

L. C. CROWELL.

AIR CUSHIONING APPARATUS FOR PRINTING MACHINES.

No. 274,084.

Patented Mar. 13, 1883.

Fig. 1.

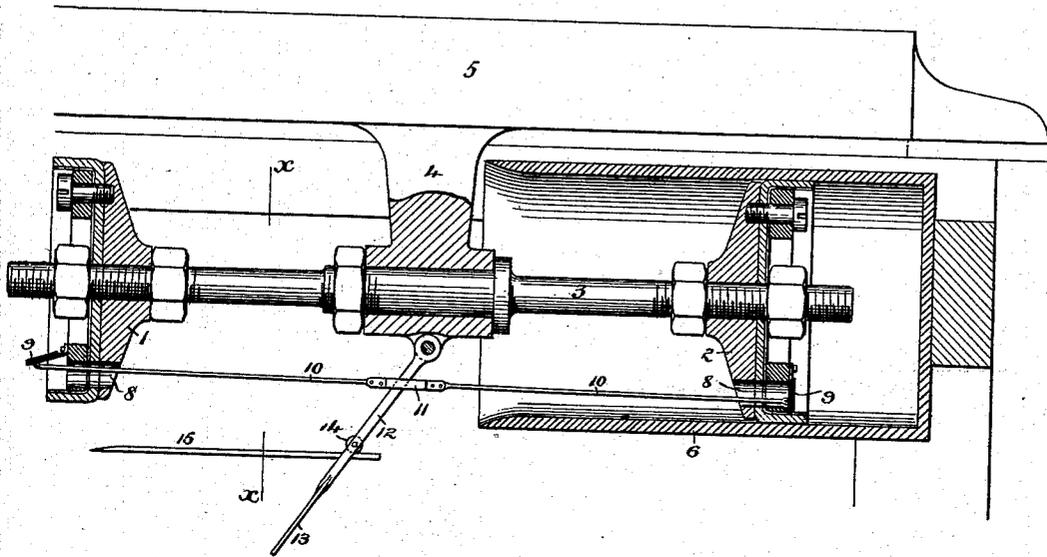


Fig. 2.

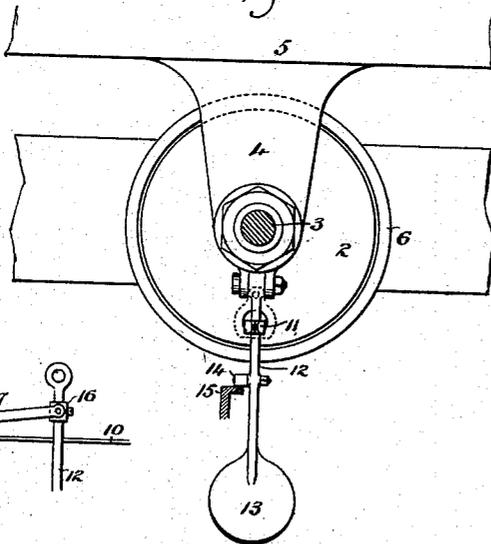
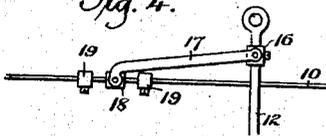


Fig. 4.



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(No Model.)

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3 Sheets—Sheet 2.

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Fig. 3.

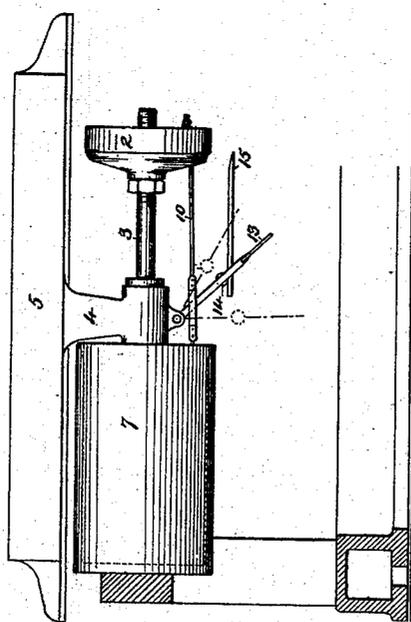
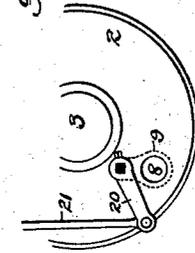
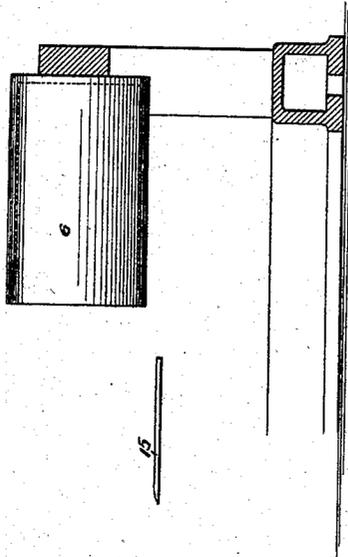


Fig. 9.



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Fig. 5.

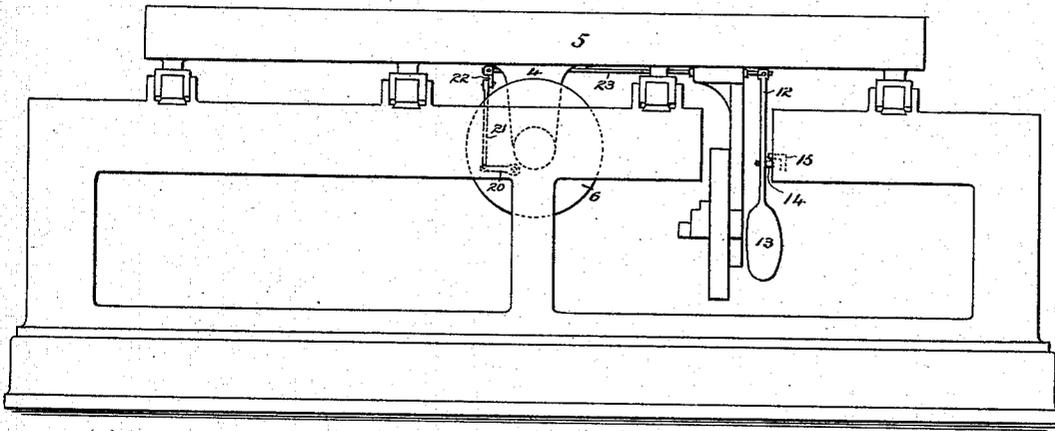


Fig. 7.

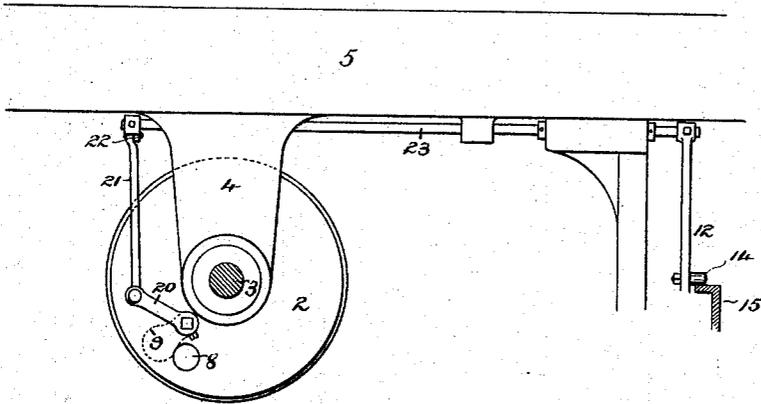
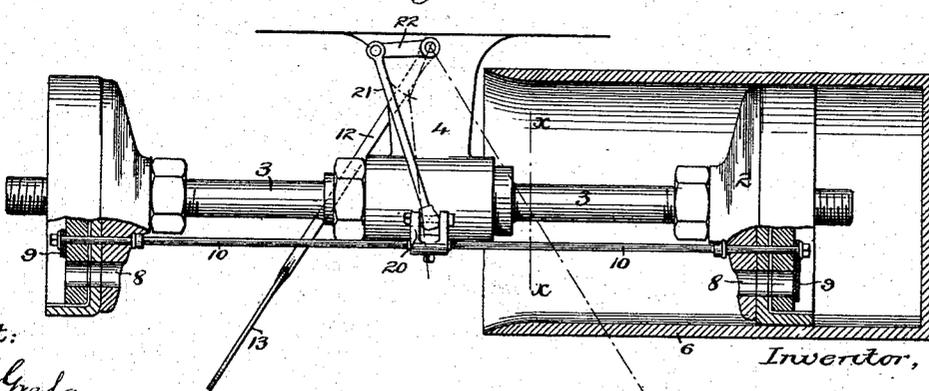


Fig. 6.



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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. 274,084, dated March 13, 1883.

Application filed October 7, 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 stored 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 against 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 escape-passages controlled by cocks or valves, so that when the bed was to be moved by hand a passage could be opened

for the escape of the air from the cylinders and all resistance to the movement of the bed be removed. These valves or cocks have sometimes been arranged to be operated by hand and sometimes so as to be automatic in their operation.

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 an escape passage and valve, and a pendulous device which, through the movement of the bed, operates the valve to allow the escape of the air from the cylinder when the bed is moved slowly by hand or otherwise, and to prevent its escape when the bed is moved at such a speed as to make cushioning necessary or desirable.

The invention also embraces various mechanical details, singly and in combination, all of which will be hereinafter fully explained and particularly pointed out.

In the accompanying drawings, which show so much of an ordinary cylinder printing-press as is necessary to illustrate the present invention, Figure 1 is a longitudinal vertical section of the two cushioning-pistons and one of the cylinders; Fig. 2, a transverse vertical section taken upon the line *x x* of Fig. 1; Fig. 3, a side elevation of both the cushioning-cylinders and one of the pistons; Fig. 4, a modification to be hereinafter referred to; Fig. 5, an end elevation of a machine in which the invention is embodied in a different manner; Fig. 6, an enlarged view, partly in section, of the pistons and one of the air-cylinders, the former being supplied with the devices shown in Fig. 5; Fig. 7, a transverse vertical section taken upon the line *x x* of Fig. 6, and Figs. 8 and 9 details to be hereinafter referred to.

The printing mechanism shown in the present case is of an ordinary and well-known construction, and consequently needs no specific description.

The air-cushioning apparatus is also in its general construction of a common form, consisting of a pair of pistons, 1 2, 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 7, 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, so that the momentum of the bed will be expended in compressing the air confined in the cylinder. As before stated, it is desirable, when the bed is moved slowly, by hand or otherwise, that the air should be allowed to escape from the cylinders, so that the pistons will meet with no resistance. This is accomplished in the present case by providing the pistons 1 2 with air-escape passages 8, controlled by valves 9, which are so constructed and arranged as to operate automatically to permit or prevent the escape of the air from the cylinders at the proper time. To secure this automatic action of the valves they are connected by a light rod, 10, which extends from one piston to the other, passing through the escape-passages 8, as shown in Fig. 1, and is of such length that when in its normal position both valves will be held in an open position. At some convenient point between the pistons the rod 10 is provided with a short slot or loop, 11, through which passes the stem 12 of a pendulous device, 13, which is pivotally suspended from the lower end of the bracket 4, or from some other convenient point beneath the type-bed. The pendulous device 13 is preferably flattened into the form of a fan or vane, as shown, by which it will meet with more resistance from the air; but it may be a simple ball or weight of any form acting like a pendulum. From this construction and arrangement it results that when the bed is at rest or is moved slowly, by hand or otherwise, the fan or pendulum 13 will pass through the air and maintain a perpendicular or nearly perpendicular position, as shown by dotted lines in Fig. 3, permitting both valves to remain open, so that the air in the cylinders will pass around them and escape, thus offering no resistance to the movement of the pistons. As soon, however, as the machine attains such speed as to make cushioning necessary or desirable, the resistance of the air or the inertia of the pendulum, or both, will retard the fan or pendulum 13, causing it to swing backward and assume the position shown in Fig. 1. In thus swinging backward its stem 12 will move the rod 10 so as to close the valve of the forward piston before said piston enters its cylinder, thus shutting off the escape of air from that cylinder and causing cushioning to take place. Upon the reverse movement of the bed the fan or pendulum will in like manner be caused to swing in the opposite direction, thereby closing the valve of the other piston, and causing cushioning to take place at the other end of its travel.

To prevent the opening of the closed valve immediately upon the reversal of the bed, which, if it occurred, would allow the air just compressed in the cylinder to escape, and thus prevent its expanding against the piston to aid in overcoming the inertia of the bed, the stem 12 is provided with a stud or bowl, 14, which, when the fan or pendulum swings back-

ward far enough to close the valve of the forward piston, will pass above a fixed guide, 15, there being one at each end of the machine, which guide will prevent the pendulous device from swinging in the opposite direction until after the piston has been nearly or quite withdrawn from the cylinder. When the bed is moved so slowly that the fan or pendulum does not close the valve of the forward piston, the bowl 14 will of course pass below the guides 15.

The speed at which the machine can operate without closing the valves will of course depend upon the size and weight of the pendulous device, the length of its stem, the distance of the rod 10 from the pivoted point of the stem, and the amount of movement required to close the valves, all of which can be readily regulated at pleasure.

In Fig. 4 a simple device is shown, by which the operation of the apparatus can be so regulated as to permit the machine to operate at a greater or less speed without closing the valves. To effect this result the stem 12, instead of passing through a slot or loop in the valve-rod 10, is provided with an adjustable collar, 16, which is connected by a short link, 17, a collar, 18, sliding loosely upon the rod 10, between a pair of adjustable collars, 19. From this construction it will be readily seen that by properly adjusting the collars 16 and 19 the valves can be closed by a very slight movement of the fan or pendulum, or a very extended movement of said device may be required to close them.

In the organization shown in Figs. 5 to 9, inclusive, the valve-rod 10, instead of being moved longitudinally to close the valves, is caused to rock, and the valves 9, instead of being raised and lowered to open and close the escape-passages, are secured to the rod, so as to be swung laterally to and from said passages. To secure this action the rod 10 is mounted in suitable bearings in the two pistons, and is at some convenient point below them provided with a short rock-arm, 20, which is connected by a rod, 21, with the arm 22 of a transverse rock-shaft, 23, supported in bearings upon the under side of the type-bed, and from the outer end of which is suspended the stem 12. In this organization the valves 9 are secured to the rod 10 in such position that when the fan or pendulum 13 hangs in a perpendicular position, as will be the case when the bed is at rest or is moved slowly, both air-escape passages will be partly or wholly open, as shown in Fig. 8, the valves upon the opposite ends of the rod overlapping the openings from the opposite side. As the speed of the press is increased the resistance of the air or the inertia of the pendulum will cause it to swing backward, as shown in Fig. 6, thereby, through shaft 23 and rod 21, rocking rod 10, and bringing the forward valve, 9, to the position shown in Fig. 9, thereby preventing the escape of the air from the forward cylinder and causing cushioning to take place. By prop-

erly adjusting the valves upon the rod 10 they can be made to only partially close the passages 8, thereby allowing a part of the air to escape from the cylinders. In this manner  
 5 the resistance of the cushion can be regulated at pleasure to suit different working conditions of the machine.

It will readily be understood that the present invention is not limited in its application  
 10 to cushioning devices in which the parts are arranged as herein shown. The cylinders, instead of the pistons, may be carried upon the moving type-bed, and be provided with the air-escape passages and valves.

15 What I claim is—

1. The combination, with an air-cushioning apparatus consisting of a cylinder and piston, one of which moves and is provided with an escape-passage, of a valve, as 9, a pendulous  
 20 device, as 13, and connections whereby the motion of said moving part controls the operation of the valve, all substantially as described.

2. The combination, with an air-cushioning apparatus consisting of a pair of pistons and  
 25 a pair of cylinders, one pair of which move and are provided with escape-passages, of valves, as 9, pendulous device, as 13, and connections whereby the motion of said moving

parts controls the operation of the valves, all substantially as described.

3. The combination, with the pistons and  
 30 cylinders, as 1 2 6 7, having escape-passages, as 8, of valves, as 9, connecting-rod, as 10, pendulous device, as 13, and connections, all substantially as described.

4. The combination, with the pistons and  
 35 cylinders, as 1 2 6 7, having escape-passages, as 8, and valves, as 9, of connecting-rod 10, pendulous device, as 13, means for holding said device in an elevated position during a  
 40 part of the return movement of said pistons, and connections, all substantially as described.

5. The combination, with the pistons and  
 cylinders having passages, as 8, and valves, as 9, of connecting-rod 10, pendulous device,  
 45 as 13, adjustable collar 16, adjusting-collar 19, and connecting-rod 17, all substantially as described.

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

LUTHER C. CROWELL.

Witnesses:

JAS. A. HOVEY,  
 A. N. JASBERA.