power-presses that will be found sufficient; but when the current of air bearing the finely-divided moisture has to cross a wide press, it is better to duplicate all that has been described at the other side of the press, so as to insure the necessary uniformity.

According to the size of the surface to be damped, a proportionate amount of subdivided water must be maintained in the trunk *a*.

This should always be in excess, so that it may be reduced, while the press is running, by means of the valve *g*, to the minimum quantity requisite to keep the stone clean. An excess is easily obtainable, for two or more pairs of atomizing-tubes can be used in the trunk *a* as easily as the one pair shown in the drawings. Our experience further establishes the fact that it is better to use two or more pairs of atomizing-tubes with small orifices and high pressure than to attempt to secure the same amount of water by larger openings.

The foregoing is sufficiently explanatory of the means we adopt to effect the damping of a printing-surface when the atomization is accomplished by the aid of compressed air or steam; but the essential principle of our invention may be applied to the ends in view when other methods of atomization are employed, which the following will make clear.

In Figs. 7, 8, 9, 10, and 11, *o* is a cylindrical brush, which may be made of hair, wire, or analogous elastic material. It extends across the press in the position usually occupied by the damping-rollers, but at some distance above the stone. This brush is fast upon an axle which runs in stationary bearings bolted to the side framing of the press, and it is made to rotate by a belt over the speed-pulley *p*, which is driven from any convenient shaft. Around the brush is the thin metal trough *q*. This trough contains a stratum of water, in which the brush *o* revolves. The trough is open on one side, preferably that facing the impression-cylinder, and in relation to this opening the brush is driven in the direction shown by the arrow. The stone reciprocates clear of the floor of this trough. The stiff bar *r*, attached to the arms *s s*, which are pivoted at *t*, and held in place by movable pins, also crosses the press from side to side in front of the brush. It carries a blade, *u*, which may be made in sections butting edge to edge against each other, each section being adjustable by a screw, *v*. One of the arms *s* is attached to a rod from a suitable cam below, driven by the press, which lifts it slightly at the proper time, and with it the bar which carries the blade-sections just described. When the cam does not act, the arm *s* rests upon the stop *w*. Within the trough is the blade or plate *x*, hinged below and controlled by the screws *y y y*. This runs the whole length of the trough.

The damping proceeds as follows: When the stone or other printing-surface reaches the proper position, the cam lets the bar *r* fall, whereupon the blade-sections which it carries come in contact with the revolving brush, where it remains until the stone has passed. It is then lifted by the cam, and held so till the next damping is required. The hairs of the brush are held back to a greater or less extent as long as the bar *r* remains down; but each hair as it passes regains its original position, and in doing so throws off a minute drop of water, which falls upon the stone, giving rise in the aggregate to an atomized spray directed against the stone, and covering its whole surface as it travels underneath. The blade *x* within the trough *q* is held against the brush with more or less pressure, which is regulated by the screws *y y*. Its function is to cause the brush to throw off against the sloping wall of the trough (down which it runs) a large part of the water it brings up, which equalizes and tends to render constant the quantity still adhering to the hairs after they have passed on, however the stratum of water in the bottom of the trough may vary in depth. By these screws *y y* the amount of water propelled upon the stone is also controlled, for the less the brush contains (due to pressure applied to the plate or blade *x*) the smaller the particles thrown off at *u* will be. The proximity of the atomized particles of water upon the stone will depend upon the number of hairs in the brush and the relative speed at which the stone travels. The size of the particles depends upon the fineness of the hairs in the brush, their elasticity, the amount of water adhering to them at the time they reach the blade *u*, and the extent to which they are held back in passing *u*, due to its pressure upon them. The last condition is effected, first, in a general way, by the elevation or depression of the stops *w w*, and, secondly, by the position given to each section of the blade *u* by means of the screws *v v*, and it is to admit of the local increase or decrease of the quantity of water thrown off that we make said blade *u* in sections. The application of this second method of atomizing water to the damping of stones and other printing-surfaces similarly printed has many advantages; but we do not base any claims upon the special devices employed at the present time, as they will form the subject-matter of a future application.

Compared with the method in every-day use of damping lithographic stones by means of rollers, our invention is an important improvement. By using atomized water under proper control, as described, the work upon the stone is saved all the wear and tear due to the traveling of the rollers over it, and all smearing caused by dirty rollers is obviated. The edges of the stone, too, which every practical printer knows are very imperfectly damped by the present method, and which are in consequence constantly taking ink, can cause no trouble. In addition to these positive advantages, the labor and loss of time caused by hard, dry, dirty, and worn rollers, and by the periodical cleaning of the riding-roller, are entirely done away with.

In the foregoing we have particularly detailed and set forth the nature of our invention, and explained the benefits secured by damping a surface which prints in the lithographic manner without the contact of any solid body with said surface; but it should also be stated

that the application of the principle in compliance with which water is brought upon the stone in an atomized condition does not preclude the use of a roller or rollers to effect its more perfect distribution, and that in certain cases (mainly when very close work is to be printed from) the supplemental use of a roller may be found advantageous, and may then be employed. Figs. 12 and 13 show in plan and section the way in which the equalizing-roller *z* is used conjointly with the horizontal trunk *b* of the atomizing apparatus, the exhaust-pipes *k k* in this case being omitted, as hereinbefore suggested.

What we claim, and desire to secure by Letters Patent, is—

1. The improvement in the art of printing in the lithographic manner which consists in first projecting upon the printing-surface a delicate spray of atomized water, then inking the surface so treated, and finally printing from the same on paper or other flexible material, substantially as and for the purpose described.

2. The improvement in the art of damping surfaces prepared for printing in the lithographic manner which consists in producing a cloud of atomized water, and in conveying the same to the surface to be damped, substantially as and for the purpose described.

3. The improvement in the art of damping surfaces prepared for printing in the lithographic manner which consists in producing a cloud of atomized water, and in conveying the same to the surface to be damped by an independent current of air generated by extraneous means, substantially as and for the purpose described.

4. The improvement in the art of damping surfaces prepared for printing in the lithographic manner which consists in producing a cloud of atomized water, and selectively conveying the lighter particles in said cloud to the surface to be damped, substantially as and for the purpose described.

5. The improvement in the art of damping surfaces prepared for printing in the lithographic manner which consists in producing a cloud of atomized water, and selectively conveying the lighter particles in said cloud to the surface to be damped by means of a current of air, substantially as and for the purpose described.

6. The improvement in the art of damping surfaces prepared for printing in the lithographic manner which consists in producing a cloud of atomized water, and selectively conveying the lighter particles in said cloud to the surface to be damped by an independent current of air generated by extraneous means, substantially as and for the purpose described.

7. The improvement in the art of damping surfaces prepared for printing in the lithographic manner which consists in projecting a spray of atomized water in a direction other than that of the surface to be damped, and then diverting the direction of said spray, or a portion of it, toward that surface and carrying it to the same, substantially as and for the purpose described.

8. The improvement in the art of damping surfaces prepared for printing in the lithographic manner which consists in projecting a spray of atomized water in a direction other than toward the surface to be damped, and then diverting the direction of said spray, or a portion of it, toward that surface, and carrying it to the same by means of a current of air, substantially as and for the purpose described.

9. The improvement in the art of damping surfaces prepared for printing in the lithographic manner which consists in projecting a spray of atomized water in any desired direction other than that of the surface to be damped, and then diverting the direction of said spray, or a portion of it, toward that surface, and carrying it to the same by means of an independent current of air generated by extraneous means, substantially as and for the purpose described.

10. The improvement in the art of damping surfaces prepared for printing in the lithographic manner which consists in conveying over such a surface a cloud of atomized water in excess, and then removing the unused excess or superfluity, substantially as and for the purpose described.

11. The improvement in the art of damping surfaces prepared for printing in the lithographic manner which consists in conveying over such a surface a cloud of atomized water in excess, and then removing the unused excess or superfluity by means of a current of air, substantially as and for the purpose described.

12. The improvement in the art of damping surfaces prepared for printing in the lithographic manner which consists in conveying to and depositing upon such a surface a quantity of water in an atomized condition, and then spreading or equalizing said deposit by means of a roller or rollers, substantially as and for the purpose described.

13. An atomizer, in combination with printing-surface of a lithographic press, substantially as and for the purpose described.

14. An atomizer surrounded by a tube or trunk opening over and in combination with a printing-surface adjusted for printing in a lithographic press, substantially as and for the purpose described.

15. The trunks *a* and *b*, containing an atomizer, and provided with the valve *f* for controlling the ingress of air, in combination with a printing-surface adjusted for printing in a lithographic press, substantially as and for the purpose described.

16. The trunks *a* and *b*, provided with a tube, *f'*, for the admission of an independent current of air, in combination with a printing-

surface adjusted for printing in a lithographic press, substantially as and for the purpose described.

17. In combination with the printing bed or surface of a lithographic press, the trunk containing an atomizer, and a valve, *g*, located between the atomizer and bed, to regulate the quantity of atomized fluid delivered to the printing-surface.

18. In combination with the trunk *b*, the tubes *k k*, provided with slit openings and connected with an exhaust fan or pump, substantially as and for the purpose described.

19. The trunk *b*, provided with the channels *n n*, and the raised edge *i*, surrounding the discharge-opening over the surface to be damped, substantially as and for the purpose described.

20. The trunk *a*, containing an atomizer, and provided with an adjustable opening or connection for the ingress of a current of air, a valve, *g*, for controlling the quantity of atomized fluid discharged, joined to the trunk *b*, provided with an opening for the descent of the cloud of atomized particles, said opening having raised channels to catch drops, and the exhaust-tubes *k k*, to remove excess, in combination with a printing-surface adjusted for printing in the lithographic press, substantially as and for the purpose described.

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Witnesses to the signature of William H. Forbes:

GEO. W. LINCOLN,
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R. P. STULL.