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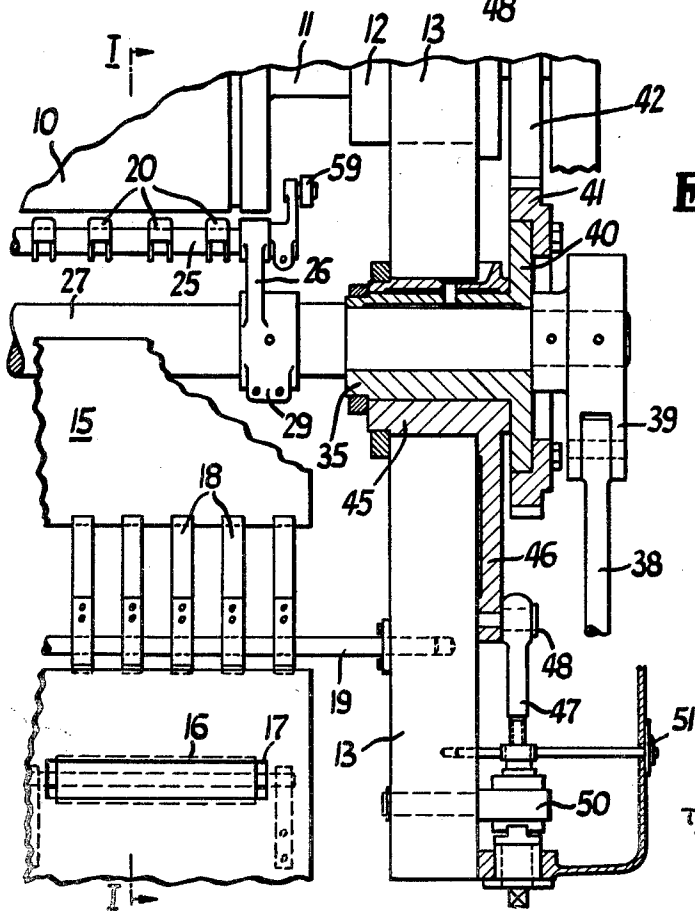
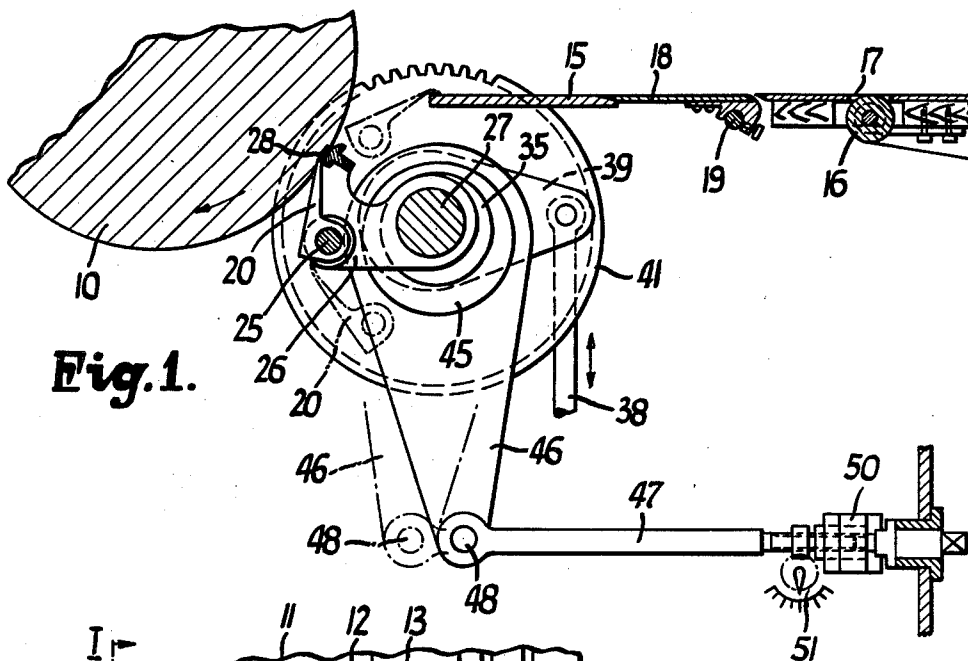
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SHEET-FEEDING DEVICE FOR PRINTING PRESSES

Filed Jan. 3, 1962

2 Sheets-Sheet 1



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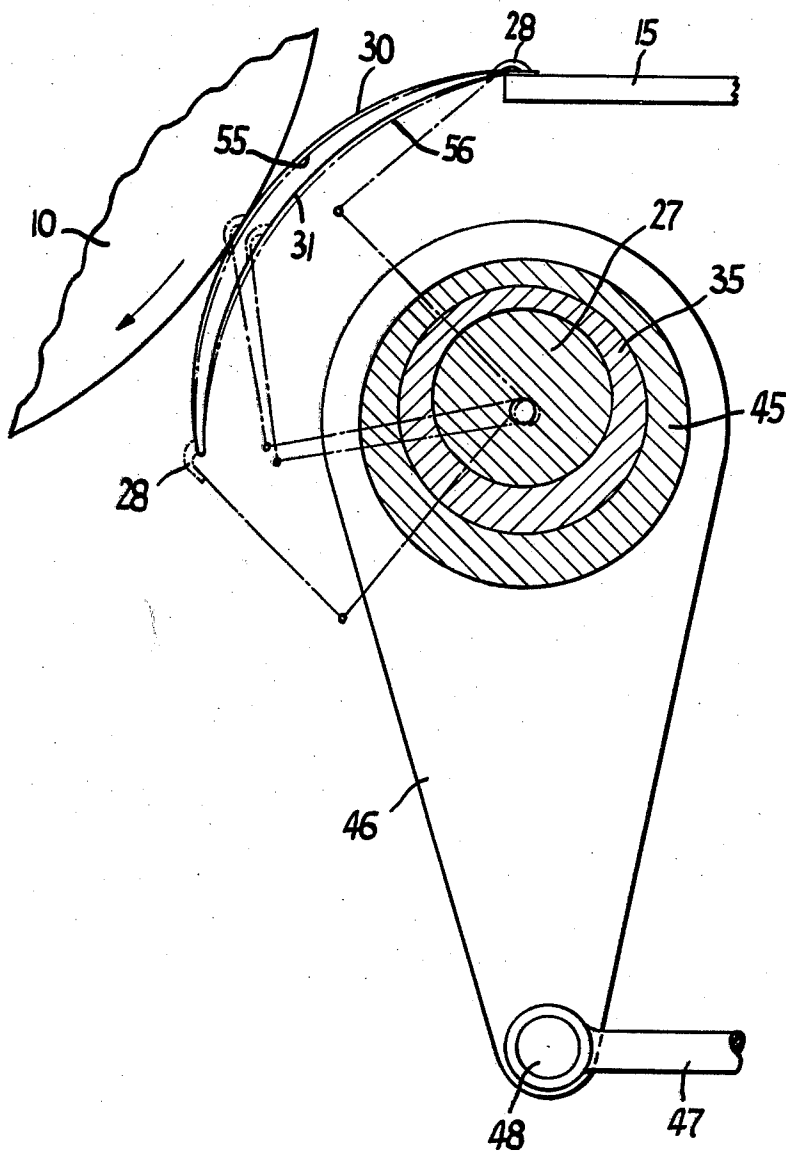
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2 Sheets-Sheet 2

Fig. 3.



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SHEET-FEEDING DEVICE FOR PRINTING PRESSES

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This invention relates to feeding devices for feeding single sheets of paper to be printed toward the impression cylinder of printing presses, and, more particularly to such devices wherein the pre-grippers for carrying each sheet of paper from the feed table to the impression cylinder are mounted below the sheets of paper and the feed table and must be adjusted with respect to the impression cylinder for different thicknesses of sheets being fed thereto.

As well understood in the printing press art, sheets of paper or other material to be printed by sheet-fed printing presses are supplied to a feed table and then fed singly toward the rotating impression cylinder so that the leading edge of the sheet is gripped by the sheet grippers on the impression cylinder and the sheet thus carried around the cylinder to receive the printing impression. Generally, there may be provided pre-gripping devices which swing back and forth between the feed table and the impression cylinder to grip the leading edge of the sheet at the feed table and carry it to the impression cylinder where it can be gripped by the sheet grippers on the cylinder, and a wide variety of such pre-gripper devices or arrangements is known.

Similarly well understood is the desirability of adjusting the positioning or spacing of the swinging pre-grippers with respect to the feed table and the impression cylinder for accommodating different thicknesses of paper or other sheet material being fed. For example, when the pre-grippers are arranged at the lower ends of the depending arms swinging back and forth between the feed table and the impression cylinder and above the feed table, such adjustment for accommodating different thicknesses of paper may be readily accomplished simply by displacing the pivot axis of the swinging arms closer to or further from both the feed table and the impression cylinder. That is, in such position of the feed grippers swinging above both the feed table and the impression cylinder, the same adjustment of the gripper with respect to the feed table is required for different thicknesses of paper as with respect to the impression cylinder.

In some types of printing presses, especially perfecting or offset presses, it may be desired for a variety of reasons to have the pre-grippers arranged below the feed table, although still effective for gripping the leading edge of a sheet on the feed table and carrying the leading edge into engagement with the sheet grippers on the rotating impression cylinder. If it is attempted, however, to provide in such an arrangement adjustability of the pre-grippers with respect to the impression cylinder for properly accommodating different thickness of sheets being fed, difficulty may be experienced because, in such a situation, the spacing or positioning of the pre-gripper with respect to the feed table should remain constant notwithstanding the need for adjustment with respect to the impression cylinder. That is, with pre-grippers swinging below the feed table and gripping the sheet on the feed table from below, the spacing relationship of the swinging pre-gripper and the feed table remains constant regardless of the thickness of the sheet to be gripped, whereas the spacing of the extreme end of the gripper with respect to the surface of the impression cylinder must be variable in accordance with the thickness of the sheet being fed in order for the pre-gripper to lay the sheet correctly against

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the impression cylinder to be engaged by the sheet grippers of the cylinder.

Thus, merely the desire or advantage of locating swinging pre-grippers below the feed table in certain kinds of printing presses, instead of above as conventionally, interjects the complication of a completely different path of travel and adjustment of the pre-grippers merely from the changed orientation of the swinging pre-grippers with respect to the feed table and the impression cylinder and whether the pre-gripper first contacts the top side or the bottom side of the sheet to be fed to the impression cylinder.

The foregoing is also further complicated if it is desired for the pre-gripper to follow different paths of travel when swinging toward the impression cylinder than are followed when swinging back to the feed table. The resulting complex movement desired of the gripping end of the swinging pre-gripper mounted below the feed table may no longer be readily provided by the type of simple adjustment mechanism conventionally utilized when the pre-grippers are mounted for swinging movement above the feed table.

According to this invention, however, arrangements are provided for pre-grippers below the feed table and impression cylinder in printing presses of the character described for swinging movement back and forth to carry sheets individually from the feed table to the impression cylinder grippers, which arrangements also include provision for adjusting the spacing or positioning of the pre-gripper with respect to the impression cylinder and without changing the positioning of the pre-gripper with respect to the feed table, while also effecting swinging movement of the pre-gripper so that it follows a different path in leading a sheet from the feed table to the impression cylinder than is followed on the return trip to the feed table. A simple and dependable arrangement in accordance herewith, which is easily and inexpensively manufactured and included in the design of an offset printing press, includes the provision of coaxing eccentric bearings or mountings for the pivotal axis of the swinging pre-grippers for adjustment thereof to provide independently the desired different swinging paths for each stroke as well as to adjust the spacing of the pre-gripper with respect to the impression cylinder without also varying the positioning of the pre-gripper with respect to the feed table at each extreme of the pre-gripper swinging strokes.

With the foregoing and other objects in view, this invention will be more completely described, and other objects and advantages will be apparent from the following description, the accompanying drawings, and the appended claims.

In the drawings:

FIG. 1 is a partial view of a printing press including an arrangement embodying and for practicing this invention, partly in section along the line I—I of FIG. 2 but with some of the printing press members omitted for clarity;

FIG. 2 is a partial top plan view of the arrangement of FIG. 1 at one side of the printing press; and

FIG. 3 is a diagrammatic view indicating some of the different positions and movements of some parts of the arrangement of FIG. 1.

Referring to the drawings, in which like reference characters refer to like parts throughout the several views thereof, the impression cylinder of an offset printing press is indicated at 10 as supported on a shaft 11 mounted for rotation in journals 12 in one side frame member 13 of the printing press. Adjacent impression cylinder 10 is indicated a conventional feed table arrangement 15 to which sheets of paper or other material to be printed are conveyed—as by a belt conveyor roller 16 operating in a cut-out 17 for sliding sheets individually over fingers

18 (which may be raised as a fence upon rotation of shaft 19) all in known manner.

For each printing cycle or impression, one sheet is fed from table 15 into engagement with conventional sheet grippers (not shown) along impression cylinder 10 so that the leading edge of the sheet will be engaged by the cylinder sheet grippers and carried around the impression cylinder to be printed all in known and conventional manner. To this end, a plurality of pre-grippers 20, each of known construction, is arranged for swinging movement back and forth between the left-hand edge of table 15 and impression cylinder 10, as indicated by the dot-dash line showings of various positions of pre-grippers 20 in FIG. 1 and, more diagrammatically, in FIG. 3. As will be understood, during each swinging cycle pre-grippers 20 pick up the leading or left-hand edge of a sheet from table 15 and draw it to the left in the drawings over to the surface of impression cylinder 10, where the leading edge of the sheet can be engaged by conventional sheet grippers on cylinder 10. For accomplishing such swinging motion, the pre-grippers 20 are mounted on swinging gripper bar 25 supported between arms 26 extending from a rotatable gripper shaft 27 (and affixed thereto as by collars 29), which shaft is mounted across the printing press between opposite side frame members 13, whereby a swinging motion is imparted to gripper bar 25 and pre-grippers 20 thereon upon rotation of gripper shaft 27.

With the pre-gripper arrangement illustrated, however, it is desired that pre-grippers 20 (or, particularly, the gripping extremities 28 thereof) follow a swinging path in moving from table 15 toward cylinder 10 different from the paths followed in the return trip to table 15 in order that the grippers 20 or tips 28 thereof will return from cylinder 10 to table 15 beneath the sheet of paper being drawn off table 15 by the sheet grippers on cylinder 10. This is indicated particularly in FIG. 3 where, for clarity, several different positions of the gripping ends 28 of pre-grippers 20 have been diagrammed as superimposed with dot-dash lines to indicate the center-lines of arms 26 (shown as connecting the axes of shafts 25 and 27) and of pre-grippers 20 in the several positions shown. Thus, the gripping tips 28 of pre-grippers 20 follow a swinging path indicated by the solid line 30 in moving from table 15 to cylinder 10, but follow the different path indicated by solid line 31 in the return trip to table 15, in order, as will be understood, to carry the leading edge of a sheet from table 15 directly against cylinder 10 for engagement with the sheet grippers thereon and then to return to table 15 without interfering with the smooth and continued drawing of the sheet off table 15 as cylinder 10 continues to rotate in the direction indicated.

To achieve these different swinging paths for the going and return strokes of swinging pre-grippers 20, gripper shaft 27, instead of being rotated or oscillated merely about its own axis, is mounted in side frame members 13 in eccentric bushings 35 in such manner that, as will be understood, rotation of eccentric bushing 35 cyclically during rotary movement of shaft 27 displaces the axis of gripper shaft 27 to achieve the desired complex motion and paths of movement of pre-grippers 20. More specifically, intermittent and oscillating rotary or angular movement is imparted to gripper shaft 27 in known manner as by a reciprocating linkage 38 connected to an eccentric arm 39 mounted at one end of gripper shaft 27 to oscillate shaft 27 angularly back and forth about its own axis. Since gripper shaft 27 is supported by eccentric bushings 35 which are also rotating, however, the cyclic displacements of the axis of gripper shaft 27 at various angular positions of rotating eccentric bushings 35, combine with the angular oscillations of shaft 27 about its own axis, provide the desired swinging movements of pre-grippers 20 on gripper bar 25 at the ends of swinging arms 26 on gripper shaft 27, so that the tips 28 of pre-grippers 20 follow the path as indicated by lines 30 and 31 in FIG. 3.

Although the angular motion of gripper shaft 27 about its own axis is of an oscillating or reciprocating nature as provided by linkage 38 and eccentric arm 39, eccentric bushing 35 may be provided to rotate continuously about its own axis and, particularly, as a simplification of the structure required for accomplishing the rather complex motions of pre-grippers 20 sequentially along the paths 30 and 31. In the illustrated embodiment, for example, the outer end of eccentric bushing 35 carries a flange 40 around which is mounted a gear 41 in meshing engagement with a drive gear 42 rotating with shaft 11 of impression cylinder 10. As will be understood, the respective sizes of gears 41 and 42 are correlated with the size and speed of rotation of impression cylinder 10 and the period and extent of oscillation imparted to gripper shaft 27 by linkage 38 in order readily to achieve the desired swinging motions and paths of travel of pre-grippers 20 on gripper bar 25.

In accordance with this invention, it is also desired to provide for a further motion or difference in motion for pre-grippers 20 for adjustment thereof with respect to impression cylinder 10 in order to accommodate or compensate for different thicknesses of the sheets or other material to be printed and fed from table 15 to the sheet grippers on cylinder 10. That is, it is desired for pre-grippers 20 to carry the leading edge of a sheet from table 15 directly against the surface of impression cylinder 10 for engagement with the sheet grippers thereon. To achieve this action for the most effective engagement of each sheet with impression cylinder 10, pre-grippers 20 (or the extremities 28 thereof) should travel closer to the surface of cylinder 10 when the sheet is very thin than when very thick paper is being fed. Nevertheless, a similar adjustment of pre-grippers 20 with respect to the top surface of table 15 is neither necessary nor desired regardless of varying thicknesses of the sheets being fed.

Accordingly, means are provided for changing or adjusting the positioning or spacing of pre-grippers 20 with respect to impression cylinder 10, but without altering the positioning of pre-grippers 20 vertically with respect to the top surface of table 15, and all notwithstanding the continuously rotary nature of the movement of eccentric bushings 35 and the cyclic displacement of the axis of shaft 27 achieved thereby. In the illustrated embodiment, such means include eccentric bushings 45 within which eccentric bushings 35 and gripper shaft 27 are mounted for rotation in side frame members 13. As will be apparent, rotation of eccentric bushings 45 displaces the axes of both eccentric bushings 35 and gripper shaft 27, depending upon the particular degree of eccentricity of bushings 45 and the angular positioning thereof.

The angular positioning of eccentric bushings 45 is controlled or adjusted by depending arms 46 and rods 47 pivotally connected to arms 46 as at 48. The opposite end of rod 47 is connected to frame member 13 through conventional setting or adjusting mechanism indicated at 50 for adjusting and maintaining the horizontal positioning of rod 47 and arm 46 in any of a plurality of positions (as indicated by solid line and dot-dash line showings of FIG. 1). Thus, eccentric bushings 45 are adjusted and maintained in any of a plurality of angular positions each of which adjusts and maintains the axes of eccentric bushings 35 and shaft 27 in different displaced relationships with respect to impression cylinder 10. Such displacements of the axes of eccentric bushings 35 and shaft 27 are, however, displacements in only a horizontal direction and substantially parallel to the top of surface of table 15, so that the proximities of pre-grippers 20 to impression cylinder 10 are adjusted but without altering the relationship of the pre-grippers 20 and the table 15 at the top extreme of each swinging cycle where pre-grippers 20 engage a sheet to be fed from table 15.

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As noted more particularly in FIG. 3, maintaining one angular positioning of eccentric bushings 45 provides for paths of travel of tips 28 of pre-grippers 20 along the lines 30 and 31, as previously noted, during the continuous and cooperating motions of eccentric bushings 35 and oscillating gripper shaft 27. Maintaining eccentric bushings 45 in a different angular position (omitted for simplicity in the drawing) provides for causing tips 28 of pre-grippers 20 to follow different paths (indicated by the dot-dash lines 55 and 56) during the same motions of eccentric bushings 35 and gripper shaft 27.

Of course, the particular angular position of eccentric bushing 45 is determined by the adjusting and setting mechanism 50 (which may be correlated in known manner with a conventional indicating pointer and scale arrangement 51), depending upon the particular thickness of the sheets being fed in each instance. For example, it is desired that tips 28 and pre-grippers 20 follow the paths indicated by lines 30 and 31, coming closer to the surface of cylinder 10, when relatively thin paper sheets are being fed; while a different setting of eccentric bushings 45 provides for tips 28 of pre-grippers 20 to follow the paths indicated by lines 55 and 56, further spaced from cylinder 10, when thicker sheets of paper are being fed. Nevertheless, in both the different positionings illustrated, the relationship of tips 28 to the top surface of table 15 is maintained without change in each case, as desired for gripping or picking up a sheet of paper resting on the top of table 15 and regardless of the thickness of that sheet.

As will be apparent from the foregoing, although only one side of the printing press is shown in FIG. 2, the frame members and eccentric bushings and drive and actuating arrangements are duplicated as necessary at the opposite side of the printing press for accomplishing the various movements in accordance herewith for gripper shaft 27 and pre-grippers 20, etc. As noted, the entire side frame member 13 has been omitted for clarity in the showings of FIGS. 1 and 3. Also, the actual operation of the gripping tips 28 of pre-grippers 20 providing for gripping the edge of a sheet on table 15 and then releasing the sheet as it is gripped by sheet grippers on impression cylinder 10 is provided by conventional or well understood means, and is satisfactorily controlled as by a cam-actuated arm 59 at one end of gripper bar 25 actuated by a cam surface (not shown) in known manner.

There is, thus, provided in accordance with this invention simple and inexpensive means for arranging swinging pre-grippers beneath the feed table in a printing press of the character described and for imparting to the swinging pre-grippers the desired complex motions for feeding sheets of material to be printed from the feed table to the impression cylinder for engagement with sheet grippers thereon, as well as for providing adjustment to accommodate sheets of different thickness notwithstanding the different swinging paths and motions of the pre-grippers desired for each different sheet thickness. Furthermore, such adjustment of the entire pre-gripper structure with respect to the impression cylinder is provided in accordance herewith without altering the vertical positioning or arrangement of the pre-grippers with respect to the top surface of the table, and the entire activating and control mechanism is compact and readily incorporated into the desired printing press design without substantially or extensively altering the overall design or interfering with the normal and desired operation of other portions or elements of the printing press structure.

While the apparatus and arrangements described herein represent preferred embodiments of this invention, this invention is not to be considered as limited to these precise apparatus or arrangements, and changes may be made therein without departing from the scope of this invention which is defined in the appended claims.

What is claimed is:

1. In a printing press sheet-feeding mechanism of the

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character described for feeding individual sheets of paper to be printed from a feed table to an impression cylinder for engagement with sheet grippers thereon, the combination which comprises swinging pre-gripper means for gripping an edge of a sheet paper on said feed table at one edge thereof and leading it to the surface of said impression cylinder for engagement with said grippers thereon, means for mounting said pre-grippers below said feed table for swinging movement back and forth between said edge of said feed table and said impression cylinder, drive means for swinging said pre-grippers intermittently along one path from said feed table to said cylinder and a different path returning from said cylinder to said table, and means for adjusting both said paths horizontally with respect to said cylinder but without vertical or horizontal displacement with respect to said feed table at the point in said swinging movement where said pre-grippers are adjacent said edge of said feed table, said adjusting means being disposed substantially perpendicularly below said edge of said feed table for horizontal displacement of the axes of said swinging movement of said pre-gripper means.

2. In a printing press sheet-feeding mechanism of the character described for feeding individual sheets of paper to be printed from a feed table to an impression cylinder for engagement with sheet grippers thereon, the combination which comprises swinging pre-gripper means for gripping an edge of a sheet paper on said feed table at one edge thereof and leading it to the surface of said impression cylinder for engagement with said grippers thereon, means for mounting said pre-grippers below said feed table for swinging movement back and forth between said edge of said feed table and said impression cylinder and including an angularly oscillating shaft for effecting said swinging movement, and means for displacing the axis of said shaft horizontally with respect to said cylinder for adjusting the spacing between said pre-grippers and said impression cylinder independently of said swinging movement thereof and in the absence of altering the horizontal or vertical spacing between said pre-grippers and said feed table when said pre-grippers are adjacent said edge thereof, the axis of said displacing means being disposed substantially perpendicularly below said edge of said feed table.

3. In a printing press sheet-feeding mechanism of the character described for feeding individual sheets of paper to be printed from a feed table to an impression cylinder for engagement with sheet grippers thereon, the combination which comprises swinging pre-gripper means for gripping an edge of a sheet paper on said feed table at one edge thereof and leading it to the surface of said impression cylinder for engagement with said grippers thereon, means for mounting said pre-grippers below said feed table for swinging movement back and forth between said edge of said feed table and said impression cylinder and on an angularly oscillating shaft for effecting said swinging movement, eccentric bushings for mounting said shaft in said printing press for intermittent displacement of the axis of said shaft upon rotation of said eccentric bushings for altering the path of said swinging movement of said pre-grippers back and forth between said feed table and said impression cylinder during said angular oscillation of said shaft, and additional eccentric bushings for mounting both said shaft and said first mentioned eccentric bushings in said press for displacement of the axes thereof for adjusting the spacing horizontal between said pre-grippers and said impression cylinder independently of said swinging movement thereof and in the absence of altering the horizontal or vertical spacing between said pre-grippers and said feed table when adjacent said edge thereof, the axes of said additional eccentric bushings being disposed substantially perpendicularly below said edge of said feed table.

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