(No Model.)

2 Sheets—Sheet 1.

C. B. COTTRELL.

PRINTING MACHINE.

No. 385,099. Patented June 26, 1888.

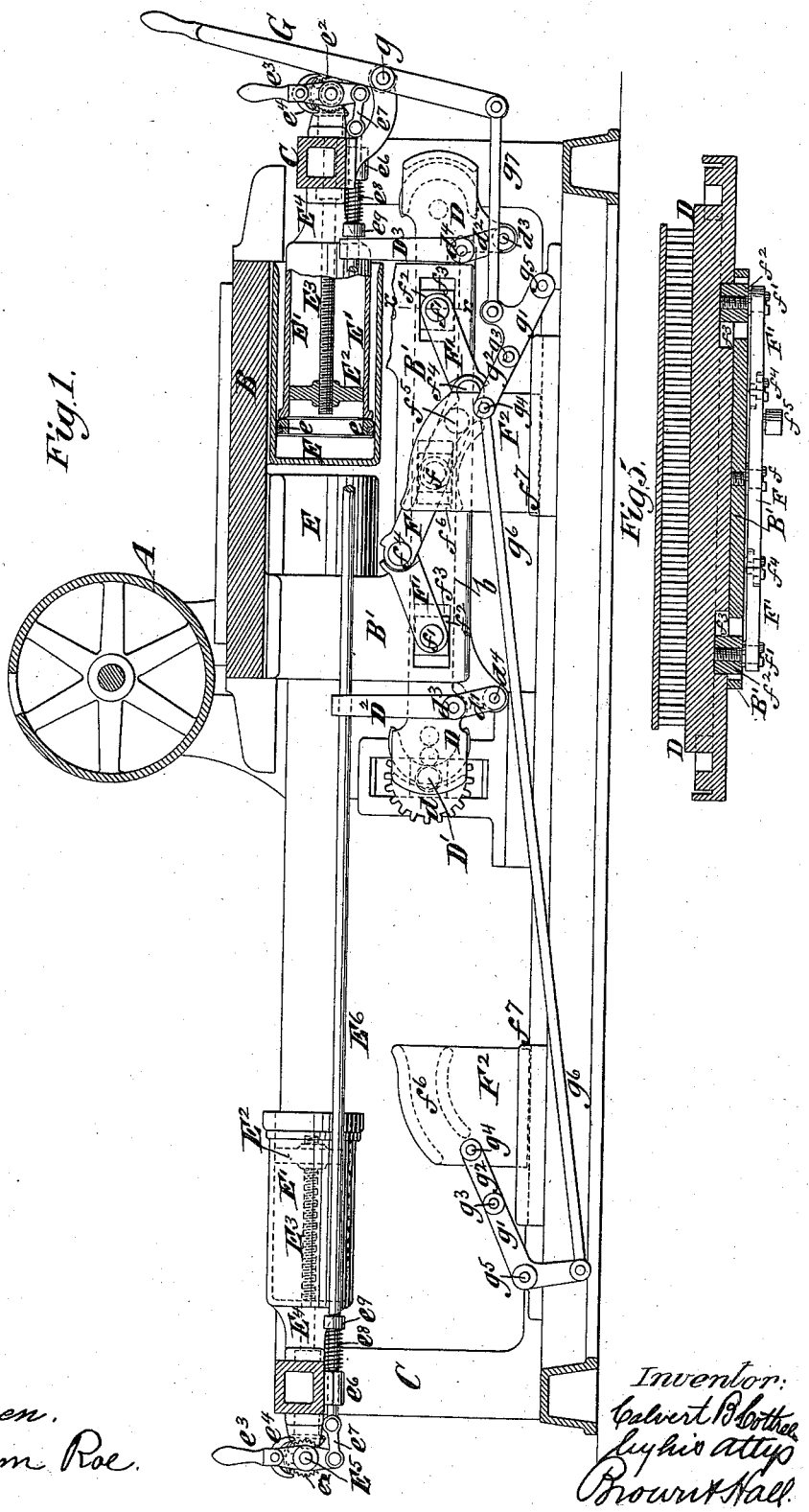

Fig. 1.

Figs.

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Inventor:
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by his attys
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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

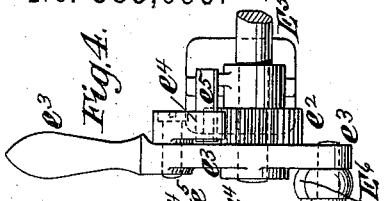


Fig. 3.

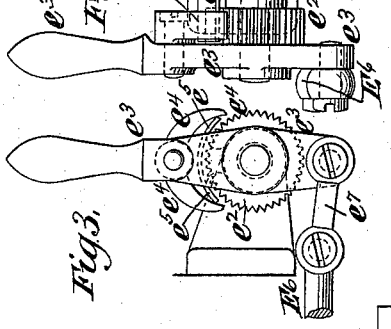
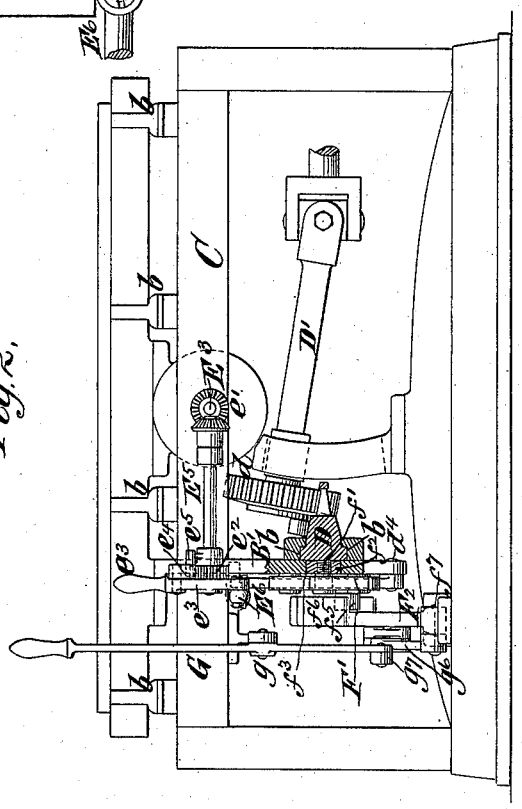


Fig. 2.



Witnesses:
C. L. Sundgren.
J. Wickham Roe.

Inventor:
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UNITED STATES PATENT OFFICE.

CALVERT B. COTTRELL, OF STONINGTON, CONNECTICUT.

PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 385,099, dated June 26, 1888.

Application filed October 29, 1887. Serial No. 253,687. (No model.)

To all whom it may concern:

Be it known that I, CALVERT B. COTTRELL, of Stonington, in the county of New London and State of Connecticut, have invented a new and useful Improvement in Printing-Machines, of which the following is a specification.

My invention relates to printing-machines which comprise an impression-cylinder and a reciprocating bed, in which the bed is operated by a mangle motion or pinion and rack gearing, giving it a definite range of reciprocation. In such machines an air spring or cushion is commonly employed at each end of the machine for arresting the movement of the bed as it approaches at full speed the end of its movement, and it is obvious that if the air spring or cushion does not arrest the movement of the bed at the desired and proper point the momentum of the bed will produce a severe strain and shock upon the mangle or other gearing, inasmuch as the rack and the bed are usually rigidly connected.

My invention is applicable with great advantage to all machines of this character in which the speed varies, and particularly machines employed for lithographic purposes, in which there is a great difference in weight between different stones which are used upon the bed, as it is obvious that with a very heavy stone or at high speed the bed would have a greater tendency to overrun than it would with a lighter stone or less speed, and consequently would require the adjustment of the air spring or cushion to arrest it without subjecting the rack and pinion to great shock and strain.

An important object of my present invention is to provide means whereby the rack and bed are so connected that while they are rigid during the main portion of the reciprocating movement they may be at each end of the stroke of the bed permitted to move slightly, one relatively to the other, so that in case of a very heavy stone being placed upon the bed, or the bed run at high speed, the bed shall be permitted to move slightly ahead of the rack at the end of its stroke and until arrested by the air spring or cushion; and a further important object of the invention is to provide means whereby such slight sliding movement of the bed ahead of the rack in case of a very heavy stone or high speed, or both, or sliding movement of the rack ahead of the bed, as soon as the latter strikes the air-spring, in case of a very light stone or slow speed, or both, shall act through suitable mechanism to automatically vary or regulate the resistance offered by the air spring or cushion, or any other spring or cushion which may be employed, to the movement of the bed.

In carrying out my invention I connect the rack with a hanger from the bed, so that a slight sliding movement of one relatively to the other may be permitted, and this result may be accomplished by connecting the bed and hanger by swinging links; and for locking the rack relatively to the hanger and bed, so as to prevent any sliding movement of one relatively to the other during the principal part of the movement of the bed, I employ toggle-levers having one pivotal point fixed upon the rack and having its other pivotal points upon blocks or slides which have a limited sliding movement in openings in the hanger. When these toggle-levers are straightened or brought into line, the blocks which slide in the hanger abut against the ends of the slots wherein they move, and the rack is then rigidly connected with the hanger, so that no sliding movement of one relatively to the other is permitted.

At one or each end of the machine I employ a cam with which a truck-roller upon the toggle-levers comes into engagement at the ends of the bed's movement, and which acts to deflect or break up the toggle-levers, so as to leave the rack connected with the hanger only by its swinging links or other means which provide for the sliding movement of the rack and bed, one relatively to the other. In connection with each air-spring I employ a mechanism whereby it may be adjusted to vary the resistance offered to the movement of the bed; and this mechanism in the present example of my invention consists of a ratchet and a lever carrying pawls geared with the screw, upon which is mounted a head fitting the cup-shaped plunger, as is shown in the application of Charles P. Cottrell, filed October 26, 1887, and the serial number of which is 253,425.

The pawl-carrying levers of the mechanism at opposite ends of the machine are connected by a rod, and I provide tappets upon the bed or upon the part carried thereby, which will

be moved into operative position by the shifting of the rack and bed, one relatively to the other, and which act upon collars on the aforesaid rod, so as to operate automatically the mechanism whereby the air-springs are adjusted to vary or regulate the resistance opposed by them to the movement of the bed. These tappets may consist of arms which are connected with the links connecting the bed hanger and rack, so that they are thrown into operative position by the movement of the bed and rack, one relatively to the other. I also provide mechanism operated by a hand-lever, whereby the cam at one or each end of the machine which acts to break or deflect the toggle-levers on the bed-hanger may be moved out of operative position after the air-spring has been adjusted to offer the proper amount of resistance to the movement of the bed.

In the accompanying drawings, Figure 1 represents a longitudinal section of such parts of a printing-machine as are necessary to illustrate my invention, and Fig. 2 is an end view including a partial section of the bed-rack and its hanger upon about the plane indicated by the dotted line *x x*, Fig. 1. Fig. 3 is a side view of the mechanism which may be operated automatically or by hand to vary the air spring or cushion, such view being similar to the representation of the mechanism in Fig. 1, but upon a larger scale; and Fig. 4 is an edge view or illustration of such mechanism similar to Fig. 2, but on a larger scale. Fig. 5 is a modification of a detail, hereinafter referred to.

Similar letters of reference designate corresponding parts in all the figures.

A designates the impression-cylinder, and B the bed, which may be connected with the impression-cylinder by any of the ordinary systems of gearing, so as to cause them to operate in unison, and which is supported by shoes or bearers *b* upon the main frame C of the machine. The bed has depending from it the usual hanger, B′, with which is connected, and which serves to carry the rack D, and this rack is here shown as a mangle-rack, and is operated by a pinion, *d*, upon a jointed shaft, D′, in the usual way, as shown in Fig. 2.

For arresting the movement of the bed at the end of its reciprocating stroke in either direction, I employ springs or spring-cushions, here represented as composed each of a cylinder, E, and a cup shaped plunger, E′, which is provided with a suitable packing, *e*, and which is arranged with its open end presented in an opposite direction to the open end of the cylinder. Within the cup-shaped plunger E′ is a sliding head, E^2, which, by means of a screw, E^3, may be shifted lengthwise of the plunger E′, so as to vary the amount of air trapped between the plunger and the cylinder at the time the cylinder strikes the plunger and to vary the space wherein the air is compressed. As here represented, the screw E^3 is fitted, as in a nut, to the head E^2, and by turning the screw in one or other direction the head will be moved lengthwise within the cup-shaped plunger E′, as is described in the aforesaid application of Charles P. Cottrell. The plunger E′ is secured through a bracket, E^4, to a portion of the framing C; and I will now describe, with particular reference to Figs. 3 and 4, a mechanism, which is also shown in Figs. 1 and 2, whereby the screw E^3 may be turned and the head E^2 shifted.

The screw E^3, which is at each end of the machine, has a cross-shaft, E^5, connected with it by bevel gear-wheels *e′*, and upon this shaft is secured a toothed ratchet-wheel, e^2. Upon the shaft is loosely pivoted a lever or arm, e^3, carrying pawls e^4, presented in opposite directions to the teeth of the wheel e^2; and e^5 represents an arc-shaped guard, which covers the upper portion of the wheel e^2 and serves as a rest for the pawls e^4 to keep them out of engagement with the wheel e^2 when the lever e^3 is adjusted to mid-position, as shown in Figs. 1 and 3. If, however, the lever e^3 is swung by hand or automatically in either direction, the pawl e^4, which passes off the guard or shield e^5, will drop into engagement with the wheel e^2 and will impart a turning movement thereto. As before stated, such a mechanism is arranged at each end of the machine for varying the air spring or cushion at each end, and the two mechanisms are shown as connected by a sliding rod, E^6, which is fitted to suitable guides, e^6, and is connected by links e^7 with the lower ends of the lever e^3. I have represented springs e^8 as applied between the guides or bearings e^6 for the rod E^6 and collars e^9 on said rod, and these springs e^8 return the rod E^6 and the pawl-levers e^3 to mid-position after each operation, so that the pawls will rest upon the shield e^5 of each mechanism.

The mangle or other rack D, during the principal portion of the reciprocating movement of the bed B, should be rigid upon the hanger B′; but I provide by suitable means for connecting the said rack with the hanger, so that a limited sliding movement between the rack and hanger, one relatively to the other, may be permitted at each end of the reciprocating movement.

The rack D is represented as fitted to a channel or guideway, *b*, upon the hanger B′, as shown in Fig. 2, and the hanger and rack are connected by swinging links *d′ d²*. The link *d′* forms a part of an arm or lever, D^2, which is fulcrumed at d^3 to the rack D and is connected at the point d^4 to a bracket or arm projecting downward from the hanger B′. The link d^2 forms a part of an arm or lever, D^3, which is fulcrumed at the point d^3 to an arm or projection on the rack D and is connected at the point d^4 to the hanger B′.

From the above description it will be understood that in case the bed and hanger B B′ slide toward the right relatively to the rack D as they complete their reciprocation toward the right such movement will throw the upper end of the arm D^3 toward the right hand of the drawings, Fig 1, and will throw the upper

end of the arm D^2 toward the left hand of Fig. 1.

I will now describe the means whereby the rack and bed are locked relatively to each other, so that there can be no sliding movement of one relatively to the other during the principal part of the reciprocating movement.

F F′ designate three levers or bars, which are connected so as to form toggle-levers. The bar F is pivoted at the point f to a fixed pin in the rack D; but the bars F′ are pivotally connected at the points f' to blocks f^2, which have a limited sliding movement in openings f^3 in the hanger B′, and which are not connected with the rack. The bars F F′ are pivotally connected together at the points f^4, and it will be obvious that when these bars are brought into a straight line the blocks f^2 will be moved in opposite directions, so as to abut against the outer ends of the openings f^3, and thus form a brace of fixed length to hold the rack and the hanger B′ against sliding movement, one relatively to the other. When the toggle-levers are broken or deflected from a straight line and to the position shown in Fig. 1, such limited movement is permitted to the extent of the distance between the blocks f^2 and the outer ends of the openings f^3 in the hanger B′. Upon the bar F of the toggle-levers is a truck roll or pin, f^5, which, as the bed is reciprocated, may be alternately engaged with curved grooves or ways f^6 in cams or cam-blocks F^2, fitted to slide in suitable guides or slideways, f^7, at opposite ends of the machine. When the cams F^2 are slid toward each other to the position shown in Fig. 1, and supposing that the toggle-levers F F′ are straightened and the bed is moved toward the right hand of Fig. 1, the truck-roll f^5 will enter the groove f^6 in the right-hand cam F^2, and will thus break down the levers or deflect them to the position shown in Fig. 1, which is before the pinion d rounds the shoe at the end of the rack. We will suppose that a very heavy stone has been put upon the bed B or that the speed is increased, or both, and that the bed has just completed its reciprocating movement toward the right hand of Fig. 1. The toggle-levers F F′ have been deflected by the cam F^2, thereby leaving the bed free to slide slightly relatively to the rack D, and when the rack has by the pinion d been brought to the right hand of its stroke the momentum of the bed causes it to slide relatively to the rack toward the right hand of Fig. 1. This overrun of the movement of the bed acting upon the lever or arm D^3 throws it toward the right and against the right-hand collar, e^9, of the rod E^6, and by moving said rod toward the right hand the pawl-lever e^3 at the right-hand end of the machine is operated so as to shift the head E^2 in the air-spring toward the open end of the cup-shaped plunger E′, thereby tending to decrease the volume of air which is trapped in the cylinder E at the moment that it strikes the plunger E′ and decreasing the air-space between the cylinder and plunger. Through the rod E^6 a like operation of the air-spring mechanism at the left hand of the machine is also produced, and as the bed commences its reciprocation toward the left hand the cam F^2, through the truck-roll f^5, serves to straighten the toggle-levers F F′ and bring them into a locking position. Where the stone upon the bed is extraordinarily heavy or the speed high, this automatic adjustment of the air-spring is performed each time that the bed comes to the right-hand end of its movement until the adjusting mechanism is no longer affected, and when the attendant sees that this is the case he operates a hand-lever, G, which is fulcrumed at g, to move the cams F^2 away from each other and out of operative position. I have shown each cam F^2 as moved by toggle-levers g' g^2, having a movable center, g^3, and fixed centers g^4 g^5. I have shown the pairs of toggles as connected by a rod, g^6, and with one pair the hand-lever G is connected by a rod, g^7. Therefore it will be understood that by moving the hand-lever toward the left of Fig. 1 both pairs of toggles will be broken up or deflected and the cams F^2 moved in opposite directions to such position that they will not operate the truck-roll f^5.

Having thus described how the bed B will, in case of a very heavy stone being placed thereon, or high speed, effect the automatic adjustment of the air-springs, so as to increase the resistance which they offer to the movement of the bed, I will now describe how, in case of a very light stone being put upon the bed, or a slow speed, or both, and in case the air-springs would serve to check the movement of the bed before the rack has quite completed its movement, the air-springs will be automatically adjusted so as to decrease the resistance which they offer to the movement of the bed. It is, of course, obvious that the air-springs should not be of a strength sufficient to stop the bed before the rack has completed its movement, because in that case the labor of overcoming such resistance would have to be performed by the mangle-gearing until the rack had fully completed its movement.

Suppose that the bed is moving toward the left hand of Fig. 1, and that the air-spring at the left hand of the machine has checked the bed before the rack D has quite completed its movement. Obviously the rack will move ahead of the bed and will throw the upper end of the arm D^2 toward the left hand of Fig. 1, and such arm, by acting upon the collar e^9, will move the pawl lever e^3 and will shift the head E^2 in the left-hand air-spring toward the closed end of the plunger E′, thereby increasing the volume of air which is entrapped in the cylinder E when it strikes the plunger and increasing the space between the cylinder and plunger. This action is repeated at each left-hand movement of the bed until the air-spring-adjusting mechanism is no longer operated, and then the cams F^2 are moved out of operative position. After any change of stones on

the bed or change of speed the cams F^2 are moved into operative position, when the machine is started, and then the machine will automatically adjust its air-springs to exactly suit the weight of the bed and speed, and the cams F^2 are then moved away from each other and out of operative position.

From the foregoing description it will be obvious that the lever or arm D^3, which is operated when the bed is run at a high speed, or when a very heavy stone is in place, to adjust the air-spring at the right-hand end of the machine, may serve simply as an indicator to the attendant, and when he sees by the movement of said arm D^3 that the bed is running ahead of the rack at the end of the movement of the bed toward the right hand he can operate by hand the spring-adjusting mechanism, which is at that end of the press, and through the rod E^6 he will operate the spring, which is at the opposite end of the press. It is also obvious that a movement of the bed and the rack, one relatively to the other, may be utilized simply for shifting the air-springs in case of a very heavy stone or high speed, or both, and that the attendant may, through the spring-adjusting mechanism, adjust such springs by hand to suit the slower speeds and lighter stones. It is also obvious that the rod g^6, connecting the toggle-levers which operate the two sliding cams F^2, may be dispensed with and a hand-lever and rod, G g^7, similar to those at the right-hand end of the machine, may be applied to the cam F^2, which is at the left-hand end of the machine.

I have above described the toggle-levers F F′ as having a fixed pivotal point, *f*, on the rack D and other pivotal points, *f′*, on blocks f^2, which slide in openings in the hanger; but it is obvious that exactly the same result would be secured by having the fixed pivotal point *f* upon the hanger and the blocks f^2, on which are the other pivotal points, *f′*, sliding in the rack. This modification, which is the full equivalent of the construction above described, is illustrated in Fig. 5, which is a horizontal section through the rack and hanger. In that figure it will be seen that the fixed pivotal point *f* is on the hanger and the blocks f^2, on which are the other pivotal points, *f′*, slide in openings f^3 in the rack.

From the former description it will be obvious that not only do I provide for adjusting the resistance offered by the air-springs to the weight of the stone upon the bed, but, what is of still more importance, I provide for adjusting such resistance to suit the speed at which the bed is operated, for, as is well known, the momentum of a moving body increases as the square of the speed.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, with the bed of a cylinder printing-machine and a rack-and-pinion gearing for operating the bed, the rack of the gearing being hung from the bed to provide for a slight lengthwise movement of one relative to the other, of springs or cushions to arrest the movement of the bed without shock, mechanism, substantially as described, for regulating or varying the resistance which the springs or cushions oppose to the movement of the bed, and tappets which are carried by the bed and are shifted by the movement of the bed and rack, one relatively to the other, to operate through the said mechanism for varying the resistance offered by the springs or cushions, substantially as herein set forth.

2. The combination, with the bed of a printing-machine and a rack and-pinion gearing for reciprocating it, the rack of said gearing sliding in the hanger on the bed and connected with said hanger by swinging links to provide for a slight sliding movement of the rack and bed, one relatively to the other, of toggle-levers having a pivotal point fixed on the rack and other pivotal points upon blocks having a limited sliding movement in the hanger, whereby when the toggle-levers are straightened the bed and rack are locked against sliding movement, one relatively to the other, a cam at one or each end of the machine with which a truck-roll on the toggle-levers engages to break up or deflect the toggle-levers, air springs or cushions for arresting the movement of the bed, and mechanism, substantially as described, for varying the resistance offered by the air springs or cushions, substantially as set forth.

3. The combination, with the bed of a printing-machine and a rack-and-pinion gearing for reciprocating it, the rack of the gearing sliding in the hanger on the bed and connected therewith to have a slight sliding movement between the rack and bed, one relatively to the other, of toggle-levers having a pivotal point fixed on the rack and other pivotal points on blocks having a limited sliding movement in the hanger, whereby when the levers are straightened the bed and rack are locked against sliding movement, one relatively to the other, a sliding cam at one or each end of the machine with which a truck-roll on the toggle-levers engages to break up or deflect the toggle-levers, a hand-lever and connections for sliding said cam into and out of operative position, air springs or cushions for arresting the movement of the bed, and mechanism, substantially as described, whereby the resistance offered by the air springs or cushions may be varied, substantially as herein set forth.

4. The combination, with the bed of a printing-machine, air springs or cushions for arresting its movement in opposite directions, and mechanism, substantially as described, for varying the resistance offered by the air springs or cushions, the mechanism at opposite ends of the machine being connected by a rod, as E^6, of the rack-and-pinion gearing for operating the bed, including a rack having a slight sliding movement between it and the bed-hanger, toggle-levers, as described, whereby the

rack and bed may be locked to prevent such sliding movement, arms D^2 D^3, which are connected with the bed-hanger and rack so as to be operated one by the bed running ahead of the rack and the other by the rack running ahead of the bed, and which operate on the rod E^6 to vary both air springs or cushions, and cams at opposite ends of the machine for breaking up or deflecting the toggle-levers, substantially as herein set forth.

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