(No Model.) 5 Sheets—Sheet 1.

L. C. CROWELL.

BED MOTION FOR CYLINDER PRINTING MACHINES.

No. 477,738. Patented June 28, 1892.

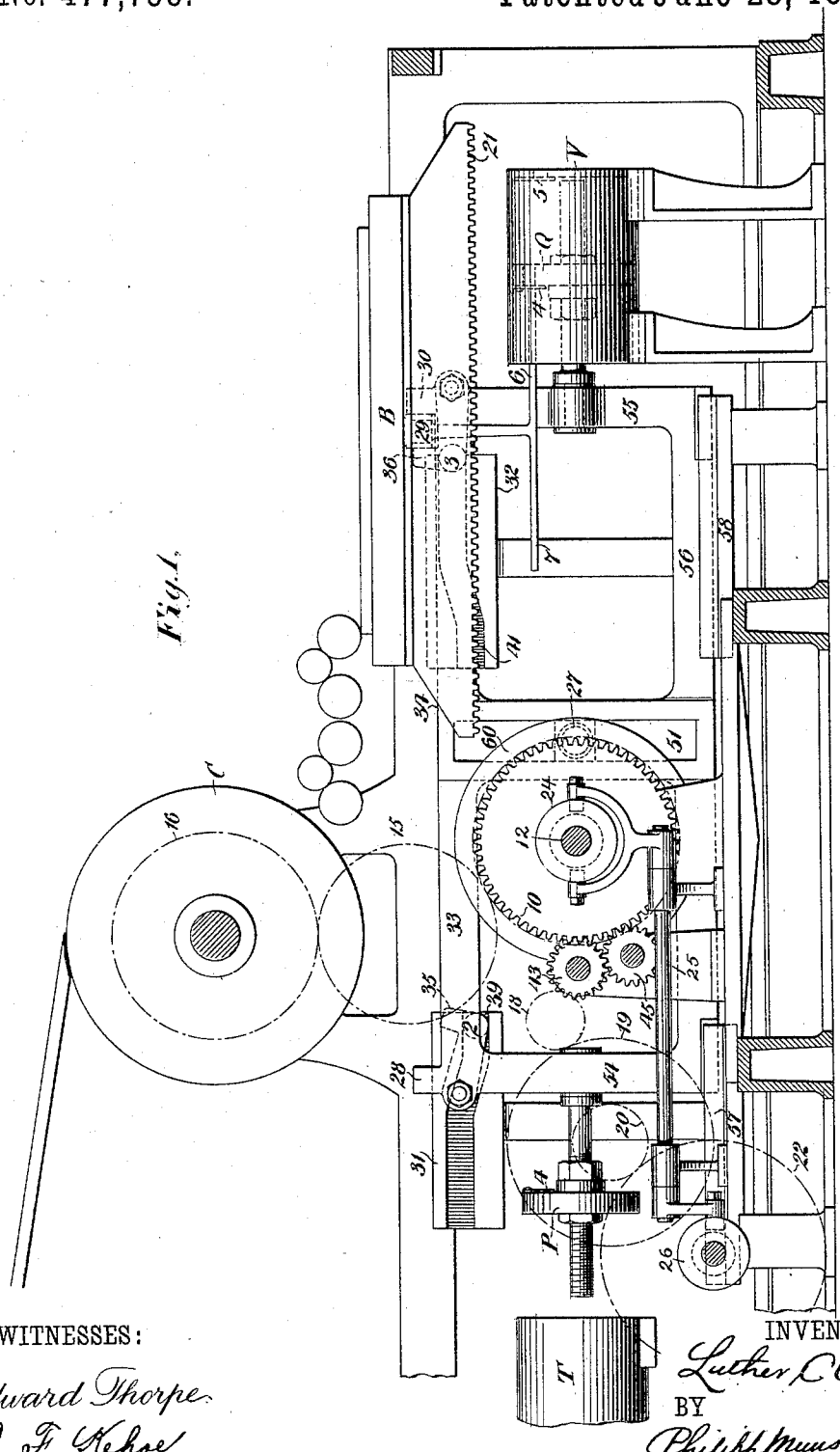

Fig. 1.

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(No Model.) 5 Sheets—Sheet 2

L. C. CROWELL.

BED MOTION FOR CYLINDER PRINTING MACHINES.

No. 477,738. Patented June 28, 1892.

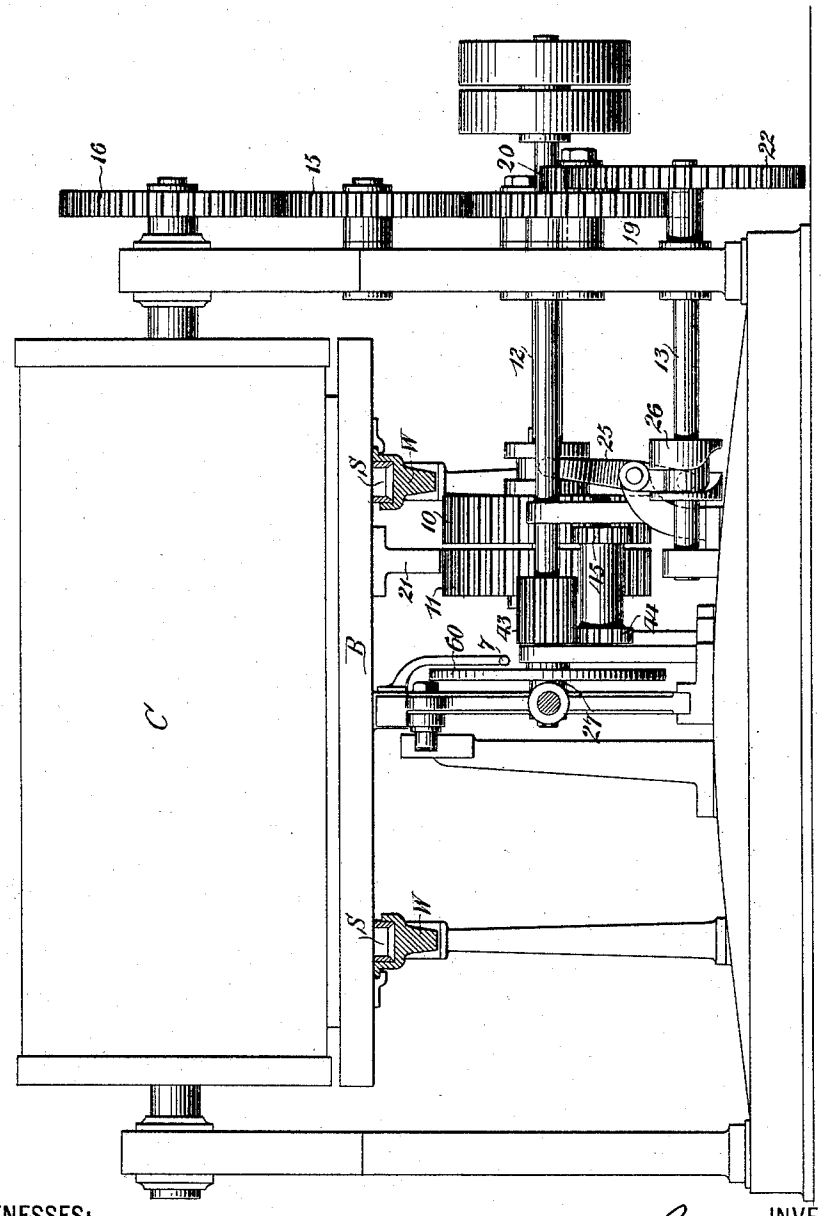

Fig. 2.

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L. C. CROWELL.

BED MOTION FOR CYLINDER PRINTING MACHINES.

No. 477,738. Patented June 28, 1892.

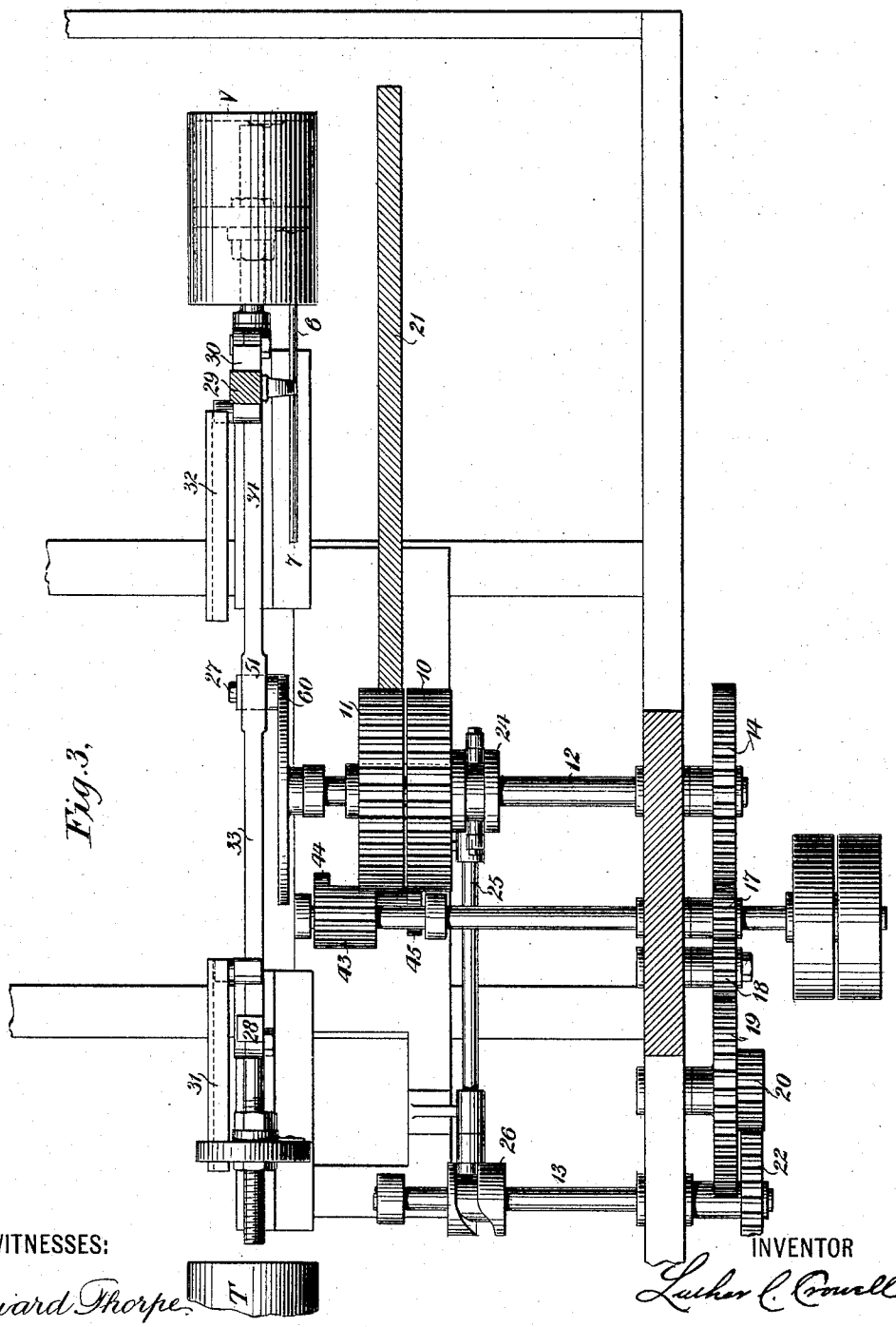

Fig. 3.

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L. C. CROWELL.

BED MOTION FOR CYLINDER PRINTING MACHINES.

No. 477,738. Patented June 28, 1892.

Fig. 4.

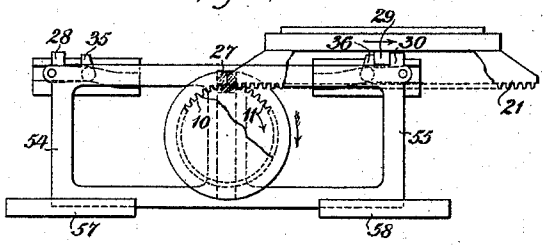


Fig. 5.

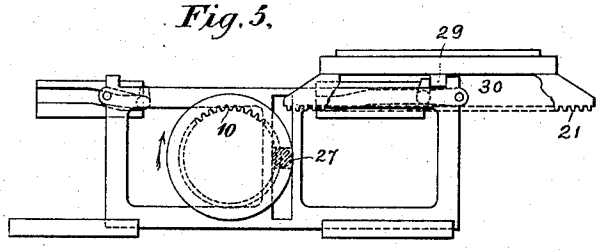


Fig. 6.

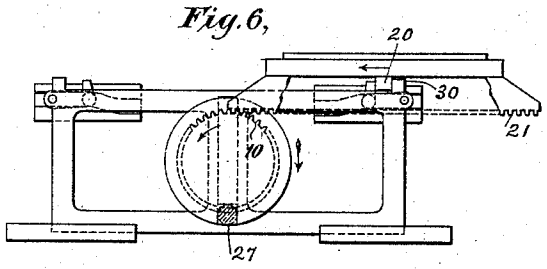


Fig. 7.

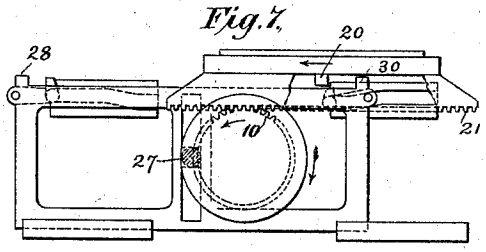
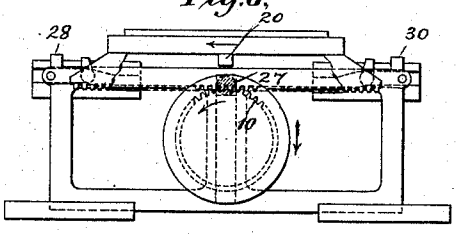


Fig. 8.



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(No Model.) 5 Sheets—Sheet 5.

L. C. CROWELL.

BED MOTION FOR CYLINDER PRINTING MACHINES.

No. 477,738. Patented June 28, 1892.

Fig. 9.

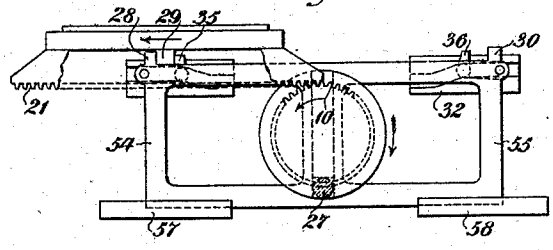


Fig. 10.

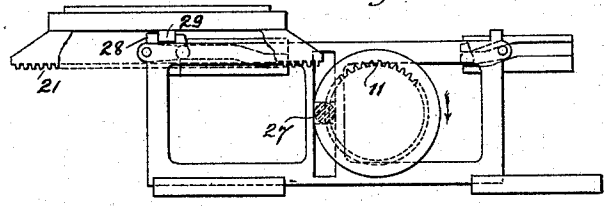


Fig. 11.

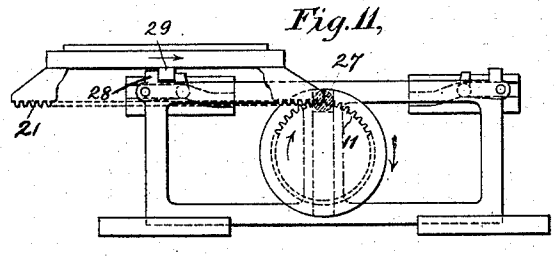


Fig. 12.

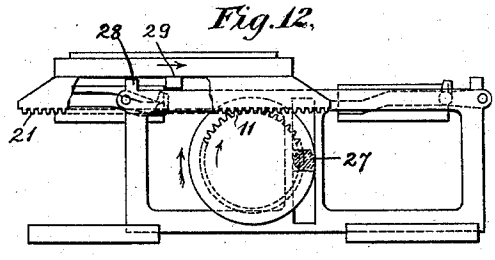
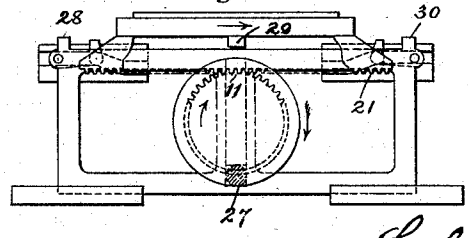


Fig. 13.



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UNITED STATES PATENT OFFICE.

LUTHER C. CROWELL, OF BROOKLYN, ASSIGNOR TO ROBERT HOE, STEPHEN D. TUCKER, THEODORE H. MEAD, AND CHARLES W. CARPENTER, OF NEW YORK, N. Y.

BED-MOTION FOR CYLINDER PRINTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 477,738, dated June 28, 1892.

Application filed March 31, 1892. Serial No. 427,162. (No model.)

To all whom it may concern:

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

In printing-machines of that class in which the form of type is carried by a reciprocating bed and the impression therefrom is obtained by a co-operating cylinder great difficulty has been experienced in reversing the bed at the ends of its run within such a period of time, without producing injurious results, as will admit of running the machine at a high rate of speed. It is most desirable that the highest practical speed of operation shall be secured, and this is limited, principally, by the difficulty experienced in slowing down and stopping the movement of the bed in one direction and immediately thereafter starting and accelerating it in the other direction. Many improvements with this object in view have heretofore been made, some of which are set forth in my application, Serial No. 421,914, filed February 18, 1892, and one branch of the present invention in part constitutes an improved construction of the devices shown in that case.

While the main object of the present improvements is the speedy accomplishment of the reversing operation with the least possible modification of the high speed at which it is desirable to run the bed throughout the major part of its reciprocating movements, a second part of this invention relates to auxiliary means for aiding the action of the main slowing, stopping, starting, and accelerating devices, which consists in combining therewith an air-cushioning device acting as a take-up for the momentum of the bed, whereby any undue strain of the parts or jarring action is wholly prevented.

Another feature of invention is found in providing the reciprocating bed with a rack-and-pinion mechanism that co-operates with a single rack for imparting the major part of its movements.

In the drawings illustrating said improvements, Figure 1 is a side elevation of a printing-machine embodying these improvements with its nearest side frame removed. Fig. 2 is a similar end elevation. Fig. 3 is a plan view taken just below the type-bed. Figs. 4 to 13 are diagrammatic views of the bed and its driving mechanism in various positions.

For the purpose of illustrating this invention a single-cylinder flat-bed perfecting-machine has been selected; but it is to be understood that the improvements are applicable to all of the many constructions of flat-bed presses, whether provided with one or more impression-cylinders and whether of the single-acting or perfecting type.

The printing-machine in its main features comprises an impression-cylinder C, that turns in suitable journals supported by the framework and co-operates in performing the printing operation with a reciprocating type-bed B, that runs upon sliders S, supported in ways W. The cylinder C is rotated by means of a wheel 16, driven through an intermediate 15 from a wheel 14, mounted on the shaft 12, which may be the driving-shaft. A train of wheels 17, 18, 19, 20, and 22 communicates motion from the wheel 14 and drive the shaft 13.

There are two bed-driving pinions 10 11 of equal pitch and double width that alternately mesh with a single rack 21, which is fixed in a horizontal plane close to the under surface of the bed. These pinions 10 11 revolve freely upon a sleeve that may be splined upon the shaft 12, and they are made to constantly revolve in opposite directions by means of the intermediates 43 44 45, which pinions 10 11 are so connected together, as by collars on the sleeve, that they will slide bodily into positions to bring the appropriate one of them into the vertical plane of and hence enable it to readily gear with the bed-rack, and yet remain geared with their intermediates. These intermediates turn freely on their shafts, and 43 is wide enough to accommodate this sliding movement of the pinion 11, and yet remain geared with it, and the intermediate 45

will likewise remain in gear with the pinion 10 during such movement. This sliding movement of the pinions 10 11 is accomplished by means of a collar 24 on the sleeve carrying the pinions, into which the yoked end of a vibrating lever 25 engages, said lever being rocked at timely intervals by means of a cam 26 on the shaft 13. When the pinion 10 is engaged with the rack 21, the bed will be driven through the main portion of its movement in one direction—say the printing period—and when the pinion 11 is engaged with the rack 21 the bed will make the main portion of its return movement.

The stopping of the movement of the bed in one direction and starting it in the opposite direction at each end of its stroke is accomplished by means of a crank-pin 27, that is carried by a disk 60, fast upon the shaft 12, and projects therefrom so as to correspond with the pitch-line of the pinions 10 11, and hence makes concerted movement with said pinions. This crank-pin plays in a yoke 51, and through connecting-rods 33 34 actuates controlling-arms 28 30, which alternately connect with the type-bed to slow it down in one direction and bring it to a state of rest, start and accelerate it in the opposite direction and then become disconnected therefrom. These rods 33 34 extend outwardly from the upper end of the yoke, by which arrangement the controlling-arms 28 30, which run in the guides 31 32, are brought so near to the plane of travel of the bed as to enable the lug 29 to be short and the leverage to be much reduced, and in order to steady the reciprocations of these arms they are provided with end plates 54 55, that connect the arms with a lower member 56, that moves in guiding-slots provided in blocks 57 58, attached to the framework. This structure provides a carrying-frame of great strength and the arrangement of its parts is such as to insure a steady movement of the heavy type-bed that is most desirable. The arms 28 30 are provided with latches 35 36, which have the mode of operation described in said application, Serial No. 421,914—that is to say, they are automatically raised into and lowered from their locking position by means of studs 2 3, that run in cam-slots 39 41, with which the guides 31 32 are provided. They are, however, not claimed herein, but are shown as a convenient means for securing in position the controlling-arms when they are in contact with the lug 29, so that the arm may be secured in continuous contact when so held and not lose its relation thereto by any jarring action or slow movement in starting and stopping the machine.

A particular description of the operation of the mechanisms thus far described will now be given, aided by the diagrams Figs. 4 to 13, in which inactive parts are omitted for perspicuity. The bed is supposed in Fig. 4 to be running in the direction of its arrow and about to finish its non-printing run, the major part of which has been accomplished by the pinion 11, which was moved into gear with the rack 21 for that purpose, as in Fig. 2. As the crank-pin 27 approaches and passes its high point the arm 30 will have been engaged by the lug 29 on the bed, be there secured by the latch 36, and the pinion 11 will have been simultaneously disengaged from the rack 21, while all of the parts are moving with like surface speed, so that the control of the movement of the bed is transferred from the pinion 11 to the arm 30. The crank-pin 27 will while traveling from its high point, as in Fig. 4, to its quarter-point, as in Fig. 5, cause the arm 30 to progressively retard the movement of the bed until a state of rest is attained, as in Fig. 5, and while the crank-pin 27 is traveling from its quarter-point to its low point, as in Fig. 6, it will have started the bed in the direction of the arrow and accelerated the same, until when the parts reach the positions shown in Fig. 6, just before which time the cam 26 has moved the pinion 10 into alignment with the rack 21, the arm 30, rack 21, and pinion 10 will be moving with like surface speed, so that as the crank-pin 27 passes its low point the rack 21 will gear with the pinion 10 and the lug 29 will be simultaneously disengaged from the arm 30. The said pinion 10 will now become the sole driver for the bed and move it through the major part of its printing-run, or while the crank-pin 27 is making a complete revolution and again reaches its low point, as in Fig. 9. The positions of the parts in this complete revolution of the crank-pin 27 are shown at the end of the first quarter of such revolution in Fig. 7, at the end of the second quarter in Fig. 8, and at the end of the last quarter in Fig. 9, which latter position is the equivalent of that shown in Fig. 4, but with the bed approaching the other end of its run. As the crank-pin 27 approaches and passes its low point during this revolution the controlling-arm 28 will engage the lug 29, be held in place by the latch 35, and the rack 21 will simultaneously move out of gear with the pinion 10, while said parts are moving with like surface speed. As the crank-pin 27 moves from its low point a quarter-revolution it will cause the arm 28 to progressively retard the movement of the bed until a state of rest is attained, as in Fig. 10, and while the crank-pin 27 is traveling from this quarter-point to its high point it will have started the bed in the opposite direction (shown by the arrow, Fig. 11) and accelerated the same until when the parts reach the positions shown in Fig. 11, just before which time the cam 26 has moved the pinion 11 into the path of travel of the rack 21, the arm 28, rack 21, and pinion 11 will all be moving with like surface speed, so that as the crank-pin passes its high point the rack 21 will gear with the pinion 11 and the lug 29 will be disengaged from the arm 28. The pinion 11 will

then become sole driver for the bed and move it through the major part of its non-printing run, or while the crank-pin is making a complete revolution and again reaches its high point, as in Fig. 4. The positions which the parts have during this revolution of the crank-pin are shown at the end of the first quarter of such revolution in Fig. 12, at the end of the next quarter in Fig. 13, and at the end of the complete revolution in Fig. 4, in which latter figure the parts are in the positions they had when description of their operation was begun. It need only be added that during each reversing operation at a convenient time after the rack has left one pinion, as 11, the other pinion 10 is brought into the plane of travel of the rack so as to be engaged thereby.

In order to aid the stopping and starting mechanisms in their performance, and while preventing the least jarring or other disturbance of the machine which is liable to occur in large machines where the weight of the bed is great, its travel is extensive, or its speed of movement high and the consequent momentum and inertia serious obstacles to a ready stopping and starting of the same, an auxiliary take-up device is advantageous. A suitable one is provided by air-cushions T V, one at each end of the machine, the pistons P Q of which are rigidly secured to the members 54 55 of the sliding carrying-frame for the arms 28 30, and as this frame and the controlling-arms make three reciprocations to each one of the bed, two of which are idle while only one is active in the operation of stopping and starting the bed at each end of its stroke or run, two things become obvious: first, that said air-cushions must be operative during the one said active reciprocation and inoperative during the said two idle reciprocations. In order to secure this action of the air-cushions, the cylinders are provided with valves, as 4 5, and the bed carries rods 6 7 for holding the valves 4 4 closed during that part of the active movement of the arms 30 or 28 when the momentum of the bed is to be speedily overcome and the same brought to a state of rest, and also at the time when the inertia of the bed is to be overcome. From this construction it will be observed that when the arm 30 or 28 is being engaged with the bed to control its outward movement, as in Figs. 4 and 9, the arm 6 or 7 will simultaneously engage the valve 4 in the piston Q or P, and that while said arm, bed, and piston make the movement illustrated by Figs. 4, 5, 9, and 10 to stop the bed the retaining of said valve 4 closed will enable the piston to compress the air within the cylinder, and thus constitute it a resisting-cushion opposed to the movement of the piston. When, however, the reverse movement of the arm, bed, and piston is made, the air-pressure will aid in overcoming the inertia of the bed, and immediately after the same is started the valve, as 5, will open to admit the atmosphere and aid the free movement of the piston. Many other valve arrangements may be provided; but that shown is a simple and effective one.

The combination of the air-cushion take-up devices are illustrated herein in connection with the main-bed propelling and reversing devices particularly shown in Fig. 17 of my said application, Serial No. 421,914; but it is to be understood that any of the said propelling or driving mechanisms, whereby the principal part of the movements of the bed are made during its run in either direction and its reversal at the end of such run is accomplished, as shown and described in said application and my application, Serial No. 422,835, filed February 26, 1892, may be substituted for like mechanisms herein.

What is claimed is—

1. The combination, with the type-bed and its engaging-lug 29, of the crank-operated carrying-frame having rods 33 34 projecting from the upper end of its yoke and supporting the controlling-arms 28 30 near the under surface of the bed, substantially as described.

2. The combination, with the type-bed and its engaging-lug 29, of the controlling-arm-carrying frame, its top guides 31 32, and bottom guides 57 58, substantially as described.

3. The combination, with the moving bed, a rack-and-pinion mechanism for imparting to it the major part of its movement in either direction, and a controlling-arm moved to and fro and automatically engaged with the bed to retard, stop, start, and accelerate the same, of an air-cushion co-operating with said arm, substantially as described.

4. The combination, with the moving bed, a rack-and-pinion mechanism for imparting to it the major part of its reciprocation, and a crank-operated reversing mechanism, of the air-cushion take-up, substantially as described.

5. The combination, with the moving bed, rack-and-pinion mechanism for imparting to it the major part of its reciprocation, a crank-operated reversing mechanism, and an air-cushion take-up, of a valve-operating mechanism and means for automatically closing said valve during the operative movement of said reversing mechanism, substantially as described.

6. The combination, with the valves 4, the air-cylinder pistons, and the reciprocating bed, of the arms 6 7, carried by the bed, substantially as described.

7. The combination, with the bed and its single driving-rack, of two pinions on a common axis and revolved in opposite directions and means for shifting said pinions laterally, so that they shall alternately engage said rack to drive the bed in opposite directions, substantially as described.

8. The combination of the bed, its single driving-rack, two pinions 10 11, intermediates 43 44 45, and means for alternately shifting said pinions into the path of travel of the said rack, substantially as described.

9. The combination, with the type-bed, its single driving-rack, two pinions on a common axis and revolved in opposite directions, means for shifting said pinions laterally, so that they shall alternately engage said rack to drive the bed during the major part of its run in opposite directions, of a reversing mechanism moving in harmony with said pinions and operating to retard and stop the bed in one direction and start and accelerate it in a contrary direction at each end of its run, substantially as described.

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

LUTHER C. CROWELL.

Witnesses:
THOS. F. KEHOE,
J. J. KENNEDY.