(No Model.) 3 Sheets—Sheet 1.

A. CAMPBELL.

AIR CUSHION FOR THE RECIPROCATING BEDS OF PRINTING PRESSES.

No. 291,875. Patented Jan. 15, 1884.

Fig. 1.

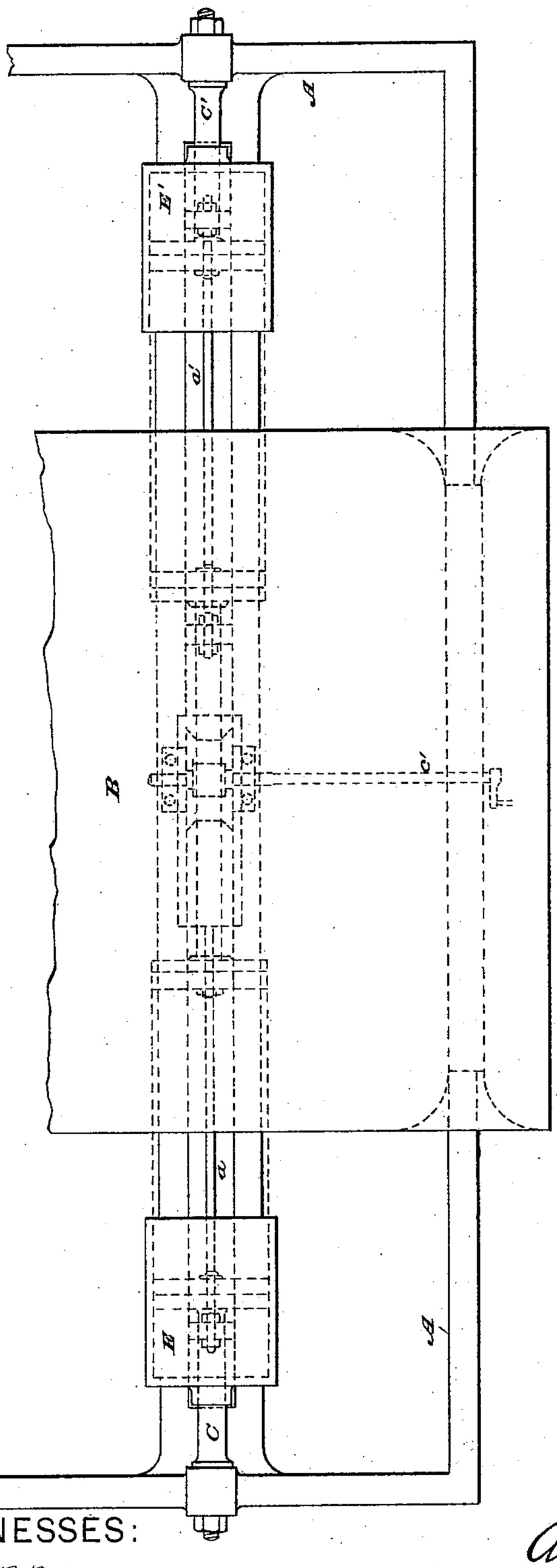
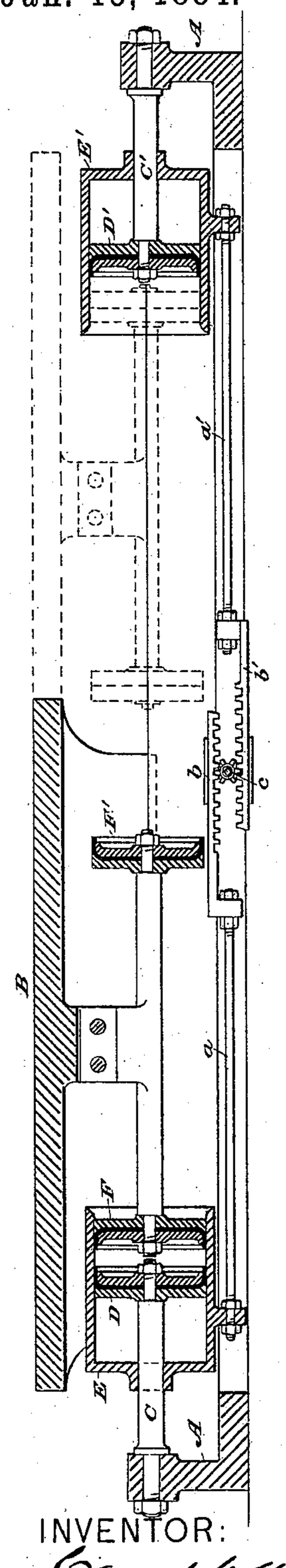


Fig. 2.



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Geo. Bainton

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(No Model.) 3 Sheets—Sheet 2.

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Fig. 3.

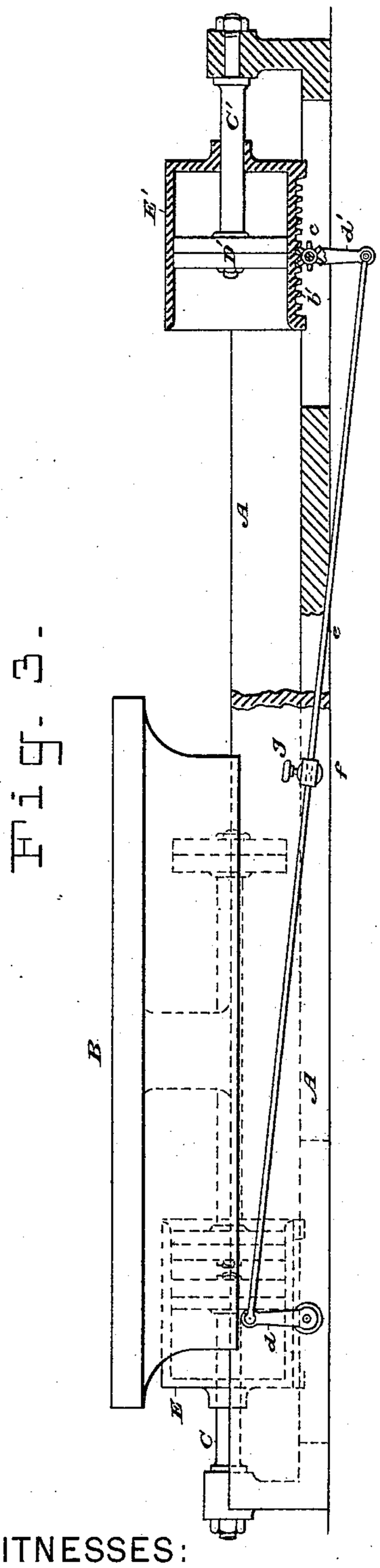

Fig. 4.

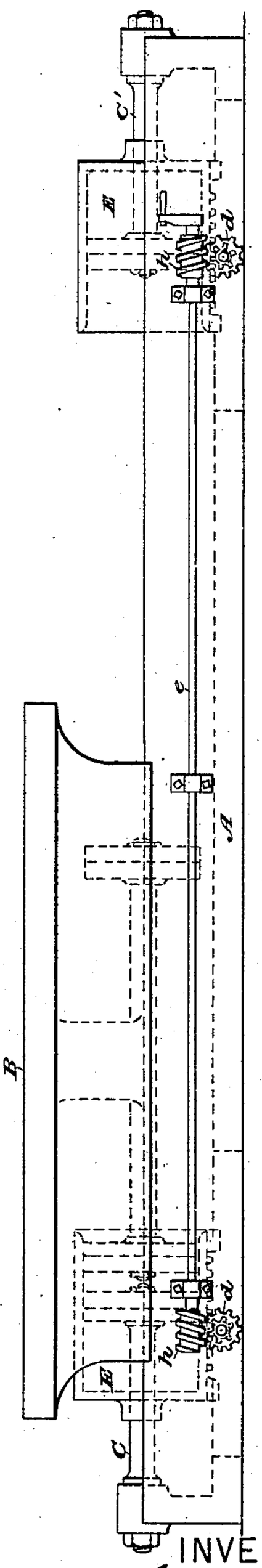

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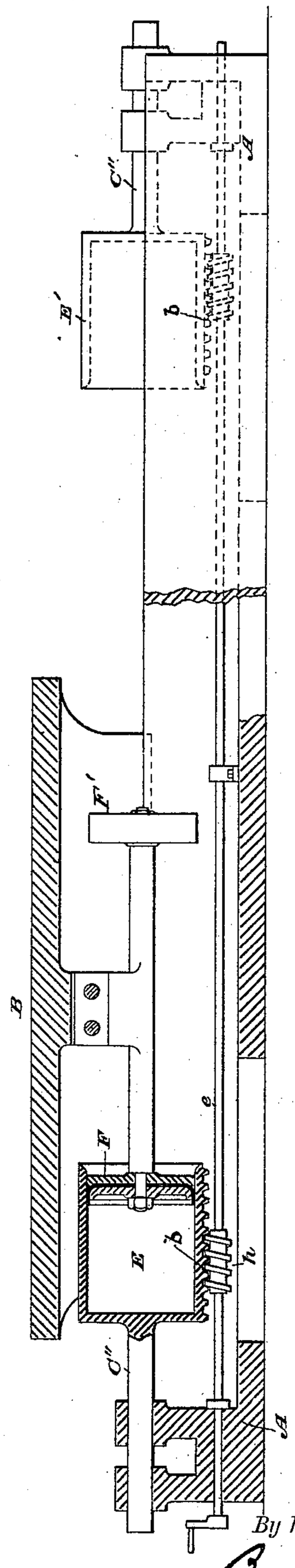
Fig. 5.



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UNITED STATES PATENT OFFICE.

ANDREW CAMPBELL, OF BROOKLYN, ASSIGNOR TO JOHN AND EDMUND McLOUGHLIN, OF NEW YORK, N. Y.

AIR CUSHION FOR THE RECIPROCATING BEDS OF PRINTING-PRESSES.

SPECIFICATION forming part of Letters Patent No. 291,875, dated January 15, 1884.

Application filed June 19, 1883. (No model.)

To all whom it may concern:

Be it known that I, ANDREW CAMPBELL, a citizen of the United States, residing at Brooklyn, Kings county, New York, have invented certain Improvements in Air Cushions for the Reciprocating Beds of Printing-Presses, of which the following is a specification.

My invention relates to air cushions for checking the momentum of the reciprocating beds of printing-presses. For this purpose fixed air-bells or open-ended cylinders are commonly employed, fastened to the frame of the machine in connection with pistons mounted upon the reciprocating bed, and entering the air-bells at each end of the stroke of the bed. These bells have been made adjustable by setting them bodily toward or from the bed by means of set-screws, in order to regulate the depth to which the pistons on the bed shall enter them, and consequently the extent of resistance of the air cushion. But with the constructions heretofore employed it has been practically impossible to effect this adjustment of the depth of the air cushions except when the machine was at rest, the cylinders or air-bells being set to an approximately correct position at first, and their effect then tried by running the press, and if they were found to give too deep or too shallow a cushion, the press was stopped and they were set to a different position. Furthermore, the two air-bells at opposite ends of the press have been unconnected with each other, and it has been necessary to adjust them separately.

Inasmuch as printing-presses are operated at varying speeds, being run sometimes faster than at others, and as the momentum of the bed becomes greater as the speed of the press increases, and as a deeper air cushion is necessary to overcome this momentum as the speed of the bed is increased, it is highly desirable that the depth of the air cushions should be made quickly and easily adjustable to adapt the press to different speeds, and that this adjustment shall be made simultaneously with both air-bells and without stopping the press. To this end I connect both air-bells together in such manner that both shall approach toward or recede from the middle of the press simultaneously, and I provide mechanism for so moving them, capable of being operated by the attendant of the press while the latter is running, so that as the speed of the press increases he can cause the air-bells to approach, and so proportionately deepen the air cushions.

Another feature of my invention consists in constructing the air cushions by mounting a fixed piston on the machine exactly in line, axially, with the piston borne by the reciprocating bed, and in such a position that the latter piston will approach very near it when the bed reaches the end of its stroke, and arranging a cylinder or bell to embrace the fixed piston, and to be slid along thereon to project more or less beyond the same, so that the capacity of the portion of the cylinder between its open mouth and the fixed piston inside may be varied. Thus the capacity of the bell is varied, and of course the amount of air at the normal tension, which is compressed by the moving piston, may be also varied at will; but as the travel of the moving piston does not vary, the tension of the air compressed will depend upon its quantity.

In the accompanying drawings, Figure 1 is a plan view designed to illustrate my invention, and Fig. 2 is a vertical longitudinal section taken in the axes of the bells and pistons. Figs. 3, 4, and 5 are views designed to illustrate modifications, which will be hereinafter described.

Let A represent the frame of a printing-machine or press, and B the reciprocating bed, arranged to be reciprocated by any means whatever.

On the frame A, at each end, are mounted, fixedly, two studs, C C′, and on the ends of these studs are mounted, fixedly, two pistons, D D′. Mounted on the studs C C′, so as to slide thereon, are two cylindrical bells, E E′, in which the fixed pistons D D′ fit snugly. By moving the bells along in the direction of their axes on the studs C C′, the fixed pistons are brought nearer to or farther from the open mouths of the bells, and the capacity of the bell is thus varied, as will be well understood.

Mounted on the bed B are two pistons, F F′, the axes of which are aligned with the axes of the bells, so that when the bed reaches the end

of its stroke to the left, as shown in Fig. 2, the piston F will have entered the bell E and compressed the air therein, when at the end of its stroke the piston F stands close to and face to face with the fixed piston D. If it be desired to increase the tension of the compressed air in the bells, the latter are moved inward or toward each other, so as to increase their capacity. If it be desired to decrease the tension, they are moved outward or from each other, so as to lessen their capacity. Of course the normal size of the cylindrical bell is not altered, but the fixed piston inside of it serves as a sort of movable bottom or head, which, although stationary, moves with respect to the cylinder or bell. To shift both bells to the same extent and at the same time, any one of several different kinds of mechanical devices may be employed. That shown in Figs. 1 and 2 comprises two rods, *a a'*, secured at their outer ends to the bells E and E', respectively, and bearing on their inner ends racks *b b'*, which mesh with opposite sides of a pinion, *c*, on a cross-shaft, *c'*, mounted rotatively in the main frame. By rotating this pinion, the bells may be moved out or in simultaneously, and to a like extent, and by securing the crank on shaft *c'*, the bells will be retained in position. Fig. 3 shows a mechanism for the same purpose in which each bell is provided with a rack on its under side with which meshes a pinion mounted rotatively in the frame A. To the outer ends of the shafts of these pinions are fixed oppositely-arranged cranks *d d'*, connected by a rod, *e*, which passes through and slides in a swivel-bearing, *f*, on frame A. By moving rod *e* endwise the pinions are rotated and the bells moved in or out. The rod *e* may be secured in the bearing *f* by a set-screw, *g*, to hold the bells in place. Fig. 4 shows a similar arrangement in which the cranks *d d'* are replaced by worm-wheels, and the rod *e* by a shaft bearing right-and-left screws or worms, *h h'*, which mesh with the worm-wheels. The shaft may be rotated by a crank and will move the bells out or in, as desired. The screws *h h'* will serve as locks.

It will be obvious that if the bell be moved outward until the fixed piston stands in its mouth, there will be no compression of air, and the movement of the bed will not be checked; but if the bell be moved inward as far as possible the compression will be very great—about five atmospheres, in practice—and considerable heat will be generated. This heat will, by expansion, increase the tension, and I contemplate utilizing this extra tension to neutralize the friction of the moving piston in the bell, which would otherwise have to be taken into account in estimating the retarding force. I estimate this extra tension as sufficient to overcome the friction of the piston when the latter is withdrawn on the return-stroke. The tension exclusive of this—that is, the normal tension due to mechanical compression—serves to overcome the inertia of the bed in starting. Before the press is started the air-bells should be moved inward with the fixed pistons standing at or near their mouths, so that little or no cushoning will result. The press is then started, and as its speed increases the attendant should gradually move the bells toward each other, thereby deepening the air cushions until the regular maximum speed of the press is attained, when he should carefully adjust the air cushions to such depth that the bed of the press will be caused to slow up and reverse its motion at each end of its stroke with the utmost smoothness of movement and absence of vibration. In stopping or slowing up the press the air cushions should be made shallower to a corresponding extent.

In Fig. 5 I have shown a modification, in which the fixed piston D is omitted and the bell E is fixed directly to a stem, C'', arranged to slide in a bearing on the frame A. A rack, *b*, is formed on the bottom of the bell and a worm, *h*, on a shaft, *e*, arranged to engage therewith. By this means the bells may be moved in or out, as circumstances may require. I have shown but one end of the device in section; but it will be understood that both ends are alike. In this construction of bell, which is that heretofore used, the volume of air compressed is always the same, and the tension due to compression is governed by the distance the piston enters into the bell. In my improved construction of bell first herein described, the tension is governed by the volume of air compressed, which is capable of being varied by the shifting of the bell. Any number of air-bells may be provided. I usually employ four, two at each end of the frame.

Having thus described my invention, I claim—

1. As a means for checking the momentum of the reciprocating bed of a printing-press, the combination, with said bed and pistons borne thereby, of air-bells arranged at opposite ends of the machine, mounted upon the fixed frame thereof and adjustable axially toward and from each other, and mechanism, substantially as set forth, connected with said air-bells for moving them simultaneously toward or from each other.

2. As a means for checking the momentum of the reciprocating bed of a printing-press, the combination, with said bed and pistons borne thereby, of axially-movable air-bells arranged at opposite ends of the machine, where they will be entered by said pistons at the extreme stroke of the bed, and mechanism, substantially as set forth, connected with said bells, the operation of which causes the bells to move toward or from each other simultaneously and to the same extent, and which is capable of operation while the press is running, as described.

3. As a means for checking the momentum of the bed of a printing-press, the combination,

with the bed, of a piston borne thereby, a fixed piston, and a movable bell adapted to be shifted in the direction of its axis over said fixed piston, all arranged to operate substantially as set forth.

4. The combination, with the reciprocating bed, the pistons F F′ borne thereby, the pistons D D′, fixedly mounted on the frame, and the movable bells E E′, of the means, substantially as described, for shifting said bells simultaneously and equally, as set forth.

5. The combination, with the reciprocating bed and the pistons borne thereby, of the fixed pistons, the movable bells, the rods *a a′*, the racks *b b′*, and the pinion *c*, all arranged substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

ANDREW CAMPBELL.

Witnesses:
G. M. HUDSON,
HENRY MAGOWAN.