No. 676,437. Patented June 18, 1901.

A. E. KNOCH & H. VOGEL.

CYLINDER PRINTING PRESS.

(Application filed Nov. 22, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

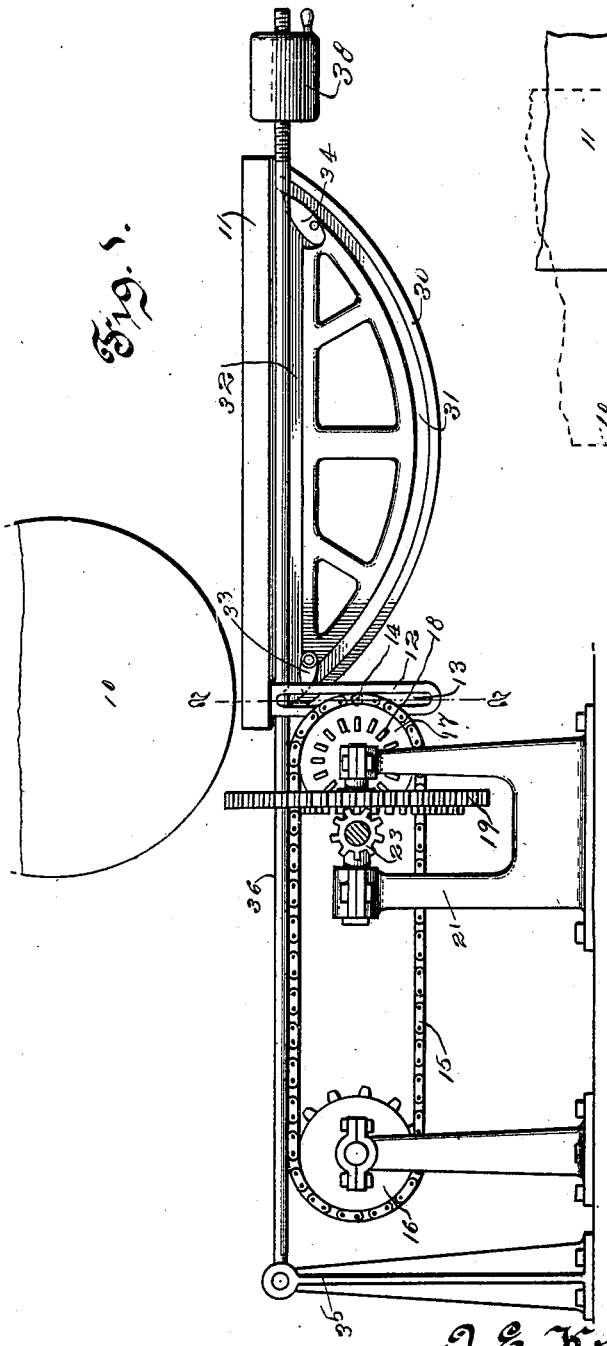

Fig. 3.

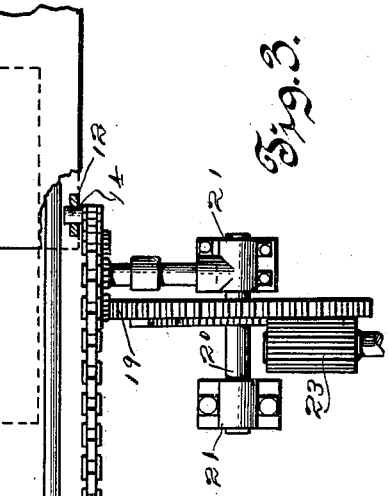

Fig. 4.

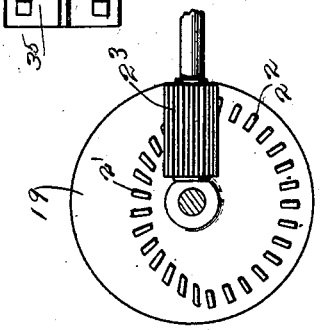

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Fig. 5.

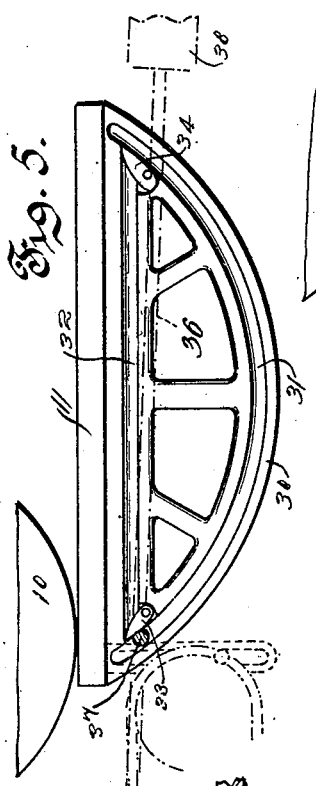


Fig. 6.

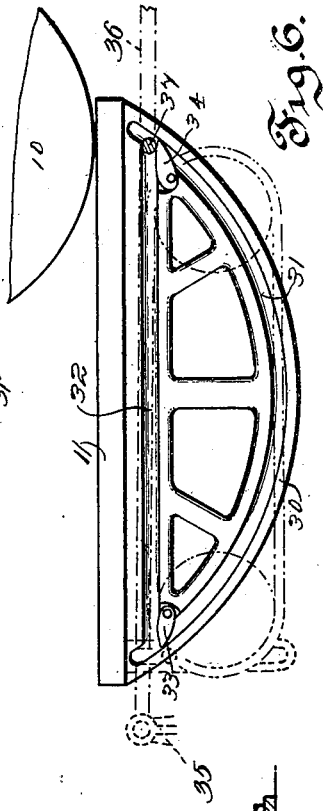


Fig. 7.

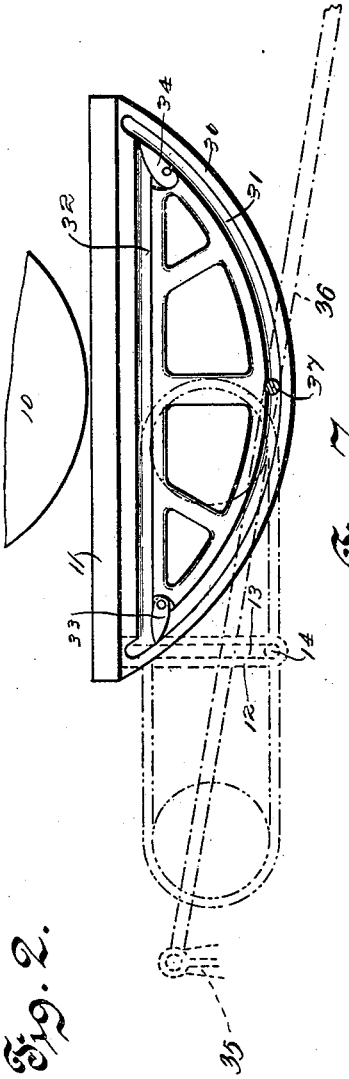
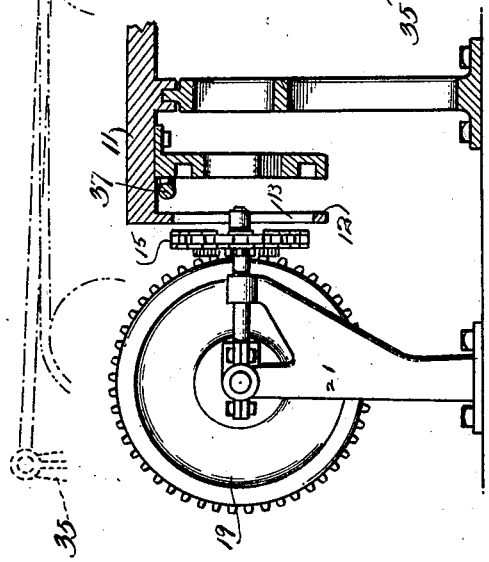


Fig. 2.



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(Application filed Nov. 22, 1900.)

(No Model.)

3 Sheets—Sheet 3.

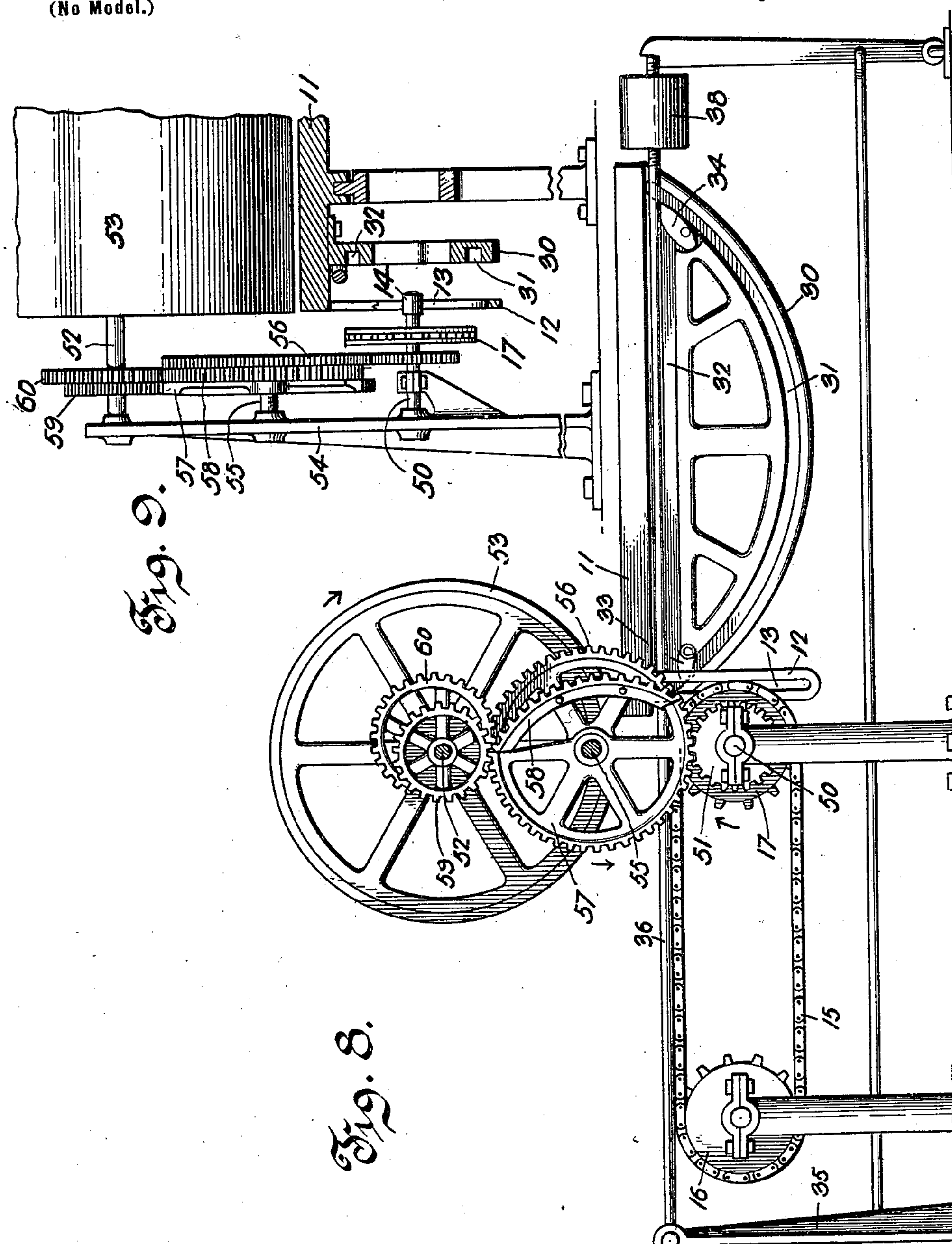

Fig. 9.

Fig. 8.

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UNITED STATES PATENT OFFICE.

ADOLPH ERNST KNOCH AND HERRMANN VOGEL, OF LOS ANGELES, CALIFORNIA.

CYLINDER PRINTING-PRESS.

SPECIFICATION forming part of Letters Patent No. 676,437, dated June 18, 1901.

Application filed November 22, 1900. Serial No. 37,373. (No model.)

To all whom it may concern:

Be it known that we, ADOLPH ERNST KNOCH and HERRMANN VOGEL, citizens of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Cylinder Printing-Press, of which the following is a specification.

This invention relates to printing-presses, and more particularly to cylinder-presses, and it has specific reference to the bed-motion thereof, one object of the invention being to provide a construction wherein the reciprocatory bed will have a slow and even forward movement during the making of the impression, will be brought gradually to a stop at the end of the impression, and will be returned with a movement that is first accelerated and then diminished, the movement being the same as that of a pendulum and being hereinafter referred to as a "pendulous" motion.

A further object of the invention is to provide a counterbalance which will oppose the movements of the bed at the ends of the movements, so as to form a cushion, and which in the return of the bed will have first an accelerating and then a retarding tendency, so that the bed during its return movement will have a pendulous motion and all racking or shaking loose of the press will be prevented.

Additional objects and advantages of the invention will be evident from the following description.

In the drawings forming a portion of this specification, and in which like numerals of reference indicate similar parts in the several views, Figure 1 is a side elevation showing the bed of a press with mechanism for moving and counterbalancing it, all constructed and arranged in accordance with the present invention, the position of the cylinder of the press being indicated. Fig. 2 is a section on line 2 2 of Fig. 1. Fig. 3 is a plan view showing the feeding-chain and the mechanism for operating it, a portion of the bed being shown as partly broken away to illustrate the engagement of the feeding-chain with the bed. Fig. 4 is an elevation showing the face of the double crown-gear and the gear engaged therewith. Fig. 5 is a detail view showing the side of the bed with the frame thereof with which the counterbalancing-lever is engaged, said lever being indicated in dotted lines. Fig. 6 is a view similar to Fig. 5 and showing the position of the lever with regard to the bed when the latter is in its forward position, the feeding-chain being indicated in dotted lines. Fig. 7 shows the bed in its intermediate position on the return movement and the relative positions of the lever and feed-chain, which latter are represented in dotted lines. Fig. 8 is a view similar to Fig. 1 and showing a different mechanism for establishing the pendulous motion. Fig. 9 is a vertical section taken transversely through the bed and showing the gearing in elevation, the slotted hanger being partly broken away.

Referring now to the drawings, 10 represents the cylinder of a printing-press, adjacent to which is slidably mounted a bed 11, adapted to receive the paper upon which the impression is to be made, the bed being movable in a direction at right angles to the axis of the cylinder and beneath it. It has been found that the best impressions have been secured with a slow movement of the bed, while it is of course advisable that the bed be returned with a quick movement, and to secure these results there is provided mechanism, as follows:

Depending from the bed 11 is a hanger 12, having a vertical slot 13, and in this slot is slidably engaged a roller 14, carried rotatably by one of the links of a chain 15, which is mounted upon sprockets 16 and 17, these sprockets having the outermost points of their peripheries spaced apart a distance equal to the travel of the bed, while their diameters are such that the spool of pulley 14 in its movement with the chain will not pass to the periphery of the forward sprocket until the impression is completed, while the pulley will pass from the rear or drive sprocket 17 before the impression begins. The chain is moved in a direction to cause the upper portion thereof to travel toward the sprocket 16, the engagement of the roller 14 with the slot 13 causing the bed to move with the chain and with the same speed until the roller reaches the wheel 16, when in passing around the wheel the advance of the roller is gradually diminished in speed until it comes to a full stop, after which an accelerated return move-

ment begins and continues until the roller leaves sprocket 16, when the speed of the roller, and therewith the bed, is maintained until the roller reaches wheel 17, when the speed diminishes until it stops, and then starts and increases until it leaves the wheel 17. During the passage of the roller around the sprocket-wheels 16 and 17 it has a percentage of lost motion in the slot 13, the bed being thus given first an accelerated motion, then a constant forward motion, then a gradually-diminishing motion to a stop, after which it is returned, first, with accelerated motion, as hereinbefore stated, and, finally, diminishing motion to a stop, this movement of the bed being continued so long as the chain is operated. As above stated, however, it is desirable that the return movement of the bed be much quicker than the forward movement, while its motion will be first accelerated and then diminishing, and to secure this the drive-sprocket 17 during the return movement of the roller 14 must be rotated at a correspondingly-varying speed. To secure the two motions of the drive-sprocket, and therewith the drive-chain or feeding-chain, the sprocket 17 is provided with a crown-gear 18, with which is engaged a gear 19, mounted upon a shaft 20 in standards 21, the relative proportions of the engaged gears being such that for each rotation of the gear 19 the roller 14 will make one complete circuit of its orbit, and hence during one-half of a rotation of gear 19 the roller 14, and therewith the bed, will be moved forwardly, while during the remaining half of the rotation of the gear 19 the roller 14 and the bed will be returned. In order to rotate the gear 19 slowly with this first half of its rotation and give it the pendulous motion during the latter half of its rotation, one face of the gear 19 is provided with two crown-gears 22 and 21′, which are mutilated gears, gear 22 having a length of one hundred and eighty degrees. The gear 21′ has a greater radius than the gear 22, but its angular extent is less, the ends of gear 21′ springing from the ends of gear 22 and in the same plane therewith. Gear 22 is concentric with gear 19. The gears 21′ and 22 are adapted for intermittent engagement by a cylindrical gear 23, which is fixed upon a drive-shaft 24, disposed with its axis parallel with a radius of the gear 19 and in such close proximity to the gears 21′ and 22 that it will engage them. As the gear 23 is rotated it will operatively engage, first, gear 21 until it reaches its end and will then pass to the gear 22. During the engagement of the gear 23 with gear 22 the gear 19 will be given a slow rotation, and when the gear 23 engages gear 21′ gear 19 will be given a gradually-increasing speed and then a gradually-decreasing speed. During the former engagement the bed 11 travels forwardly to make the impression, and during the latter movement it returns to its original position. The bed is thus given the proper slow forward and pendulous return movement, while the connections between the feeding-chain and the table or bed insure a gradual slowing up of the bed at each end of its movement.

In order further to cushion the bed at the limits of its movement and insure a proper and steady movement of the bed, what may be termed a "counterbalance" is provided. A frame 30 is secured to one side of the bed or formed integral therewith, as preferred, the lower side of this frame being arc-shaped, of which the bed forms the chord, and in the outer face of the frame and conforming to the curvature of the lower edge thereof is formed a guide-groove 31, adjacent to the curved edge of the frame. Parallel with the bed 11 is formed in the outer face of the frame 30 a second groove 32, which communicates with the groove 31 below the ends thereof. At the ends of the groove or slot 31 are pivoted two gates 33 and 34, which are disposed in recesses in the face of the frame 30 and flush therewith, the gate 33 being yieldably held by a spring to normally close the forward end of the slot or groove 31 by bridging it just below the point of communication of the two grooves 31 and 32. The gate 34 lies normally and yieldably across the end of the slot or groove 32, as shown in Fig. 1 of the drawings, which illustrates the bed in its retracted position.

Pivoted to a standard 35 is a lever 36, which extends rearwardly beyond the bed 11 and adjacent to the frame 30, and this lever has a laterally-projecting lug 37, engaged with the grooved frame, said lug being adapted to travel from one groove to the other in the following manner: When the bed is retracted, as shown in Fig. 1 of the drawings, the lug 37 lies at the upper end of the groove 31 at the front of the bed. When the bed moves forwardly, the lever drops and the lug moves downwardly of the groove 31 by reason of the weight 38 at the free end of the lever until it strikes the gate 33, when it is deflected into the groove 32 and continues in this groove 32 during the making of the impression, and when the bed is near the end of its forward movement the lug 37 leaves the groove 32 and passing over the gate 34 strikes the curved wall of the upper rear end of the groove 31 and is forced upwardly against the tendency of the weight 38, which acts to cushion the movement of the bed. The bed comes to a stop before the lug 37 has reached the upper end of groove 31. When the lug 37 passes from groove 32, it depresses the gate 34, which returns to its former position when the lug leaves it in passing to the upper end of groove 31, and when the bed 11 returns the gate 34 is in position to close the end of groove 32 and direct the lug down the groove 31. The weight 38 causes the lever 36 to move downwardly, pressing the lug against the bottom of groove 31 and tending to force the bed along, the movement of the lever gradually diminishing in speed until the lug 37 has reached

the lower point of the groove 31, when the upward movement of the lug, and therewith the lever, begins. This upward movement of the lever gradually increases in speed, and consequently its resistance to the movement of the bed constantly increases, so that there is a constantly-increasing tendency to retard the movement of the bed, which corresponds to the gradual retardation in speed of the bed, it being understood that the time of greatest speed in the return movement of the bed is when the lever is at its lowest point.

In Figs. 8 and 9 of the drawings there is shown a second form of the invention, wherein the sprocket 17 is given its proper movement, first with a slow constant speed and then with an accelerated and subsequent retarding movement. In this embodiment of the invention the shaft 50 of the sprocket 17 is provided with a pinion 51, through the medium of which it is rotated instead of through the medium of a crown-gear on its face. The shaft 50 is rotated from the shaft 52 of the cylinder 53 of the press. A pillar 54 is erected at the side of the press and has bearings for the shaft 50 for a stub-shaft 55 directly thereabove and for the shaft 52 of the cylinder 10, these three shafts being one directly above another, as shown.

Upon the stub-shaft 55 is mounted a gear 56, which is engaged with the pinion 51, and fixed to this gear 56 to rotate therewith are two mutilated gears 57 and 58, of which the gear 57 is concentric with gear 56, while gear 58 is eccentric thereto and has a much greater radius than gear 57. The peripheral length of the gear 57 is such that with one rotation it will move the gear or pinion 51 on shaft 50 sufficient to carry the spool 14 from the point of initial engagement of its carrying-link with the sprocket 17 to its point of leaving the sprocket 16, this corresponding to the motion of the spool from the terminating portion of the return movement of the bed to the end of the first portion of the next return movement. It must be remembered in this connection that the movement of the bed at the latter part of its return movement is constantly diminished in speed until the spool 14 reaches the line of the common diameter of the two sprockets, while the initial movement during the return motion of the bed is accelerated from the time the spool leaves this common diameter on sprocket 16 until it has traveled ninety degrees around said sprocket. The function of the mutilated gear 58 is to continue the accelerated motion constantly until the bed has made half of its return movement and then to gradually decrease the motion until the carrying-link of the spool 14 engages sprocket 17, when the speed is further constantly decreased to zero. To accomplish this, the mutilated gear 58 is provided.

The gear 57 is rotated through the medium of a gear 59, fixed upon the shaft of the cylinder 10 and concentric therewith, and under the influence of this gear 59 gear 57, and therewith gear 56, is rotated at a uniform speed. When the gear 57 has passed from engagement with its gear 59, gear 58 is brought into initial engagement with a gear 60, which is carried by the cylinder-shaft 50, but eccentric thereto, the eccentricity of this gear 60 being such as to maintain engagement thereof with the mutilated gear 58. The point of greatest eccentricity of gear 60 of course moves with a greater speed through a circle concentric with the shaft 50 than does the point of least eccentricity, while the intermediate points of gear 60 move with corresponding speeds between the maximum and minimum. Thus from the point of initial engagement of gear 60 with gear 58 until it has reached the intermediate point of its engagement gear 60 exerts or transmits a constantly-increasing speed to gear 58, and from this intermediate point to the end of its engagement the gear 60 moves gear 58 with a constantly-decreasing speed. As gear 56 moves with gear 58, gear 56 is given this same variable speed, and the same variable speed is given to sprocket 17 and the chain carried thereby. The time of engagement of gear 60 with gear 58 is the time at which on the return movement of the bed the spool 14 is passing from the sprocket 16 to the sprocket 17. This variable speed is, however, increased in the point of difference between its maximum and its minimum speeds by reason of the eccentricity of the mutilated gear 58, as it will be understood that even with a uniform speed a gear engaged with gear 58 will rotate the shaft thereof at a greater speed when said uniformly-moving gear is at the point of least eccentricity, and this increase in speed is multiplied in the present instance, because of the engaging teeth of the gear 60 having different degrees of eccentricity and having consequent difference in speeds.

The remaining portion of the mechanism has the same operation as in the previous structure described, and it will be seen that with both structures the bed moves with a slightly-accelerated motion up to the point of initial impression, then has a constant motion during the impression, and terminates its impression movement with a decreasing motion, while its return movement is a gradually-increasing speed until maximum is reached and then a gradually-decreasing speed until zero is reached, the values of the gears being relatively such as to give a constant increase and a constant decrease, so that the highly-important pendulous motion is secured.

What is claimed is—

1. A printing-press comprising a reciprocatory bed having means for giving thereto initial accelerated motion and terminal diminishing motion in both directions of movement, the forward intermediate movement being at a constant speed and the return movement being first with an increasing speed and then with a diminishing speed, and vari-

able means for opposing the terminal movements of the bed.

2. A printing-press comprising a reciprocatory bed having means for giving thereto initial accelerated motion and terminal diminishing motion in both directions and variable means for opposing the terminal movements of the bed and for assisting the initial return movement of the bed.

3. A printing-press having a reciprocatory bed having an arcuate groove whose chord is in the direction of movement of the bed, a second, straight groove communicating with the arcuate groove short of the ends of the latter, and a pivoted and weighted lever having a stud engaged for movement through said grooves as the bed is reciprocated.

4. A printing-press comprising a reciprocatory bed provided with an arcuate groove whose chord is in the direction of movement of the bed, a second, straight groove communicating with the arcuate groove short of the ends of the latter, a pivoted lever having an adjustable weight at its free end and a stud upon the lever disposed for movement through the grooves as the bed is reciprocated.

5. A printing-press comprising a reciprocatory bed provided with an arcuate groove whose chord is disposed longitudinally of the bed and a second groove which is straight and communicates with the first groove short of the ends of the latter, pivoted gates of which one is disposed to lie normally across the arcuate groove to form a continuation of a wall of the straight groove and the other is disposed to lie normally across the second groove to form a continuation of a wall of the first groove and close to the second groove, and a pivoted lever having a stud disposed to traverse the grooves in the direction of opening of the gates.

6. A printing-press comprising a reciprocatory bed adapted for initial accelerated motion and terminal diminishing motion in both directions of movement, said bed having an arcuate groove and a second groove communicating therewith below the ends of the former, pivoted gates of which one is disposed to lie normally across the first groove to form a continuation of a wall of the second groove and the other is disposed to lie normally across the second groove to form a continuation of a wall of the first groove, and a lever having a stud disposed to traverse the grooves in the direction of opening of the gates as the bed is reciprocated, whereby the terminal movements of the bed will be opposed and the initial return movement will be assisted.

7. A printing-press comprising a reciprocatory bed having a slotted hanger, a chain having a stud engaging the slot, a sprocket engaged with the chain for operating it to reciprocate the bed, a drive-shaft having a drive-gear, and mutilated gears of different radii operatively connected with the sprocket and disposed for alternate engagement with the drive-gear to move the chain at different speeds.

8. A printing-press comprising a reciprocatory bed, a drive-gear, mutilated gears operatively connected with the bed and having different radii, said gears being disposed for alternate engagement to operate the bed at different speeds, and a variable means for assisting the initial movement and opposing the final movement of the bed.

9. A printing-press comprising a reciprocatory bed, eccentric mutilated gears operatively connected with the bed to operate it alternately, and a drive-gear for each of the mutilated gears adapted for successive engagement with their respective mutilated gears.

10. A printing-press comprising a reciprocatory bed, eccentric mutilated gears operatively connected with the bed to move it in opposite directions, and a drive-gear for each of the mutilated gears disposed for engagement with their mutilated gears alternately.

11. A printing-press comprising a reciprocatory bed, eccentric mutilated gears operatively connected with the bed to move it in opposite directions, a drive-shaft, and drive-gears on the shaft disposed for engagement with their respective mutilated gears alternately.

12. A printing-press comprising a reciprocatory bed, a shaft operatively connected with the bed, mutilated gears on the shaft, one of the mutilated gears being eccentric to the shaft, a drive-shaft having drive-gears thereon corresponding to the mutilated gears, the gear for the eccentric mutilated gear being eccentric to the drive-shaft, and means for actuating the drive-shaft.

13. A printing-press comprising a reciprocatory bed, eccentric multilated gears operatively connected with the bed for moving it, and eccentric drive-gears disposed to engage with their respective mutilated gears successively to move the bed at different speeds.

In testimony that we claim the foregoing as our own we have hereto affixed our signatures in the presence of two witnesses.

ADOLPH ERNST KNOCH.
HERRMANN VOGEL.

Witnesses:
GEORGE MACKEY CORNWALL,
W. C. PETCHNER.