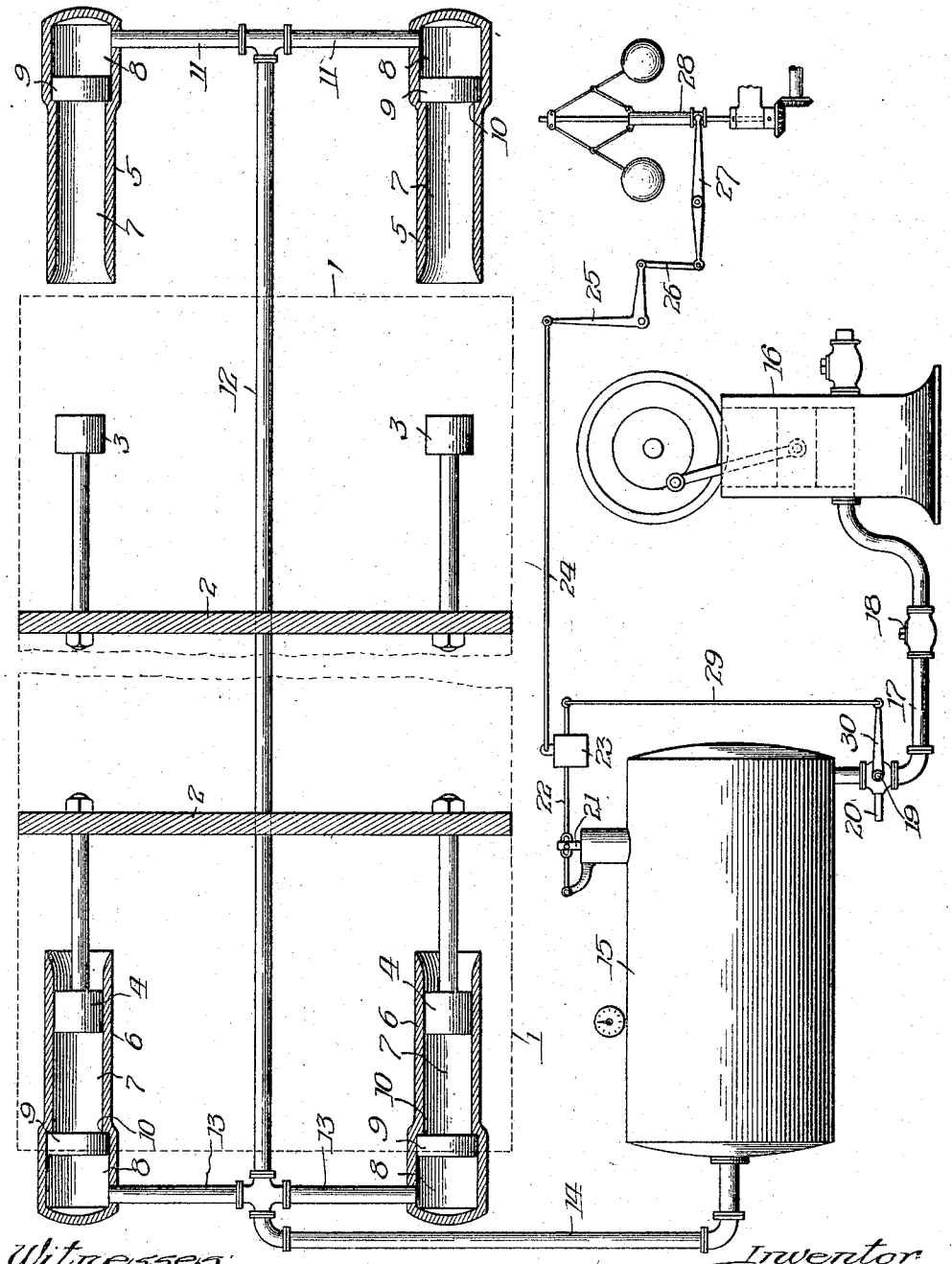
B. D. STEVENS.

AIR CUSHION CONTROL FOR PRINTING PRESSES.

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1,192,353. Patented July 25, 1916.



Witnesses:
F. C. Dorion
Louis T. Greist

Inventor
Burt D. Stevens,
By C. C. Kuthieum
Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

BURT D. STEVENS, OF RIVERSIDE, ILLINOIS, ASSIGNOR TO MIEHLE PRINTING PRESS & MANUFACTURING COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

AIR-CUSHION CONTROL FOR PRINTING-PRESSES.

1,192,353. Specification of Letters Patent. Patented July 25, 1916.

Application filed February 10, 1915. Serial No. 7,227.

To all whom it may concern:

Be it known that I, BURT D. STEVENS, a citizen of the United States, residing at Riverside, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Air-Cushion Control for Printing-Presses, of which the following is a specification.

In the operation of printing presses having a reciprocatory bed it is necessary to provide means for gradually stopping the same at the end of its stroke preparatory to a reversal of the direction of movement. It has been proposed and has now become customary to employ for this purpose a dash pot mechanism comprising one or more cylinders and coöperating pistons at each end of the press, the air trapped behind the pistons serving as a resilient medium to cushion the bed at the end of each stroke and by the rebound to assist in its return. A simple cylinder and piston combination has, however, proved to be objectionable in that the resistance built up by the compression of air in the cylinder does not at all correspond to the conditions present as it increases very slowly at the start and very rapidly at the end, the rapid increase at the end reaching a high point which is far in excess of that which is proper and which occurs at the time when the driving mechanism of the press is at dead center; and, moreover, this resistance is ever the same, under given adjustments, at different speeds of the press, wherefore it follows that the cushioning effect calculated for one speed will be entirely unsuited to other speeds as when starting and slowing down and moving at slow or high speed.

In the effort to overcome the difficulties noted many expedients have been devised such as venting the cylinder when the pressure reaches a predetermined point and also controlling the point at which such relief shall take place by means of a governor under the influence of the bed driving mechanism, such expedients being illustrated for example in patents Nos. 4,974, 788,931, 944,492, and 989,384.

The object of the present invention reaches farther and provides for a building up of the resistance in the cylinder the curve of which corresponds more nearly to ideal conditions required and for the varying of such resistance to suit different speeds of operation. To accomplish these results I provide for the gradual building up of the pressure in the ordinary cylinder until the bed approaches the end of a stroke and then provide for a further but more gradual increment of pressure during the remainder of the stroke and its reversal, thus avoiding the excess resistance or "peak" and yet not unduly cutting it down by venting the cylinder. I moreover so connect the device with the governor mechanism as to vary the rate of this final increase of resistance with changes in speed of operation whereby to bring about substantially ideal conditions.

In order that the invention and the manner of its application may be readily apparent a preferred embodiment of the same is set forth in the accompanying drawing and in the description based thereon. As, however, the invention is not confined to the particular embodiment set forth the drawing and description are to be taken in an illustrative and not in an unnecessarily limiting sense.

In the drawing is shown in diagrammatic manner, partly in horizontal section and partly in side elevation, one application of the invention to a reciprocating bed of a printing press.

Herein the outline of the bed is indicated in dotted lines at 1, while 2 indicates ribs depending from the lower side of the bed and having rigidly affixed thereto pistons arranged in pairs 3—3 and 4—4 arranged as the bed is reciprocated to coöperate respectively with the cylinders 5—5 and 6—6, which cylinders are suitably supported in a rigid manner. Each of the cylinders has a longitudinal bore divided into two portions 7 and 8 of dissimilar cross sectional area, the bore portion 7 having a diameter corresponding to that of the piston heads and having a length commensurate with the stroke of the piston, the bore 7 thus corresponding to the usual cylinder employed for cushioning purposes. Within the enlarged bore portion 8 is fitted a disk 9 which bears forwardly against a shoulder 10 and serves as a rear end wall of the cylinder separating the bore portion 7 from the bore portion 8 which latter forms the primary reservoir for the body of compressed air acting as a cushion against the rear face of the disk 9.

Where, as is usual, a plurality of cylinders and pistons are employed, I arrange for

the control of the pressure within each of the reservoirs 8 by connecting all of said reservoirs through the pipes 11, 12, 13, and 14 to a common secondary reservoir 15 which is supplied with air under pressure from the pump 16 through the pipe 17 provided with a check valve 18 and with a vent valve 19 communicating with the atmosphere at 20. In order to prevent an excess of pressure in the reservoir 15 and to vary the maximum pressure to correspond to the speed of the press I provide the reservoir 15 with a puppet valve 21 of the safety type having mounted upon its arm 22 the usual weight 23 which is connected by means of the rod 24, the angle lever 25, the link 26 and the lever 27 with the governor 28 which latter is driven by the bed driving mechanism. I may also advantageously connect the safety valve arm by means of the link 29 with the handle 30 of the vent valve 19 in order that, short of the blowing off of the valve 21, the upward movement of the arm 22 will operate the vent valve 19 and permit the air coming from the pump 16 to escape into the atmosphere 20 instead of entering the reservoir 15.

It will be obvious that the vent valve 19 and its connection with the arm 22 may be omitted and it will also be obvious that instead of connecting all of the primary compressed air reservoirs 8 with the common secondary reservoir 15, the pressure in which latter is controlled by the governor 28, each of the primary reservoirs 8 may be controlled directly from the governor by providing each with a puppet relief valve 21 and connecting the pump with each by a branch of the pipe 17.

The operation of the device is briefly as follows: As the piston head 4, for instance, enters the cylinder 6 the air is compressed within the bore 7 in the usual manner until it reaches a degree of compression corresponding to that in the compressed air reservoir 8 behind the disk or movable end wall 9 whereupon any further movement of the piston head 4 and consequent increase of pressure in the bore 7 will cause the disk 9 to move to the rear resisted by the pressure of the air in the reservoirs 8 and 15. The capacity and cross-sectional area of these reservoirs singly and in the aggregate being in excess of that of the bore 7, there is but a slight increment of the pressure between the piston head 4 and the disk 9 after the latter begins to move and the curve of pressure defining the increase of resistance during the final movement of the piston in one direction and its initial movement in the return direction is made to correspond very closely to the ideal and the bed movement is stopped and reversed without shock. It is clear that the increment of pressure opposed to the movement of the piston 4 during this critical period should vary with the speed at which the press is operated, the point at which this modification of the pressure curve takes place being advantageously delayed at high speeds and the rate of increase being quickened under such circumstances. This control is provided for by the puppet valve and its connection with the governor and advantageously also by the vent valve 19 whereby the pressure within the reservoir 8 or 15 is permitted to rise higher at a high speed before the puppet valve relieves the pressure therein or the vent valve brings the pressure therein to a standstill by opening the supply from the pump directly to the atmosphere.

Obviously the invention is not confined to specific details of construction such as those illustrated for descriptive purposes, it being non-essential, for instance, that the check valve to control the communication between the cylinder 7 and the reservoir 8 be in the form of the disk 9, which as shown constitutes the entire end wall of the cylinder, or a valve controlling a port in the wall of the cylinder and thus forming a portion only of the wall, or an equivalent member arranged in a pipe connecting the cylinder and reservoir, the effect being the same in that when a degree of air compression behind the piston is reached which corresponds to the air pressure maintained in the reservoir, the capacity of the reservoir is added to that remaining in the closed end of the cylinder and the subsequent increase of resistance behind the piston is quite gradual as compared with what it would be if such combining of the two spaces were not made, whereby the usual shock at the time of stopping and reversing under high speeds is eliminated.

I claim:

1. In an air cushioning device, the combination with a reciprocatory body to be cushioned and a coöperating cylinder and piston acting thereon, of a compressed air reservoir sealed with reference to the cylinder, a movable portion of the cylinder wall cushioned by the compressed air in the reservoir, and means to vary the pressure of the air in the reservoir.

2. In an air cushioning device, the combination with a reciprocatory body to be cushioned and a coöperating cylinder and piston acting thereon, of a compressed air reservoir having a greater capacity than that of the cylinder, a movable portion of the cylinder wall cushioned by the compressed air in the reservoir, and means controlled automatically by the speed of the reciprocatory body to vary the pressure of the air in the reservoir.

3. In an air cushioning device, the combination with a reciprocatory body to be cushioned and a coöperating cylinder and piston

acting thereon, of a compressed air reservoir and having a greater cross sectional area than that of the cylinder, a movable portion of the cylinder end wall cushioned by the compressed air in the reservoir, and means to vary the pressure of the air in the reservoir.

4. In an air cushioning device, the combination with a reciprocatory body to be cushioned and a coöperating cylinder and piston acting thereon, of a compressed air reservoir having a greater cross sectional area than that of the cylinder, the cylinder having a movable end wall cushioned by the compressed air in the reservoir, and means controlled automatically by the speed of the reciprocatory body to vary the pressure of the air in the reservoir.

5. In an air cushioning device, the combination with a reciprocatory body to be cushioned and a coöperating cylinder and piston acting thereon, the bore of the cylinder comprising two portions, a disk forming a movable portion of the end wall of that portion of the bore traversed by the piston and separating the two bore portions, that portion of the bore to the rear of the disk forming a compressed air reservoir, and means controlled automatically by the speed of the reciprocatory body to vary the pressure of the air in the reservoir at the rear of the disk.

6. In an air cushioning device, the combination with a reciprocatory body to be cushioned and a coöperating cylinder and piston acting thereon, the bore of the cylinder comprising two portions of different cross sectional area, a movable disk in the larger bore portion and forming the end wall of the smaller bore portion traversed by the piston, the larger bore portion forming at the rear of the disk a compressed air reservoir, and means controlled automatically by the speed of the reciprocatory body to vary the pressure of the air in the reservoir.

7. In an air cushioning device, the combination with a reciprocatory body to be cushioned and a coöperating cylinder and piston acting thereon, the bore of the cylinder comprising two portions of different cross sectional area, a movable disk in the larger bore portion and forming the end wall of the smaller bore portion traversed by the piston, the larger bore portion forming at the rear of the disk a compressed air reservoir, a puppet valve arranged to relieve the pressure in the reservoir, a weight varying the action of the valve, a governor influenced by the speed of the reciprocatory body, and a connection between the governor and the weight whereby to vary the maximum pressure of the air with the speed of the body.

8. In an air cushioning device, the combination with a reciprocatory body to be cushioned and a coöperating cylinder and piston acting thereon, the bore of the cylinder comprising two portions of different cross sectional area, a movable disk in the larger bore portion and forming the end wall of the smaller bore portion traversed by the piston, the larger bore portion forming at the rear of the disk a compressed air reservoir, a puppet valve arranged to relieve the pressure in the reservoir, a weight varying the action of the valve, a governor influenced by the speed of the reciprocatory body, and a connection between the governor and the weight whereby to vary the maximum pressure of the air with the speed of the body, a pump to maintain a supply of compressed air within the reservoir, a vent valve between the pump and reservoir, and a connection between the vent valve and the puppet valve whereby upon an undue rise of pressure within the reservoir the pump will vent to the atmosphere.

9. In an air cushioning device, the combination with a reciprocatory body to be cushioned and coöperating cylinders and pistons acting thereon, the bore of each cylinder comprising two portions, a disk forming a movable portion of the end wall of that portion of the bore traversed by the piston and separating the two bore portions, that portion of the bore to the rear of the disk forming a primary compressed air reservoir, a secondary compressed air reservoir connected with all the primary reservoirs, and means controlled automatically by the speed of the reciprocatory body to vary the pressure of the air in the secondary reservoir.

10. In an air cushioning device, the combination with a reciprocatory body to be cushioned and coöperating cylinders and pistons acting thereon, the bore of each cylinder comprising two portions, a disk forming a movable portion of the end wall of that portion of the bore traversed by the piston and separating the two bore portions, that portion of the bore to the rear of the disk forming a primary compressed air reservoir, a secondary compressed air reservoir connected with all the primary reservoirs, a puppet valve arranged to vent the compressed air from the secondary reservoir, a weight varying the action of the valve, a governor influenced by the speed of the reciprocatory body, and a connection between the governor and the weight whereby to vary the pressure of the air with the speed of the body.

11. In an air cushioning device, the combination with a reciprocatory body to be cushioned and coöperating cylinders and pistons acting thereon, the bore of each cylinder comprising two portions of different cross sectional area, a movable disk in the larger bore portion and forming the end wall of the smaller bore portion traversed by the

piston, the larger bore portion forming at the rear of the disk a primary compressed air reservoir, a secondary compressed air reservoir connected with all the primary reservoirs, and means controlled automatically by the speed of the reciprocatory body to vary the pressure of the air in the secondary reservoir.

12. In an air cushioning device, the combination with a reciprocatory body to be cushioned and coöperating cylinders and pistons acting thereon, the bore of each cylinder comprising two portions of different cross sectional area, a movable disk in the larger bore portion and forming the end wall of the smaller bore portion traversed by the piston, the larger bore portion forming at the rear of the disk a primary compressed air reservoir, a secondary compressed air reservoir connected with all the primary reservoirs, a puppet valve arranged to relieve the pressure in the secondary reservoir, a weight to vary the action of the valve, a governor influenced by the speed of the reciprocatory body and connection between the governor and the weight whereby to vary the pressure of the air with the speed of the body.

13. In an air cushioning device, the combination with a reciprocatory body to be cushioned and coöperating cylinders and pistons acting thereon, the bore of each cylinder comprising two portions of different cross sectional area, a movable disk in the larger bore portion and forming the end wall of the smaller bore portion traversed by the piston, the larger bore portion forming at the rear of the disk a primary compressed air reservoir, a secondary compressed air reservoir connected with all the primary reservoirs, a puppet valve arranged to relieve the pressure in the secondary reservoir, a weight to vary the action of the valve, a governor influenced by the speed of the reciprocatory body and connection between the governor and the weight whereby to vary the pressure of the air with the speed of the body, a pump to maintain a supply of compressed air within the secondary reservoir, a vent valve between the pump and reservoir, and a connection between the vent valve and puppet valve whereby upon an undue rise of pressure within the reservoir the pump will vent to the atmosphere.

14. In an air cushioning device for a reciprocating body, in combination, a main cylinder or dash pot, and an auxiliary cylinder arranged so that when the volume of the auxiliary cylinder decreases the volume of the main cylinder increases, the air pressure in the auxiliary cylinder being controlled by the speed of the reciprocating body.

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

BURT D. STEVENS.

Witnesses:
JOHN A. CARROLL,
JOHN H. B. MCCAIG.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."