(No Model.) 2 Sheets—Sheet 1.

R. MIEHLE.

AIR CUSHION FOR PRINTING PRESSES.

No. 345,527. Patented July 13, 1886.

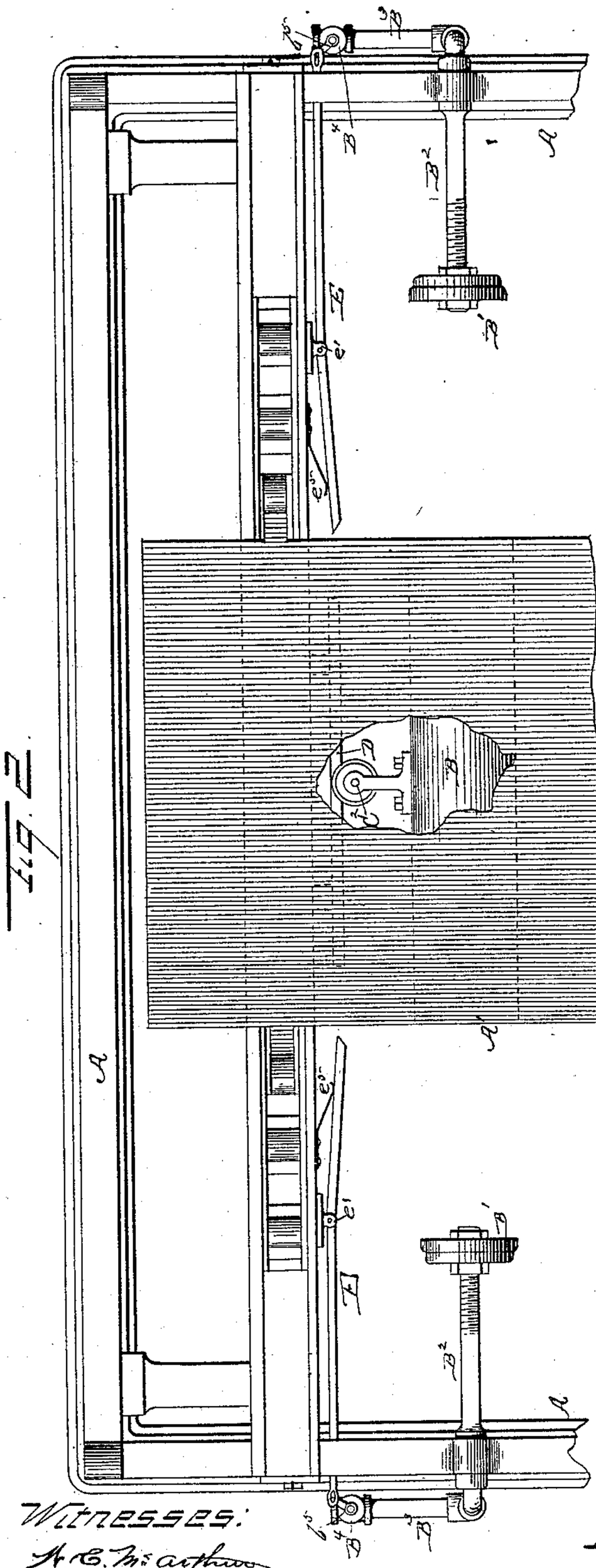

Fig. 2.

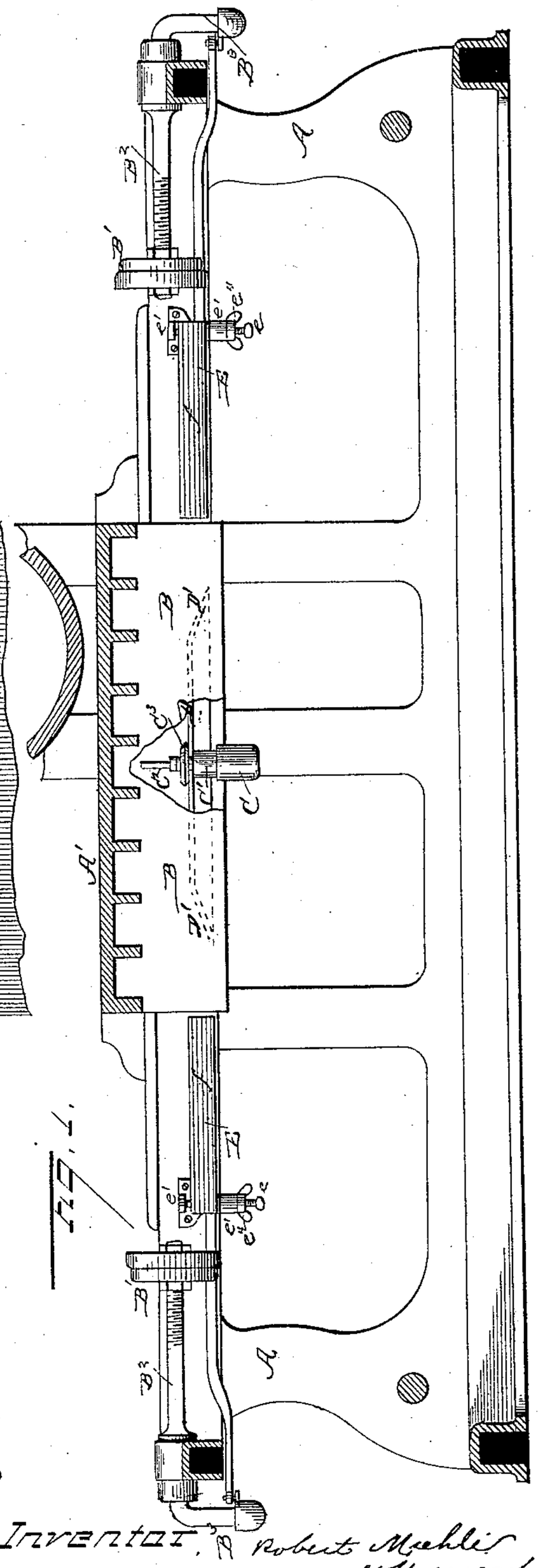

Fig. 1.

Witnesses:
H. C. McArthur
A. Paré

Inventor,
Robert Miehle
per
H. Harrison
Attorney.

(No Model.)

2 Sheets—Sheet 2.

R. MIEHLE.

AIR CUSHION FOR PRINTING PRESSES.

No. 345,527. Patented July 13, 1886.

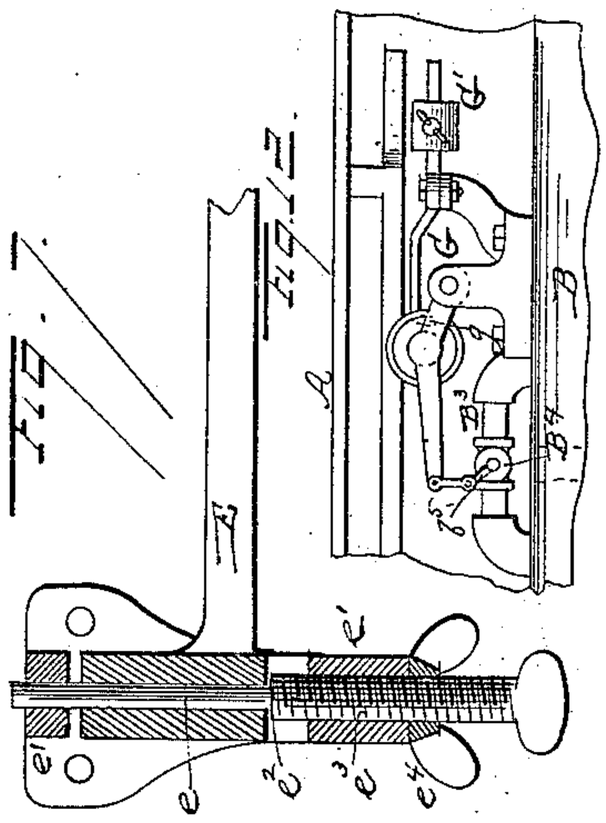

FIG. 1.

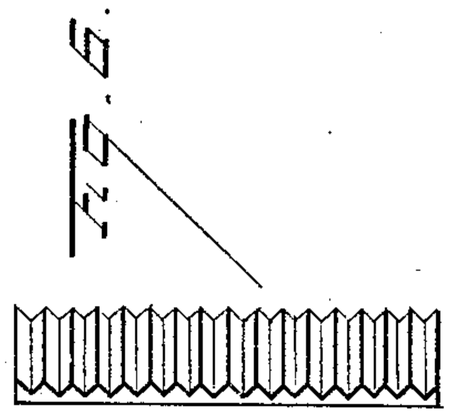

FIG. 4.

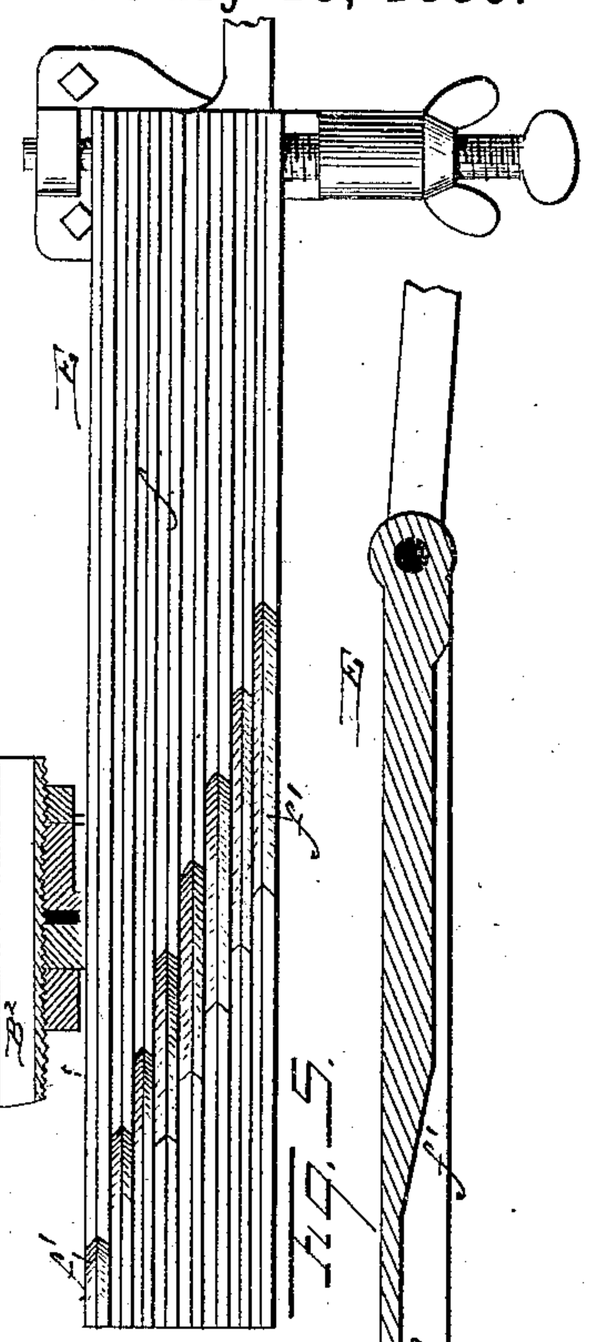

FIG. 5.

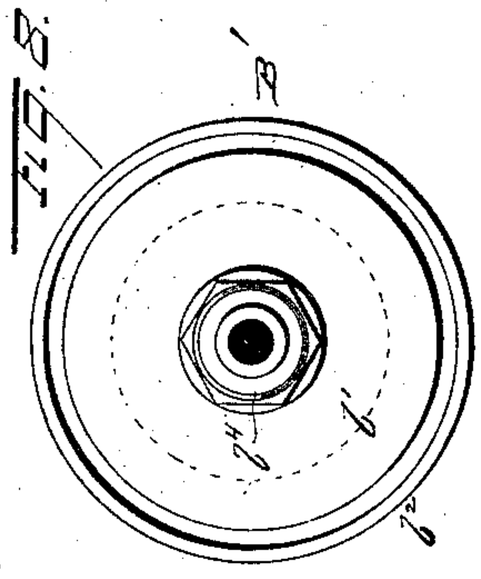

FIG. 6.

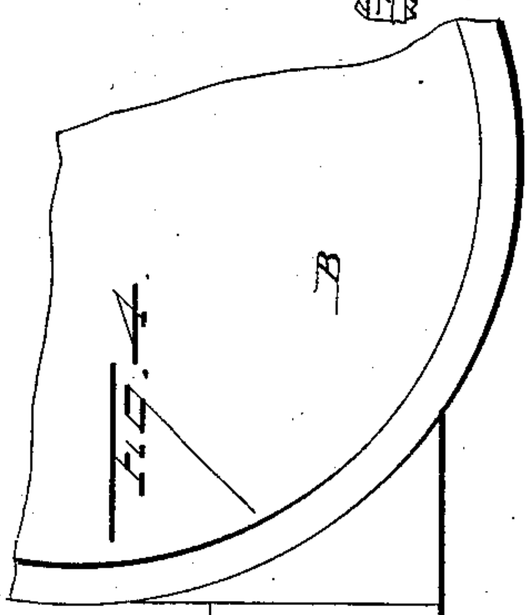

FIG. 7.

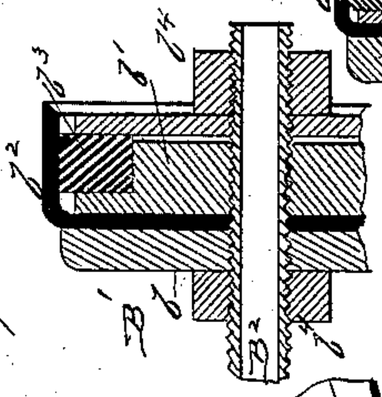

FIG. 10.

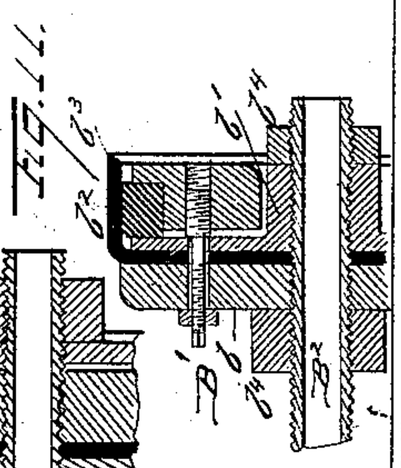

FIG. 11.

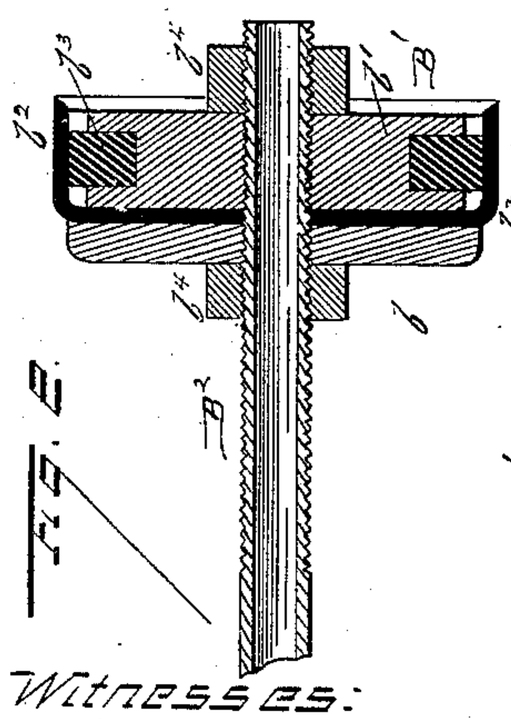

FIG. 8.

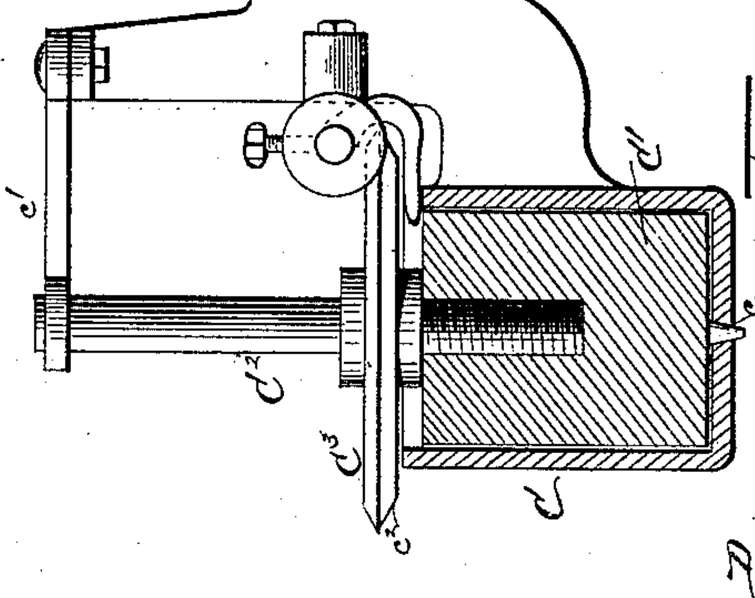

FIG. 9.

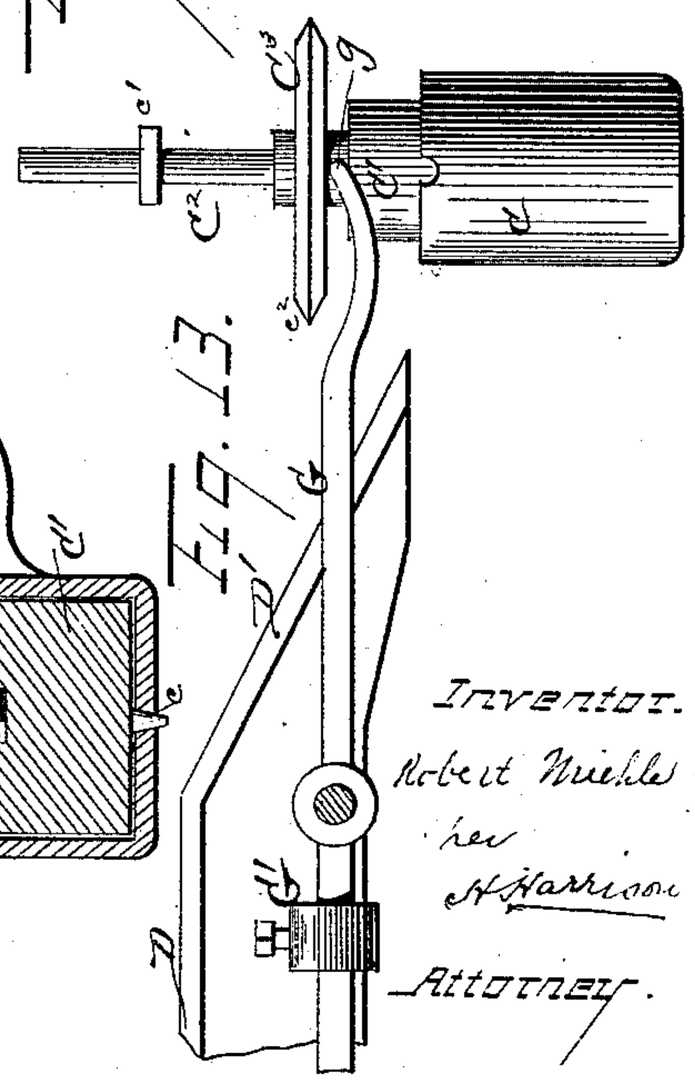

FIG. 12.

FIG. 13.

Witnesses:
H. C. McArthur
A. Paré

Inventor.
Robert Miehle
per
H. Harrison
Attorney.

UNITED STATES PATENT OFFICE.

ROBERT MIEHLE, OF CHICAGO, ILLINOIS.

AIR-CUSHION FOR PRINTING-PRESSES.

SPECIFICATION forming part of Letters Patent No. 345,527, dated July 13, 1886.

Application filed December 23, 1884. Serial No. 151,064. (No model.)

To all whom it may concern:

Be it known that I, ROBERT MIEHLE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Air-Cushions for Printing-Presses, of which the following is a specification, to wit:

This invention relates to air-cushions for printing-presses; and it consists in the peculiar construction and arrangement of the same, substantially as will hereinafter be more fully set forth and claimed.

In order to enable others skilled in the art to which my invention appertains to avail themselves of its benefits, I will now proceed to describe its construction and operation, referring to the accompanying drawings, in which—

Figure 1 is a longitudinal section of a press fitted with my improvements. Fig. 2 is a plan view of the same. Fig. 3 is an enlarged side elevation of devices for regulating the amount of air used for cushioning on one end of the press. Fig. 4 is an end view of one end of the cushioning-cylinder and the regulating-disk carried by it, and also a section of the cylinder C. Fig. 5 is a horizontal section of the grooved valve-operating lever. Fig. 6 is a face view of a portion of the same, Fig. 7, a sectional view of the pivot of this lever. Figs. 8 and 9 are views of the air-piston, and Fig. 10 is a sectional view of a modification of the same. Fig. 11 is another form of the same, and Fig. 12 is a modification of the means of operating the valves. Fig. 13 is a view of the longitudinal shelf, regulating-disk, and cylinder C.

A represents the main frame of a printing-press, and A′ the reciprocating bed, which is moved back and forth by the usual mechanism, too well known to need description here, as it has no bearing upon the present invention. Upon the under side of the bed is formed or secured the air-cylinder B, which is, as usual, a cylinder open at each end, and having a division in the center, which forms it into really two cylinders working in opposite directions as the bed is moved. The pistons B′ are adjustably secured upon a hollow arm, B^2, projecting in from the main frame in a line with the cylinders. Each piston consists of two disks, *b b′*, between which is clamped a leather disk, b^2, the edge of which is pressed back over the larger metal disk, *b′*, to form a wearing-surface for the piston-head. This larger disk, *b′*, is formed with a circumferential groove, in which is placed a ring of rubber, b^3, which presses outward against the flanged edge of the leather, as fully shown in Fig. 9, and forms an air-tight joint when the piston enters the cylinder. When the leather surface has become worn, it is readily thrown out against the cylinder by removing the ring of rubber and placing a strip of paper or other material behind it. The outer surface of the hollow arm B^2 is screw-threaded, and the piston-head is therefore adjusted upon it to suit the service desired, and a lock-nut, b^4, is placed upon the arm upon each side of the piston-head, to secure it firmly when properly adjusted.

To the rear end of each hollow arm B^2 is secured an air-escape pipe, B^3, upon the end of which is a valve, B^4, of any suitable kind, having an operating-arm, b^5, attached to its plug, for a purpose presently seen.

Upon the under side of the reciprocating bed is secured a small vertical cylinder, C, having its upper end entirely open, and a small hole, *c*, formed through its lower end, to permit the passage of air to and from the cylinder, as in Fig. 4. Within this cylinder C is fitted a head, C′, into which is screwed a rod, C^2, moving in a guide-arm, *c′*, of the frame at its upper end and carrying a circular disk, C^3, which is preferably formed with a V-shaped edge, c^2, as shown. This disk rises and falls with the rod and piston, and the rod is adjusted in and out of the piston by means of its screw-thread to lift and lower the disk with relation to the piston, as will be hereinafter explained.

Upon the main frame of the press is secured a longitudinal shelf or track, D, having an incline, D′, at each end, and in the travel of the bed the disk runs up the incline, is held elevated during its passage over the straight portion of the track, and is allowed to fall at the end.

It is necessary in the action of this description of press that the air should be confined in the cylinder in sufficient quantity to properly cushion the bed, and, as the proper

amount varies with the speed of the press, it is evident that the valve in the escape-pipe must be closed earlier or later in the stroke, according to the speed. This I do as follows: To the operating-arms b^5 of the valves are attached the slotted ends of the levers E, which extend inward toward the center of the press. These levers are pivoted upon the press-frame by means of a pivot, *e*, passing through the lugs *e'*. This pivot is formed with a shoulder, e^2, upon which the lever rests, and below this it is provided with a screw-thread, e^3, which screws into the lower lug, and by means of which the lever is raised or lowered in adjusting it. A jamb-nut, e^4, is placed on the pivot to prevent it working loose, as fully shown in Figs. 3 and 7. The rear end of each lever is broadened out, and its face is formed with a series of longitudinal grooves, *f*, each of which is formed with an incline or cam, *f'*. It will be seen by reference to Figs. 3, 5, and 6 that these grooves are made V-shaped to fit and receive the edge of the disk C^3, and that each successive groove of the series has its incline located nearer to the fulcrum of the lever. The purpose of this will be presently explained. By reference to the drawings, it will be seen that when the press is running and its bed reciprocating in the usual manner the disk C^3 runs up on the track D and lifts with it the piston or plunger in the small cylinder C. As this plunger rises and is drawn into the cylinder through the hole in its lower end, it will be evident that when removed from the track the disk and plunger can only fall as fast as their weight can force out the air in the cylinder C beneath them. It will be evident that in traversing the space between the point of leaving the track D and the end of the grooved lever E the disk will fall more or less, according to the speed of the press. Thus, if running fast, the disk will only fall a short distance, and when reaching the lever its edge enters one of the upper grooves, and further fall is thus arrested. In passing along said groove the lever is not moved until the inclined portion *f'* of this groove is reached, and in passing this the disk forces back this end of the lever, which rocks upon its pivot, and its other end closes the escape-valve. This stops the escape of air from the cylinder, and that which remains forms a cushion, which is compressed, and not only serves to stop the motion of the bed without jar or strain upon the machine, but also serves by its expansive force to aid in starting the bed again upon its reverse motion. When running at a lower speed, the disk drops to a lower point and enters one of the lower grooves, *f*, and, as the incline *f'* is in this groove situated much nearer the fulcrum of the lever, it is evident that the cutting off of the escape of air will occur at a later point in the stroke, and only enough be retained to form a proper cushion at this speed. This renders the amount of "cushion" given the bed entirely automatic and at all times in strict relation to the speed and without any attention on the part of the operator. The grooved lever is supported upon its shouldered screw-pivot in such manner that it may be readily adjusted up or down to change its relationship with the cam-track, and thereby compensate for any leakage in one of the cylinders or their pistons or valves and keep the cushioning of the two ends balanced. When the edge of the disk passes down the inclined part *f'* of a groove on its backward stroke, the lever is at once thrown forward by a spring, e^5, behind it and opens the valve for the admission of air to the cylinder. This admits the air at the precise point at which its expulsion was cut off and at which its expansion ceases, and thus prevents the possible formation of a partial vacuum in the cylinder, to form a drag upon the action of the machine.

While the device just desrcibed will form an effective automatic means of cushioning the bed, should there not be any considerable difference in the weight of the forms in use, yet when these vary to a considerable extent some further adjustment is necessary to meet additional weight, and I therefore pivot upon the bed near the small cylinder C an arm, G, the rear end of which is provided with an adjustable weight, G', and its forward end formed with a finger, *g*, which extends beneath the disk C^3, between it and the plunger C', as in Fig. 3. When the weight of the form on the press-bed requires it, the weight G' is adjusted outward on its arm, and, as its leverage is to be overcome, the plunger and disk will of course fall slower than before, and the escape of air be cut off at an earlier point relatively to the speed. The same result might be obtained by forcing the air out of the small cylinder C through a stop-cock, instead of the hole shown; but this I do not regard as so good as the device just described, as the oil used to lubricate the plunger will find its way into the stop-cock and clog its action unless constantly watched. This device is readily applied to any air-cushion press, and though here shown as applied to a press having its cylinders upon the bed and the air-pistons on the main frame, it can be used equally well upon one in which this arrangement is reversed, the escape-pipes in that case being connected to the cylinders, instead of to the pistons. The action is of course the same; or both the cylinders and pistons may be on the main frame.

It is desirable to provide for the proper adjustment and expansion of the rubber ring upon the piston-head without the trouble of removing it and underlaying with paper, as already described, and for this purpose I design to construct the metal disk in which it is recessed in two parts, one of which is forced up against the other to expand the rubber, as in Fig. 10; but I prefer to use the form shown in Fig. 11, in which the leather disk is clamped between the disks *b b'*, as before; but the latter is simply a thin plate having a hub,

i, which screws upon the hollow arm, and is secured by a lock-nut, as already described. Around this hub is a metal disk, *i'*, secured to the main body of the head by a series of set-screws or clamping screws, i^2, and having its periphery on its inner side formed with an annular recess for the reception of the rubber ring b^3. It will be seen that as the disk *i'* is drawn up by its clamping-screws the rubber, being compressed laterally, must expand radially, and all wear is thus compensated for and a fine adjustment obtained that always keeps the piston air-tight in the cylinder.

It will be evident the small air-cylinder may be used without the weighted arm for controlling the point of cutting off the air, and this arm may also be used to operate the sliding disk without the air-cylinder, and the sliding disk alone without the air-cylinder or weighted arm; but while these devices will give good results independently, the best and most perfect action is obtained by using them together. The rear end of the grooved lever may be cut off on an incline, also to give the disk more room to drop before engaging.

In Fig. 12 is shown a modification of the device, in which the air-cylinders on the press-bed are connected by a pipe having a valve, so that the air forced out of one cylinder passes into the other. The disk is in this case carried upon a hinged arm, which is connected to the valve, and is opened and closed by the lateral movement of the disk-arm, while the vertical play of the disk supported or regulated by the weighted arm governs the time of opening and closing the valve, as before described.

When this device is used, the grooved rock-levers are replaced by a grooved plate of similar form secured upon the main frame.

To prevent too much friction upon the track as the disk is lifted by it, the finger of the weighted lever may be provided with a small roller, as will be understood at once. It will be seen that as the speed of the bed decreases the disk drops lower before engaging the grooved lever, and, as this lever is not of great width, when the speed reaches so low as to need no cushion, time is given for the disk to fall its full-stroke, and thus is below and does not engage the lever at all. This enables the machine to be perfectly automatic in this regard.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an air-cushion for printing-presses, the combination, with the reciprocating bed, the cylinder, air-pistons, and air-escape pipes provided with stop-cocks, of the rocking operating-levers connected to said stop-cocks, a gravitating contact device upon the press-bed, and a cam-track upon the main frame for lifting it, whereby the stop-cocks are closed at different times, according to the speed of the press, substantially as shown and described.

2. In an air-cushioning device for printing-presses, the combination, with the stop-cocks for controlling the ingress and egress of air to the cylinders, and the operating-levers connected thereto, and having their rear ends formed with a series of grooves having a short inclined portion, each of which is successively nearer the fulcrum of the lever, of a small vertical air-cylinder carried by the bed, a gravitating plunger therein carrying a revolving disk, and a track upon the main frame having inclined ends, substantially as and for the purpose set forth.

3. In an air-cushioning device for printing-presses, the combination, with a disk carried upon a gravitating plunger working in an air-cylinder on the press-bed, of a valve-operating lever formed with a series of variously-inclined grooves for engagement with the disk, and means, substantially as described, for adjusting this lever with relation to the gravitating disk, substantially as and for the purpose set forth.

4. In an air-cushioning device for printing-presses, a small vertical cylinder upon the bed, provided with a plunger working therein, and having an opening for the passage of air to and from the cylinder beneath the plunger, in combination with a stem or rod screwed into the plunger, and provided with a disk for operating the valve mechanism, whereby the disk and plunger are relatively adjustable, substantially as and for the purpose set forth.

5. In an air-cushioning device for printing-presses, the combination, with a gravitating plunger and disk, working in a cylinder on the press-bed, of an arm pivoted on the bed and having its forward end engaged with the sliding disk and plunger, and its rear end provided with an adjustable weight, whereby the fall of the plunger is adjusted relatively to the weight upon the bed, substantially as and for purpose set forth.

6. In a device for cushioning the beds of printing-presses, the combination, with the valves for regulating the supply of air to and from the cylinders, of valve-operating levers formed with a series of inclines of successive length and successively nearer the fulcrum-points, supporting-pivots formed with shoulders for supporting the levers, and screw-threads for adjusting them in their brackets, and a gravitating device carried on the bed for engaging the levers, substantially as and for the purpose set forth.

7. In an air-cushioning device for printing-presses, the combination, with the main frame A, provided with the track D, having inclines D', the adjustable pistons B', hollow arms B^2, escape-pipes B^3, and valves B^4, of the press-bed A', air-cylinders B, the small air-cylinder C, its plunger C', and disk C^3, and the grooved levers E, connected to the valves, all constructed and arranged to operate substantially as and for the purpose set forth.

8. In an air-cushion for printing-presses, the combination, with the air-cylinders, pis-

tons, and valves, and a gravitating disk carried upon the bed, of levers provided with a series of grooves having short inclines, each of which is successively nearer the end of the stroke of the gravitating disk, substantially as and for the purpose set forth.

9. In an air-cushion for printing-presses, the combination, with the valves for controlling the ingress and egress of air to the cushioning-cylinders, and the operating-levers connected thereto, of a gravitating contact device upon the reciprocating bed, engaging and operating the levers when the speed requires it, and passing freely by them at other times, substantially as and for the purpose shown and described.

In testimony whereof I affix my signature in presence of two witnesses.

ROBERT MIEHLE.

Witnesses:

W. C. McARTHUR,

CHAS. KRESSMANN.