

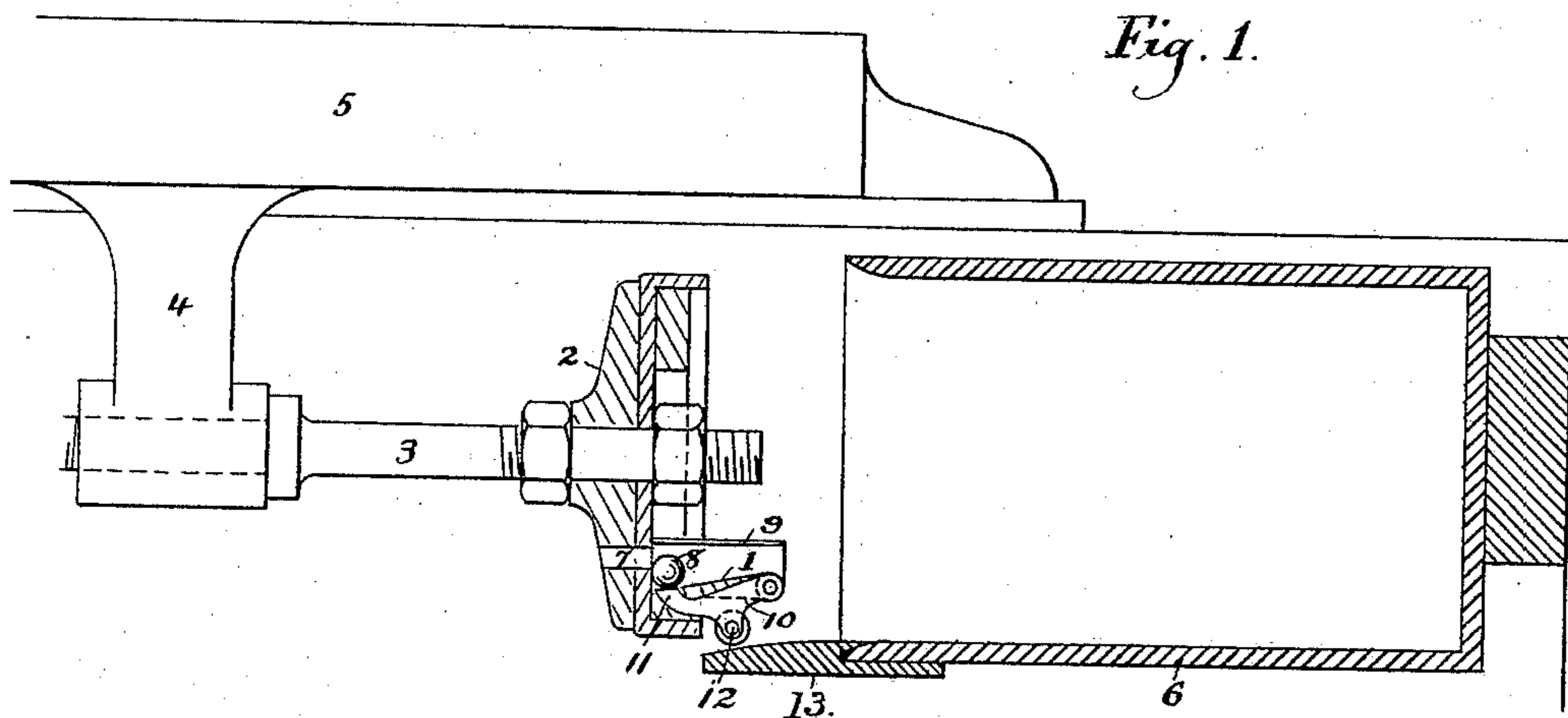
(No Model.)

L. C. CROWELL.

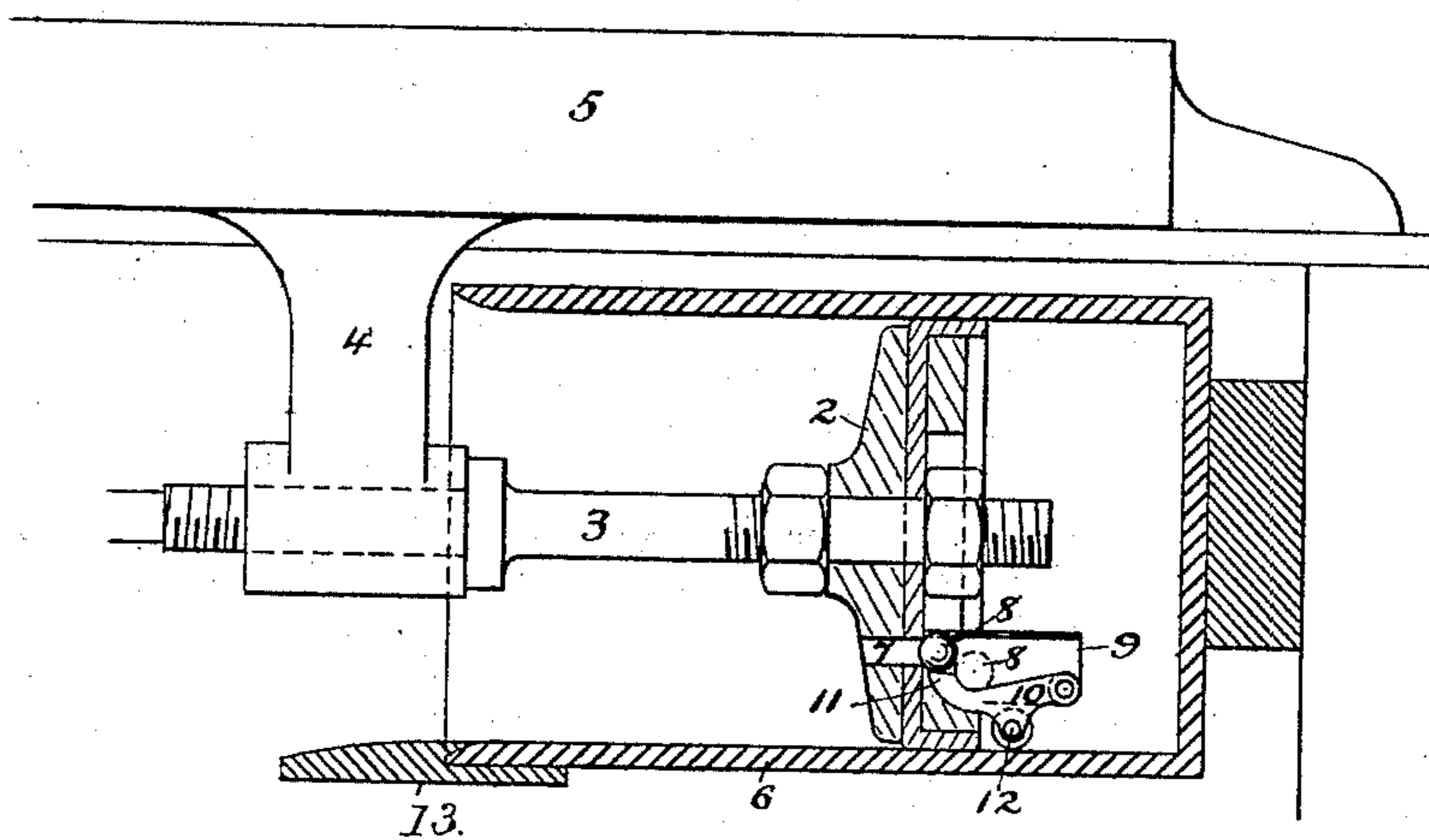
AIR CUSHIONING APPARATUS FOR PRINTING MACHINES.

No. 277,550.

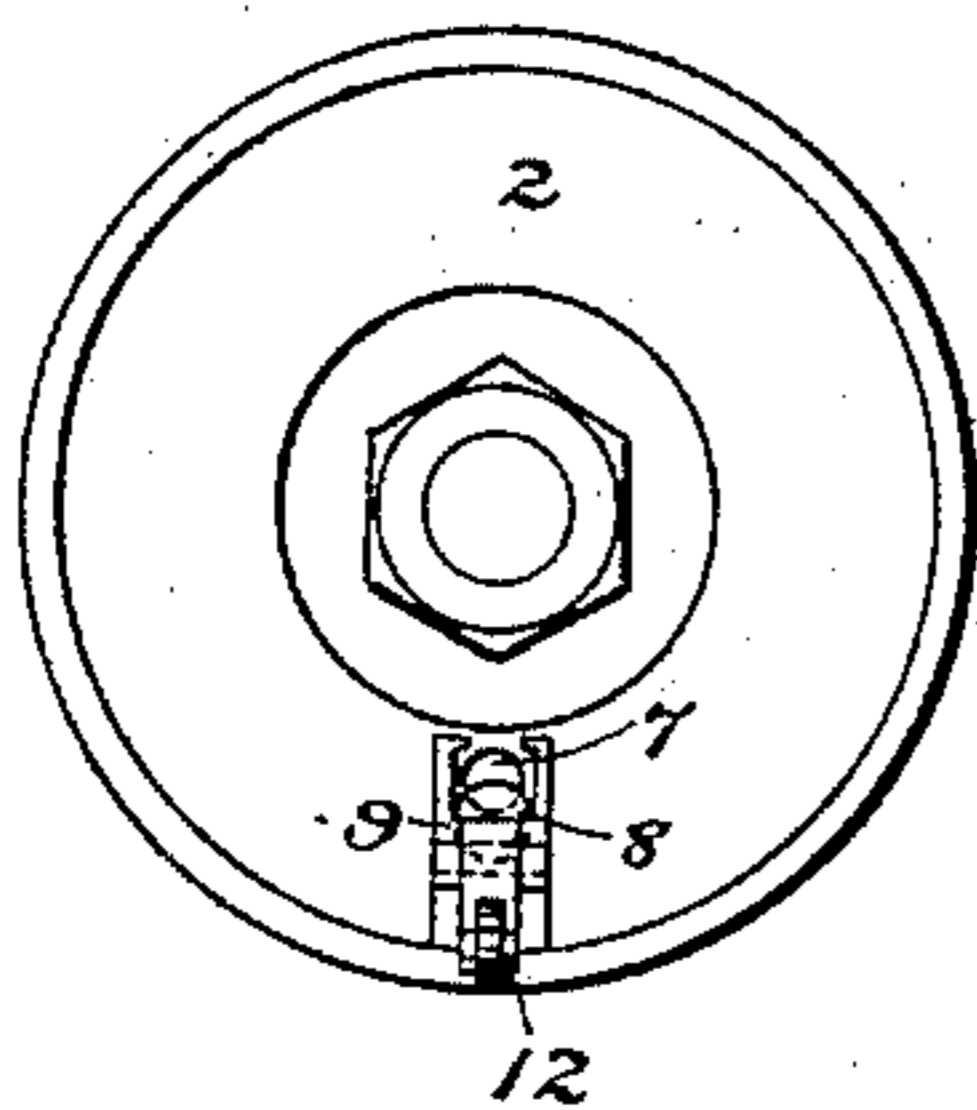
Patented May 15, 1883.



*Fig. 2.*



*Fig. 3.*



*Attest;*

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# UNITED STATES PATENT OFFICE.

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## AIR-CUSHIONING APPARATUS FOR PRINTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 277,550, dated May 15, 1883.

Application filed December 30, 1882. (No model.)

*To all whom it may concern:*

Be it known that I, LUTHER C. CROWELL, a citizen of the United States, residing in the city of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Air-Cushioning Apparatus for Printing-Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The present invention relates to that class of printing-machines in which the form is carried upon a reciprocating bed and the impression made by a revolving drum or cylinder, and which are known by the general name of "cylinder-presses."

In order to prevent the jarring and strain which would be occasioned by suddenly arresting the bed at the end of its travel in either direction, it has been customary to provide this class of machines with cushioning devices, which not only gradually overcome the momentum of the bed at the ends of its reciprocation, but also store up the force of such momentum to be utilized in overcoming the inertia of the bed in starting it in the opposite direction. These devices have sometimes consisted of metal springs, but more commonly of air-cushions, which have usually been formed by placing a cylinder, one end of which is closed, and the other end of which is adapted to receive a movable piston, at each end of the machine, and so arranging the parts that the bed, as it nears the end of its travel in either direction, will expend its momentum against said pistons and be cushioned by the compression of the air in the cylinders. The air thus compressed in the cylinders by the momentum of the bed will, in expanding, act upon the pistons, and so aid in starting the bed in the opposite direction. In using this class of machines it is often necessary for various purposes, as in adjusting and securing the form, to move the bed to and fro by hand; but it was found that in large-sized machines this was very difficult, because of the resistance offered by the confined air in the cylinders. To obviate this difficulty, the cylinders have been provided with relief-openings controlled by cocks or valves, so that when the bed was moved slowly, as by hand, a passage could be opened for the escape of the air from the cylinders, and all resistance to the move-

ment of the bed be removed. The cocks or valves for this purpose have sometimes been arranged to be operated by hand, and sometimes so as to be automatic in their action.

The present invention relates particularly to a valve apparatus having the latter mode of operation; and it consists, primarily, in an air-cushioning apparatus provided with relief-openings and valves, and means for moving said valves so as to cover said openings before the pistons enter the cylinders, and means for allowing said valves to open and allow the air to escape from the cylinders when the bed is moving so slowly as to make cushioning unnecessary or undesirable.

In the accompanying drawings, which show so much of an ordinary cylinder-press as is necessary to illustrate the structure and operation of the present invention, Figure 1 is a longitudinal vertical section of one of the air-cylinders and its piston, showing the valve in its open position. Fig. 2 is a like view, showing the valve closed; and Fig. 3 is an end view of the piston with the valve open.

Those portions of the printing mechanism shown are of an ordinary and well-known construction, and consequently need no specific description.

The air-cushioning apparatus is also, as to its principal parts, of a common form, consisting of a pair of pistons, 2, (only one of which is shown,) mounted upon the ends of a rod, 3, suspended in a bracket, 4, fixed to the under side of the reciprocating type-bed, 5, and a pair of open-mouthed cylinders, 6, (only one of which is shown,) fixed to the frame—one at each end of the machine—these parts being so arranged that as the bed nears the end of its stroke in each direction one of the pistons will enter the open end of its cylinder and the momentum of the bed be expended in compressing the volume of air thus confined.

As before stated, it is desirable, when the bed is moved by hand or is otherwise made to travel slowly, that the air should be allowed to escape from the cylinders, so that the pistons will meet with no resistance. This is accomplished automatically in the present case by providing each piston with an escape-passage, 7, the inner end of which is so shaped as to form a seat for an ordinary ball-valve, 8, contained in a cage, 9, which surrounds said seat and extends forward a suitable distance.

The bottom 1 of the cages 9 inclines, as shown in Fig. 1, toward the pistons, so that the tendency of the valves will always be to remain at the outer ends of their cages and close to the pistons, but below the openings 7. The bottoms of the cages are slotted, as shown in Figs. 1 and 3, and are provided with swinging arms 10, which are pivoted at their inner ends to the cages, and have their outer ends, 11, extended rearward, so as to lie beneath the valves when the latter are in their normal position. The ends 11 of the arms are curved upward, as shown in Figs. 1 and 2, and are so formed that when the arms are elevated, as in Fig. 2, the valves will have a strong tendency to roll away from the openings 7 and drop into the curves of the arms, as indicated by the dotted lines. The arms 10 are provided upon their under sides with projections 12, and preferably, also, with anti-friction bowls, which, as the pistons approach the cylinders, come into contact with inclined ways 13, extending from the cylinders, so that the arms will be raised, thereby carrying the valves from the position shown in Fig. 1 to the position shown in Fig. 2, and closing the relief-openings.

From the construction and arrangement just described it results that as soon as the valves are raised to the position shown in Fig. 2 they will have a tendency to roll down the inclined ends of the arms 10 to the position shown by dotted lines, so as to uncover the relief-openings.

When the bed is being moved by hand or the machine is otherwise operated slowly the valves will have ample time to roll down the inclined ends of the arms 10 and assume the position shown by dotted lines in Fig. 2 before the pistons enter the cylinders, and so leave the openings 7 uncovered and relieve the pistons from all resistance. As soon, however, as the machine attains such speed as to make cushioning necessary or desirable, the pistons will traverse the distance between the points at which the arms are raised and the ends of the cylinders so quickly that the valves will not have time to move away from the openings before the pistons enter the cylinders, and as soon as the pistons have once entered the cylinders the pressure of the confined air will be sufficient to hold the valves in position against their inclination to roll down the ends of the arms 10, and thus the escape of the air will be prevented and cushioning will take place.

When the bed has been reversed and the piston so far withdrawn from the cylinder that the air confined therein has expanded to about its original volume, the inertia of the valve, together with the incline of the end of the arm 10, will cause it to roll away from the opening, and when the projection 12 passes from the end of the way 13, so as to allow the arm to drop to its normal position, the valve will roll down the incline 1 to the position shown in Fig. 1, and so the operation will continue to be repeated as long as the proper speed is

maintained. The speed at which the machine will operate without cushioning will depend upon the weight of the valves, the distance from the cylinders at which they are raised, and the incline of the ends of the arms 10, and these can be regulated at pleasure.

In addition to the functions already specified the valves 8 operate, as the pistons are withdrawn, to permit air to enter the cylinders to compensate for leakage past the pistons, which always takes place to a greater or less extent. This is a function of considerable importance, as unless some means is provided for supplying this deficiency a partial vacuum is formed in the cylinders, which to some extent retards the forward motion of the bed.

It will be readily understood that the present invention is not limited in its application to cushioning devices in which the parts are arranged as herein shown. The order of the parts may be reversed, the pistons being secured to the frame and the cylinders attached to the bed of the press and provided with the escape-passages and valves; or the valves and escape-passages may be upon the fixed instead of the moving part of the cushioning apparatus.

The means for moving the valves may also be modified considerably without departing from the invention; and instead of ball-valves flat valves may be employed, and they may be made to either oscillate or reciprocate, it only being essential that they be moved into position to cover the relief-openings at each reciprocation of the bed, and be provided with means which will permit them to move away from said openings when the speed of the machine is not sufficient to make cushioning necessary or desirable.

What I claim is—

1. An air-cushioning apparatus provided with an escape-passage controlled by a valve, and means for moving said valve to cover said opening at each reciprocation of the apparatus, and means for allowing said valve to open unless the apparatus has attained a certain speed, all substantially as described.

2. The combination, with a cylinder, as 6, and piston, as 2, one of which moves and is provided with an escape-passage, of a valve, as 8, and means for moving said valve to cover said opening at each reciprocation of said moving part, and means for allowing said valve to open unless said part has attained a certain speed, all substantially as described.

3. The combination, with a piston and cylinder, as 2 6, of the cage 9, having inclined bottom 1, the arm 10, having inclined end 11, and the valve 8, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

LUTHER C. CROWELL.

Witnesses:

J. A. HOVEY,  
T. H. PALMER.