May 20, 1952 B. F. UPHAM 2,597,687

BED OPERATING MEANS

Filed April 9, 1946 4 Sheets-Sheet 1

Fig. 1.

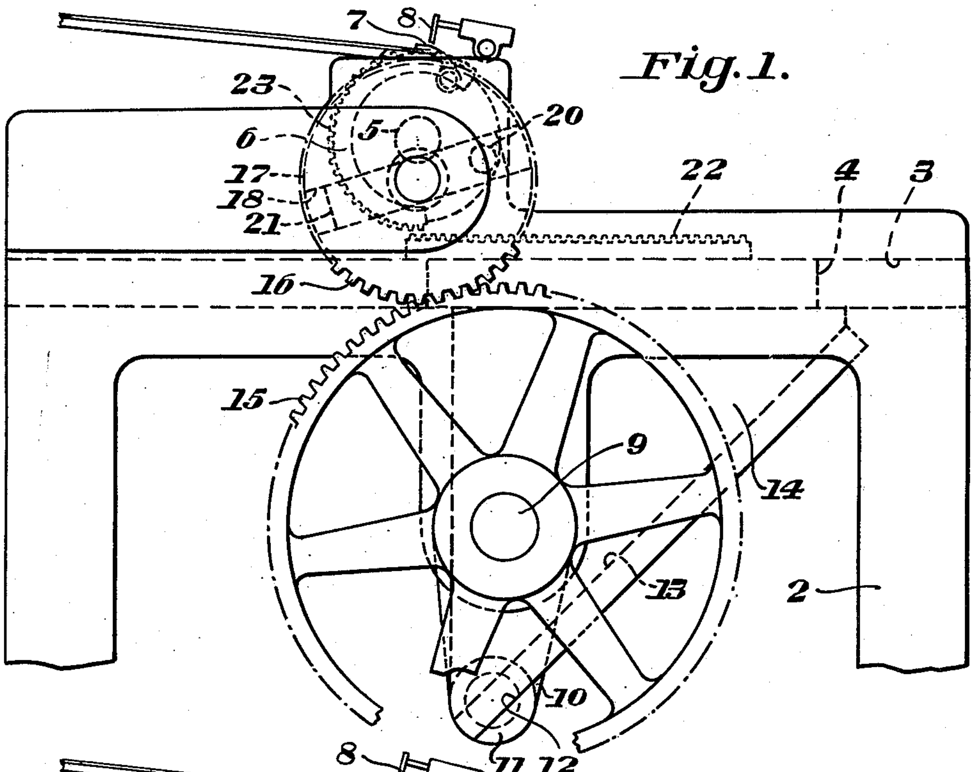
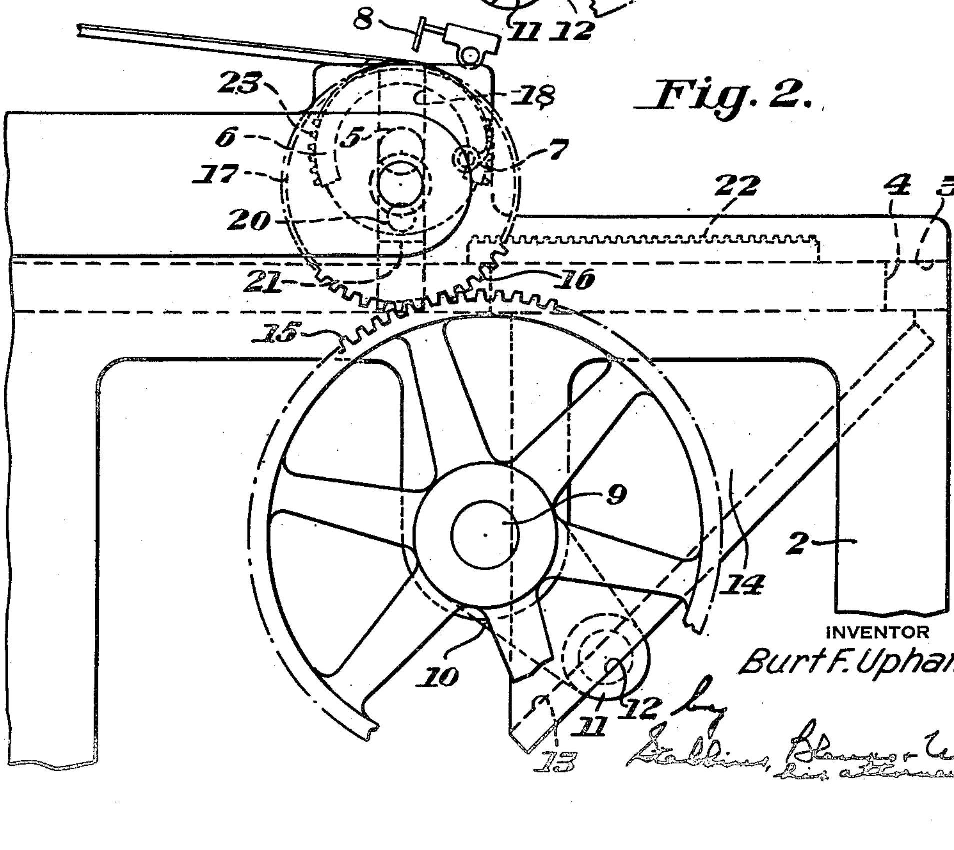


Fig. 2.



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BED OPERATING MEANS

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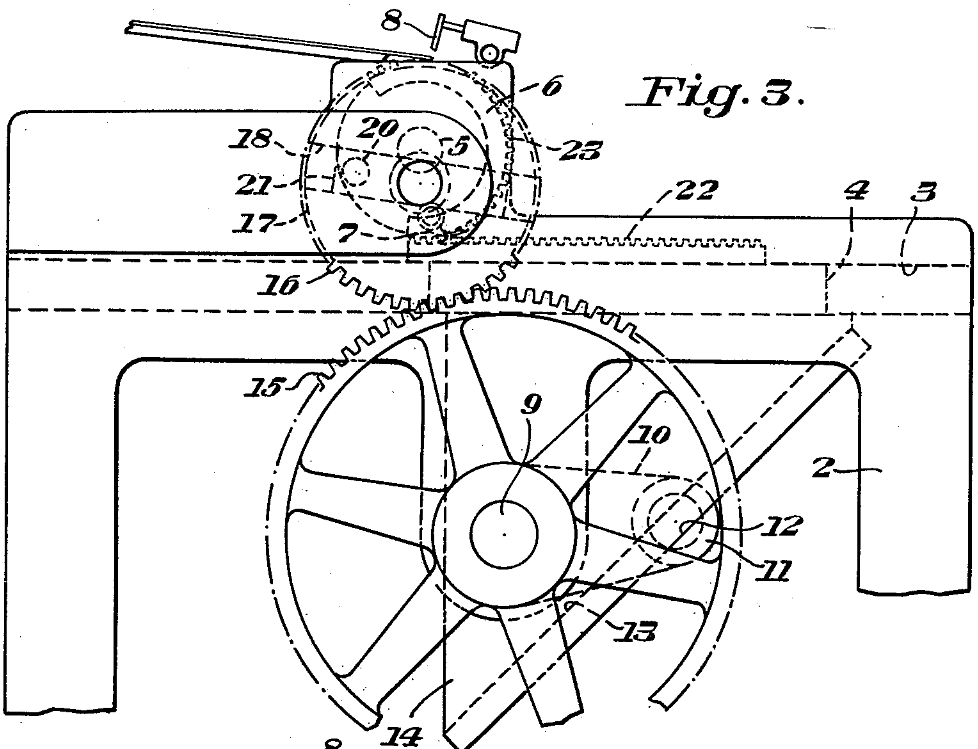

Fig. 3.

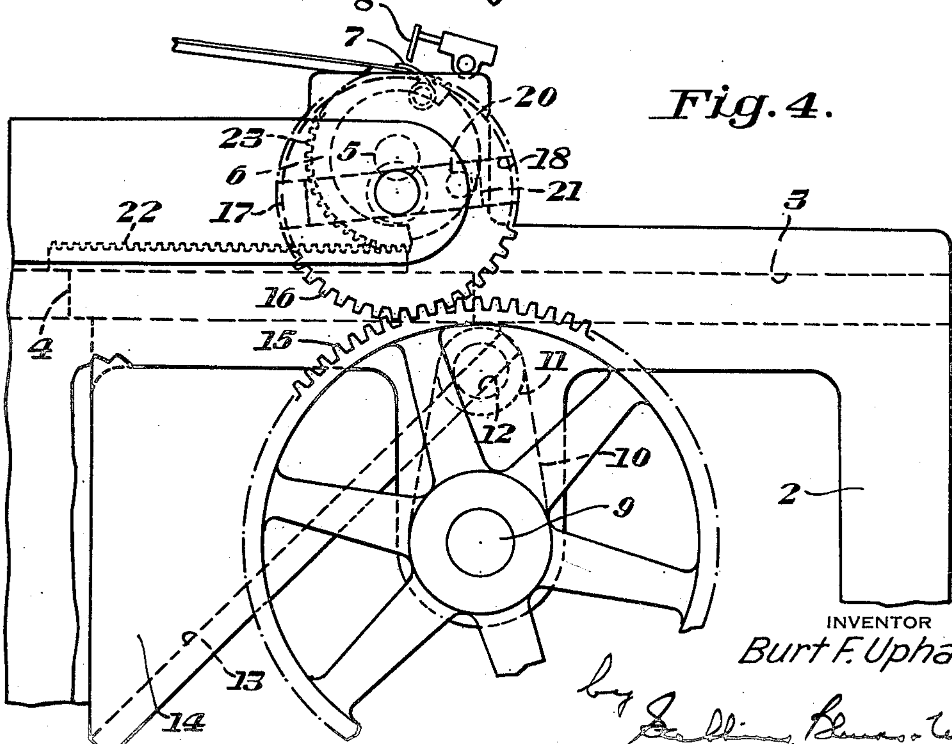

Fig. 4.

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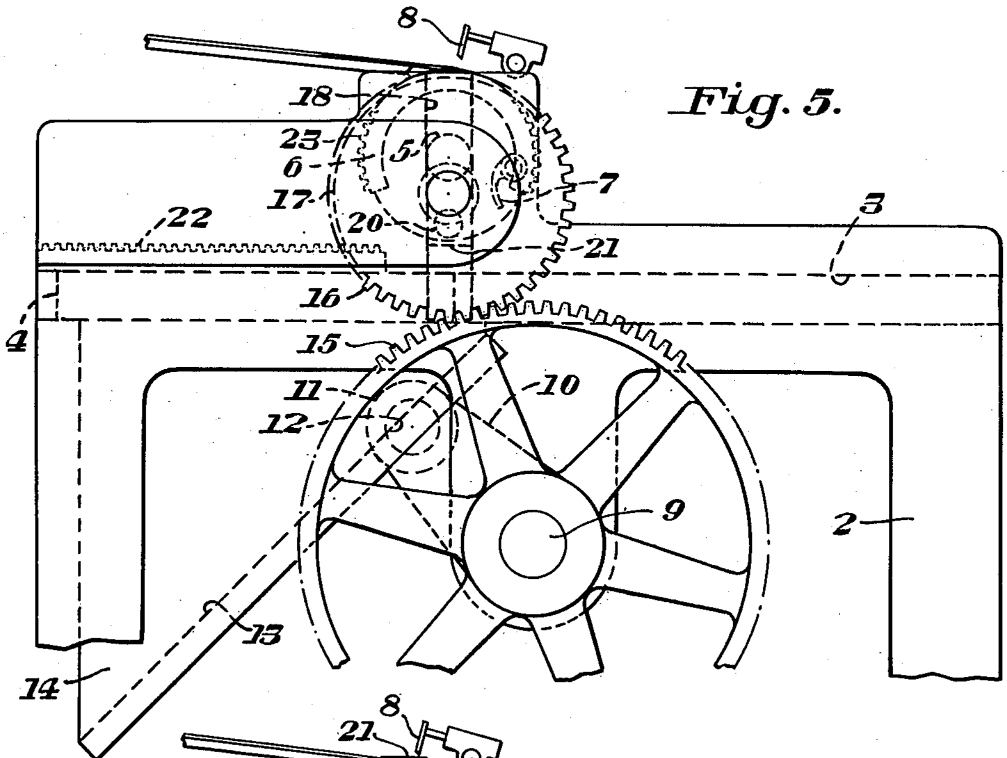

Fig. 5.

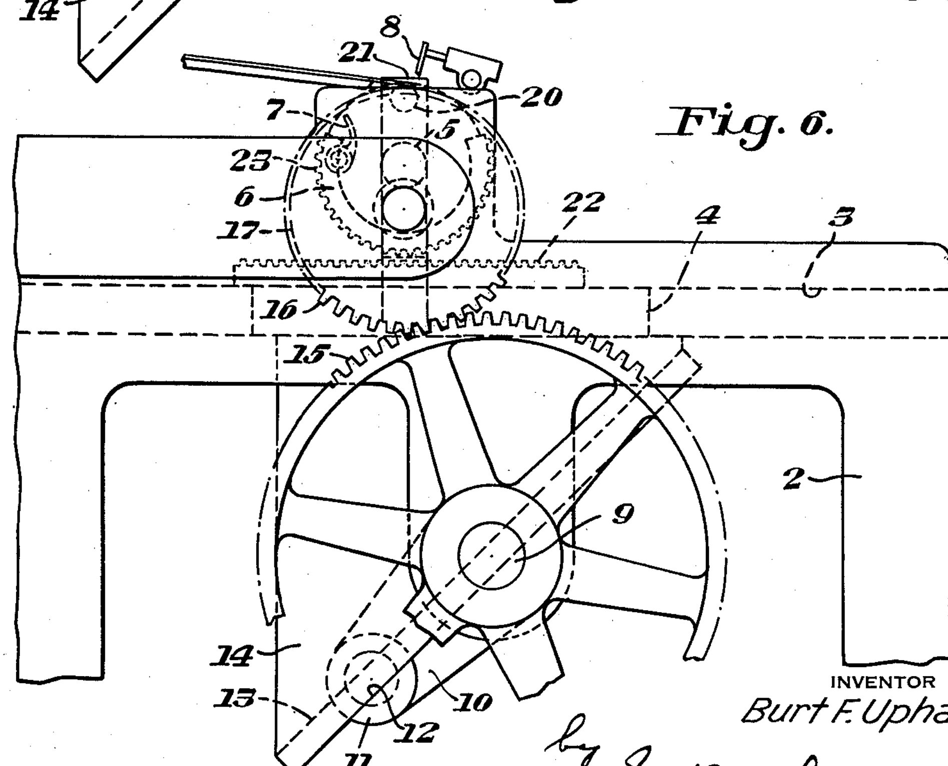

Fig. 6.

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BED OPERATING MEANS

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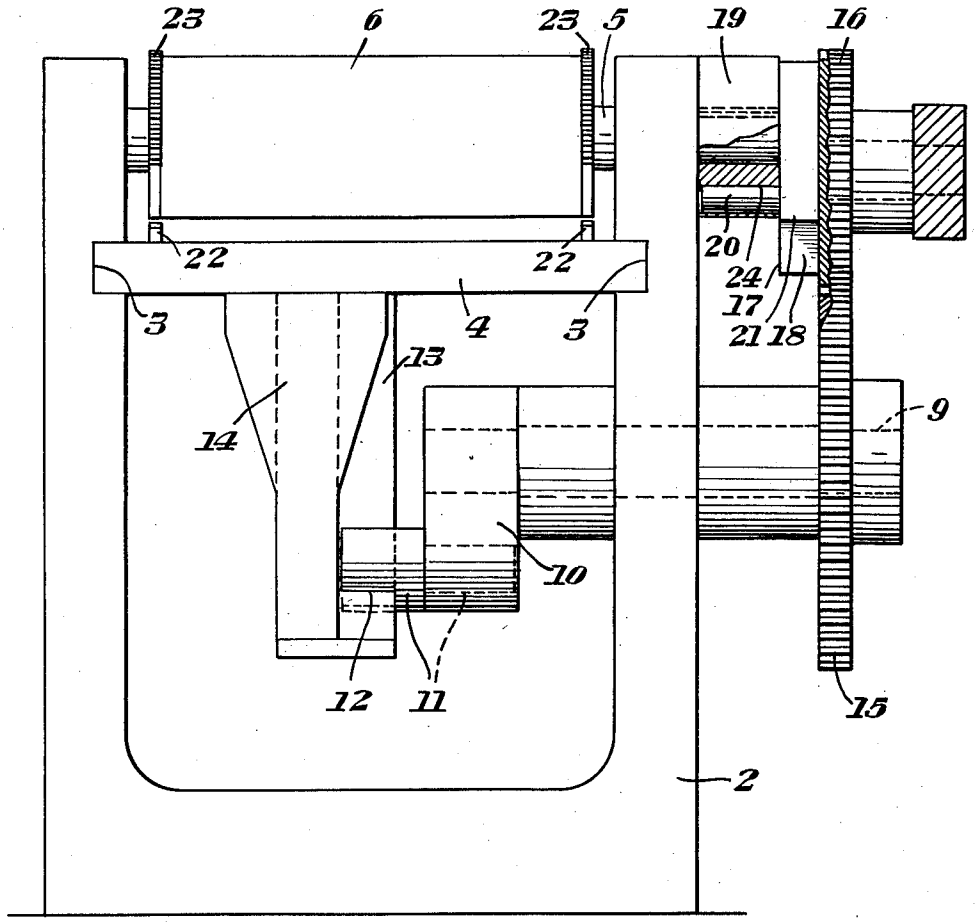
Fig. 7.



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Patented May 20, 1952 2,597,687

UNITED STATES PATENT OFFICE

2,597,687

BED OPERATING MEANS

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Application April 9, 1946, Serial No. 660,721

1 Claim. (Cl. 74—27)

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This invention relates to printing presses or the like and particularly to mechanism for operating the bed and cylinder of such apparatus. For example, the invention is applicable to flat bed and cylinder presses for printing, cutting and creasing and like operations. The invention provides an extremely simple, inexpensive, light weight structure which accomplishes its function in a highly efficient manner.

I provide, in a printing press or the like, an oscillatable bed and a cylinder adapted to cooperate with the bed and mounted for rotation. In a printing press the cylinder is an impression cylinder cooperating with the type form on the bed to cause the same to print upon sheets fed to and delivered from the press in conventional manner.

Preferably the cylinder is rotated at variable speed and during a portion of the cycle of the apparatus has approximately the same linear speed as the bed. The printing or like operation is preferably performed during that portion of the cycle. While the printing or like operation is being performed the cylinder is preferably driven directly by the bed, the normal cylinder operating mechanism being rendered ineffective during that period.

The bed desirably oscillates with simple harmonic motion, being preferably crank-driven. The bed may be provided with a hanger along which the crank pin slides during operation. The hanger preferably lies in a longitudinal plane perpendicular to the plane of the bed and may extend at a right angle or an acute angle to the plane of the bed. In the structure shown the hanger extends at an acute angle of about 45° to the plane of the bed as this effects saving of space. The crank pin is turnable in the crank and interengages with the hanger, being slidable therealong upon turning of the crank. Desirably the crank pin may have a slot through which the hanger passes.

The cylinder is as above mentioned rotated at variable speed. Desirably the cylinder is rotated by a member which rotates at constant speed, connections being provided between said member and the cylinder so that when said member rotates at constant speed the cylinder will rotate at variable speed. The cylinder operating member preferably rotates about an axis parallel to but spaced from the axis about which the cylinder rotates. The connections between said member and the cylinder may comprise a projection on one or the other thereof and means forming a slot carried by the other, the projection being

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disposed in the slot. Thus, when the cylinder driving member rotates the projection moves along the slot and the cylinder alternately accelerates and decelerates

I preferably provide a single driving shaft to which the crank for operating the bed may be fastened, the driving shaft also preferably carrying means such as a gear for driving the member which in turn drives the cylinder. Said member may be provided with gear teeth meshing with the teeth of the driving gear fastened to the driving shaft. As above mentioned the cylinder is preferably driven directly by the bed during the printing or like operation. This may be accomplished by a rack on the bed meshing with a pinion on the cylinder or by conventional bed and cylinder bearers. When said rack and pinion are in mesh or said bed and cylinder bearers are in cooperative relationship the driving gear on the driving shaft is ineffective for driving the cylinder. Certain of the teeth of the driving gear are preferably designed to provide for clearance relatively to the cooperating teeth on the cylinder driving member so that only the bed rack or bearer drives the cylinder during the printing or like operation.

Means are provided for taking sheets onto the cylinder and for delivering sheets from the cylinder. For example, the usual cylinder grippers and drop guides may be provided and they may be operated in the usual way. The operating mechanism is designed so that as a sheet is taken from the feeding means by the cylinder grippers the cylinder is rotating at a speed materially below its maximum speed and desirably at a speed not much faster than its minimum speed. Likewise the cylinder is preferably rotating slowly when a sheet which has been printed or otherwise operated upon is deposited on the delivery table. The means for feeding and removing sheets from the cylinder may be conventional and hence are not shown. The apparatus is highly efficient as the sheets being operated upon are fed to it and deposited on the delivery table when the cylinder is turning relatively slowly, the cylinder operating at materially higher speed between the feeding and delivery points. The parts are comparatively simple in construction and light in weight so that the apparatus is inexpensive to make and to operate and is relatively foolproof.

The pitch diameter of the driving gear on the driving shaft is preferably double that of the gear which operates the cylinder so that the latter rotates twice for each rotation of the for-

mer. But since the driving shaft also carries the crank for operating the bed it will be seen that the cylinder rotates twice for each cycle of the bed, once while the bed is moving in each direction. The cylinder always rotates in the same direction and when the bed is on the return stroke the cylinder is raised away from the bed by conventional mechanism which is not shown. On the operating stroke the cylinder is down in cooperation with the bed. A point is reached near the beginning of the printing or like operation when the driving mechanism drives the cylinder and bed at substantially the same linear speed. At that point the bed rack or bearer takes over control of the cylinder. Control of the cylinder by the bed is maintained until completion of the printing or like operation. The driving mechanism tends to drive the bed and cylinder at the same speed not only at the point above mentioned near the beginning of the printing or like operation but also at a second point approximately midway of the printing or like operation and at a third point near the end of the printing or like operation. At the third point the bed rack or bearer relinquishes control of the cylinder and that control is resumed by the driving mechanism. Intermediate the first and second points and intermediate the second and third points the relative speeds tended to be imparted to the bed and cylinder by the driving mechanism, while not identical, are so nearly the same that the slight difference may be allowed for by designing certain of the teeth of the driving gear to provide for clearance relatively to the cooperating teeth on the cylinder-driving member. This provision renders the driving gear ineffective for driving the cylinder during the periods while printing is taking place during which the relative speeds tended to be imparted to the bed and cylinder by the driving mechanism are slightly different. During those periods the bed and cylinder are driven at the same speed since the bed drives the cylinder.

Other details, objects and advantages of the invention will become apparent as the following description of a present preferred embodiment thereof proceeds.

In the accompanying drawings I have shown a present preferred embodiment of the invention, in which

Figure 1 is a side elevational view, more or less diagrammatic, of a printing press showing the bed near the end of the return stroke moving toward the right, the cylinder being raised out of cooperative relationship with respect to the bed;

Figure 2 is a view similar to Figure 1 showing the bed at the extreme right hand end of its stroke ready to commence the printing stroke toward the left;

Figure 3 is a similar view showing the bed at about the beginning of the printing operation when the driving mechanism drives the bed and cylinder at substantially the same speed and the bed is taking over control of the cylinder;

Figure 4 is a similar view showing the bed at about the end of the printing operation when the driving mechanism drives the bed and cylinder at substantially the same speed and the bed is relinquishing control of the cylinder;

Figure 5 is a similar view showing the bed at the extreme left hand end of its stroke ready to commence the return stroke toward the right;

Figure 6 is a similar view showing the bed about midway through the return stroke; and

Figure 7 is an end elevational view, partly in vertical transverse cross-section, of the printing press shown in Figures 1–6, the cylinder being shown in the upper position which it occupies during the return stroke of the bed.

Referring now more particularly to the drawings, there is provided a frame 2 having guideways 3 in which is mounted for rectilinear oscillation a bed 4 adapted to receive a type form. Journaled in the frame for rotation upon trunnions 5 is an impression cylinder 6. The impression cylinder is adapted to cooperate with the type form on the bed 4 to print upon sheets fed between the cylinder and form in usual manner. The cylinder is provided with grippers 7 which may be of conventional construction, and drop guides 8 which may likewise be conventional are employed in usual manner. Means are provided for raising the cylinder out of cooperative relationship with respect to the bed during the return stroke of the bed when the cylinder is turning in the direction opposite the direction of movement of the bed. The means for raising and lowering the cylinder may be conventional and are not shown.

Journaled for rotation in the frame is a driving shaft 9 which may be rotated by any suitable source of power (not shown). For purposes of explanation the shaft 9 will be considered as being driven at constant speed in the counterclockwise direction viewing Figures 1–6. The driving shaft 9 carries a crank 10 which in turn carries at its extremity a crank pin 11 which is mounted for rotation in the crank. The crank pin 11 has a slot 12 therethrough which receives a flange 13 of a hanger 14 fastened to the bottom of the bed 4. The flange 13 is disposed generally in a longitudinal plane perpendicular to the plane of the bed and while it may assume any angle with respect to the bed it is shown as disposed at an angle of approximately 45° to the bed. This results in a substantial saving of space over positioning of the hanger at right angles to the bed.

As the driving shaft 9 rotates the crank 10 also rotates and the crank pin 11 turns in the crank, the flange 13 sliding through the slot 12 in the crank pin. Thus the crank pin moves along the flange 13 between extreme upper and lower positions which are spaced apart by a distance equal to twice the distance between the axis of the shaft 9 and the axis of the crank pin. As the driving shaft 9 rotates the bed oscillates rectilinearly with simple harmonic motion.

The driving shaft 9 has keyed thereto a gear 15. Journaled for rotation in the frame is a cylinder driving gear 16 which meshes with the gear 15. The axis of the gear 16 is parallel to but spaced from the axis of the cylinder 6. Connected with the gear 16 and disposed between that gear and the cylinder 6 is a member 17 concentric with the gear 16 and having a slot 18 extending diametrically thereacross. Keyed to one of the trunnions upon which the impression cylinder 6 rotates and coaxial therewith is a member 19 having a cylindrical bore 24 which extends parallel to but is spaced from the axis of the cylinder. A pin 20 has a turning fit in the bore 24. The pin 20 is integral with a block 21 which fits in the groove 18 and is slidable therealong during operation of the mechanism. As the cylinder driving gear 16 rotates the member 17 rotates with it. The gear 16 and the member 17 rotate at constant speed. The pin 20 carried by the block 21 which slides in the groove 18 causes the cylinder to be rotated at variable speed by the constant speed gear 16. This is because during

rotation of the cylinder the pin is disposed in the bore 24 in the member 19 and the axis of the pin is constantly moving toward and away from the axis of the gear 16 of the member 17. When the pin 20 is relatively close to the axis of the gear 16 the cylinder turns relatively slowly while when the pin 20 is relatively remote from the axis of the gear 16 the cylinder turns relatively rapidly.

The parts are designed so that the bed and cylinder are driven by the driving mechanism at substantially the same speed at a point at approximately the beginning of the printing operation and at another point at approximately the end of the printing operation. At the first mentioned point control of the cylinder is taken over by the bed. To this end the bed is provided with opposed racks 22 adapted to cooperate with segments 23 on the cylinder so that during printing the cylinder is driven by the bed and movement of the bed and cylinder at the same speed is assured. During the printing operation while the cylinder is being driven by the bed the gear 15 relinquishes control of the cylinder through having certain of its teeth designed to provide for clearance relatively to the cooperating teeth of the gear 16. This may be accomplished by slightly reducing in pitch size a requisite number of teeth of the gear 15. While I have shown racks 22 on the bed and segments 23 on the cylinder these may be replaced by the usual bed and cylinder bearers if desired. At the second mentioned point, control of the cylinder is relinquished by the bed and resumed by the driving mechanism.

I shall now describe a cycle of operation of the mechanism.

In Figure 1 the bed is shown moving toward the right near the end of its return stroke, the cylinder being raised to inoperative position relatively to the bed. The cylinder is turning at rather low speed since the axis of the pin 20 is near the axis of the gear 16. The cylinder grippers are operated to take a sheet from the feeding mechanism, the sheet prior to being taken being guided by the drop guides in usual manner.

Figure 2 shows the bed at the extreme right hand end of its stroke ready to move to the left on the printing stroke. The cylinder is turning at its minimum speed since the axis of the pin 20 is closest to the axis of the gear 16.

In Figure 3 the bed is shown moving to the left on the printing stroke with the cylinder down in position to cooperate with the bed, and the cylinder segments are shown coming into mesh with the bed racks. At this point the speeds at which the bed and cylinder respectively are driven by the driving mechanism are the same. Control of the cylinder is taken over by the bed. This control is exercised through the racks 22 and segments 23. Control of the cylinder by the bed is permitted by providing a requisite number of teeth of the gear 15 of slightly reduced pitch size so that they will not drive the gear 16 while the bed is in control of the cylinder. During this time the gear 16 is driven by the cylinder through the bore 24, pin 20, block 21 and slot 18 in the member 17.

Figure 4 shows the mechanism at the end of

the printing operation and near the end of the printing stroke. The segments 23 are about to pass out of mesh with the racks 22 and return control of the cylinder to the driving mechanism. During printing which has occurred between the position of Figure 3 and the position of Figure 4 the cylinder has speeded up to maximum speed and then has slowed down. The printed sheet is deposited on the delivery table while the cylinder is moving relatively slowly.

Figure 5 shows the bed in its extreme left hand position ready to move to the right on the return stroke. The grippers are open, the sheet having passed to the delivery table. Both bed and cylinder are being driven by the driving mechanism.

Figure 6 shows the mechanism when the bed is approximately half way through the return stroke, the speed of the bed at this point being maximum. The cylinder is shown up in inoperative position.

From the position of Figure 6 the cylinder slows down to the position of Figure 1 when the cylinder grippers take another sheet and the cycle is repeated. Thus I obtain remarkable efficiency, taking sheets onto the cylinder and depositing sheets on the delivery table when the sheets are moving relatively slowly and increasing the speed of movement intermediate the points at which the sheets are taken by the cylinder and deposited on the delivery table. The mechanism is simple and light in weight. It is adapted for substantially higher speeds than other mechanisms for comparable work which have heretofore been proposed.

While I have shown and described a present preferred embodiment of the invention it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied within the scope of the following claim.

I claim:

In a printing press or the like, a bed, a hanger connected with the bed, a crank, a turnable crank pin carried by the crank, the crank pin having a slot through which the hanger passes, and means for turning the crank whereby to oscillate the bed.

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