No. 648,595. Patented May 1, 1900.

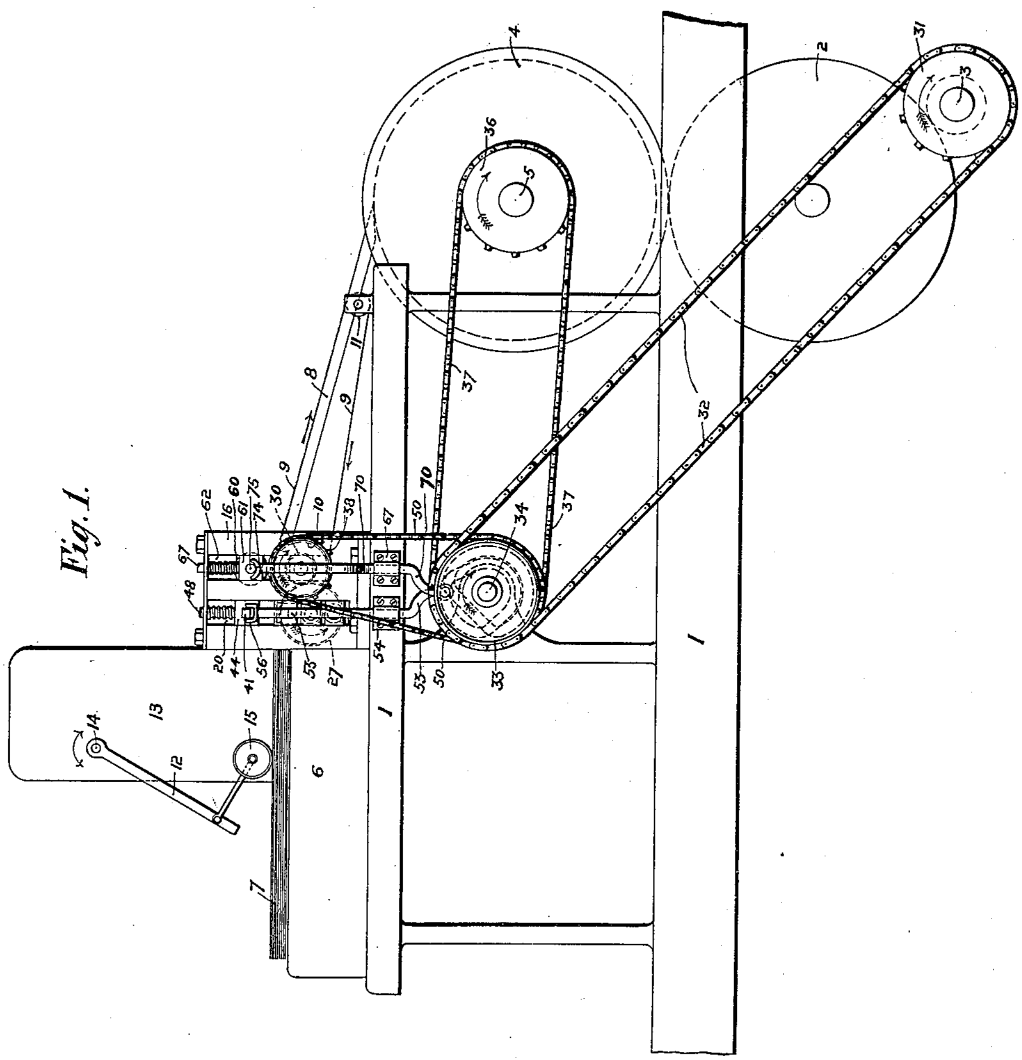
J. A. NICHOLS.

APPARATUS FOR FEEDING SHEETS TO PRINTING OR OTHER ANALOGOUS MACHINES.

(Application filed June 5, 1899.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

Fig. 2.

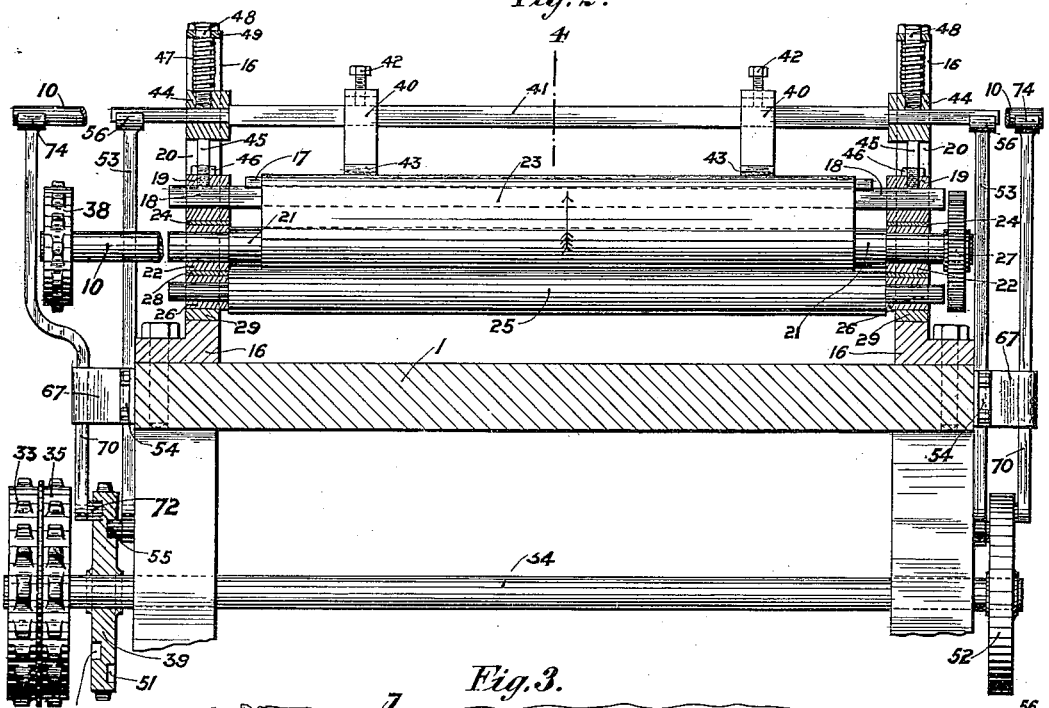
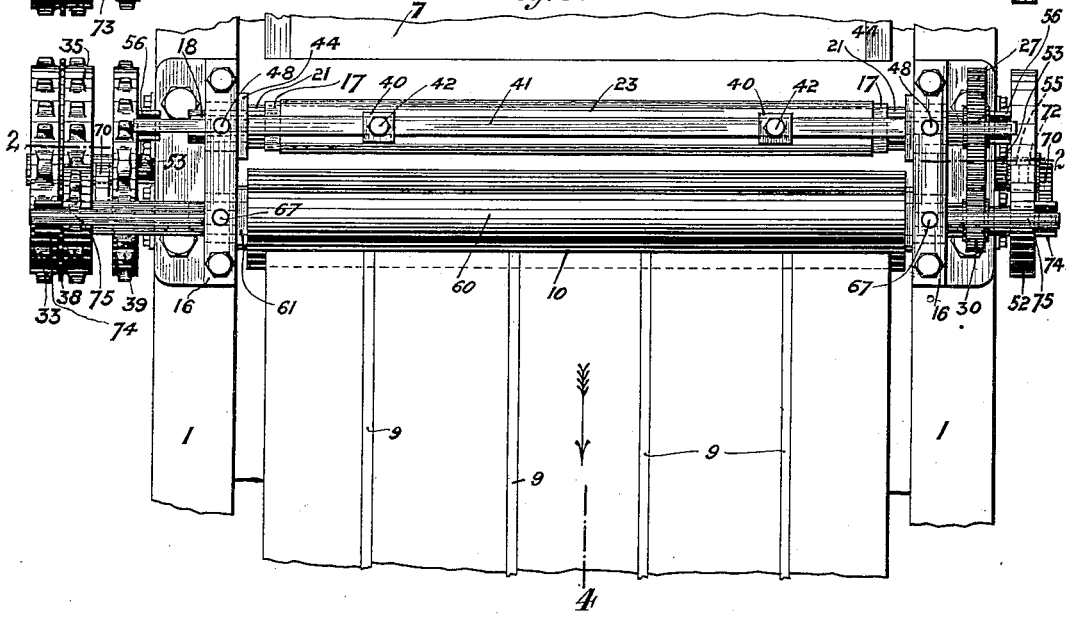


Fig. 3.



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(Application filed June 5, 1899.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 4.

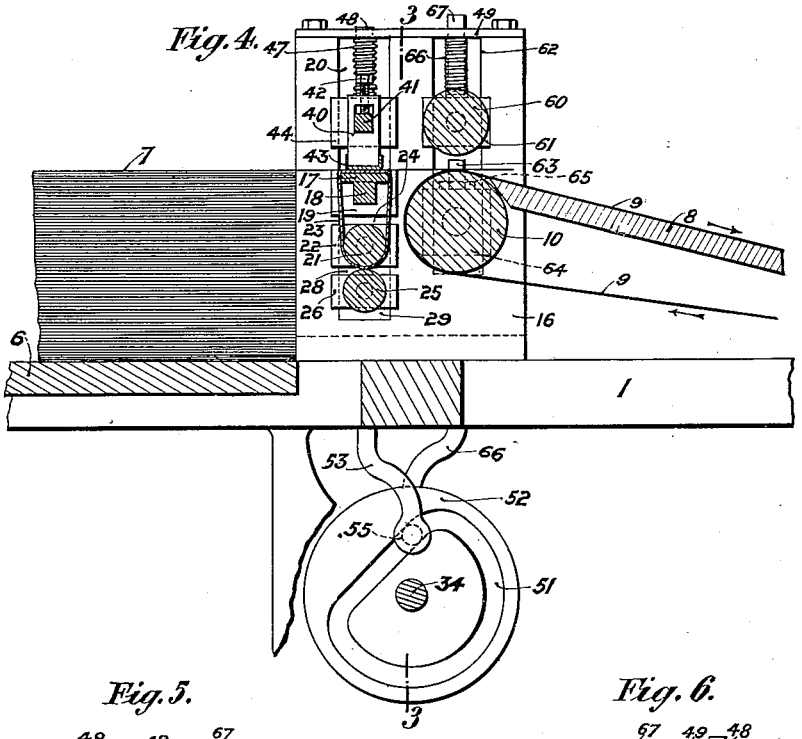


Fig. 5.

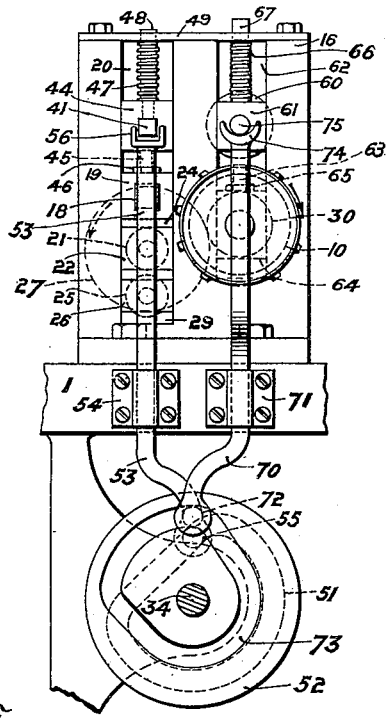
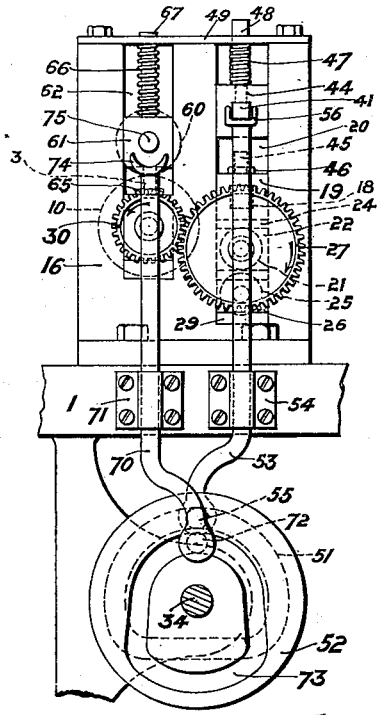


Fig. 6.



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UNITED STATES PATENT OFFICE.

JOSEPH ARTHUR NICHOLS, OF LONDON, ENGLAND.

APPARATUS FOR FEEDING SHEETS TO PRINTING OR OTHER ANALOGOUS MACHINES.

SPECIFICATION forming part of Letters Patent No. 648,595, dated May 1, 1900.

Application filed June 5, 1899. Serial No. 719,483. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH ARTHUR NICHOLS, of Upper Holloway, London, in the county of Middlesex, England, have invented certain new and useful Improvements in Apparatus for Feeding Sheets to Printing, Ruling, Folding, or Analogous Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to improvements in apparatus for feeding sheets to printing, ruling, folding, or analogous machines.

Several inventions have been offered to the trade as capable of stopping all the sheets beyond unity which the feeding-roller may feed forward from the pile, some depending upon a gateway adjusted to the thickness of the sheets to be fed, so that only one sheet at a time can pass through it, and others upon a combination of a feeding-roller bearing upon the top of the pile to feed the sheets forward from it and separator-rolls revolving in the opposite direction on the opposite side of the path of the sheet to the tape-roller of the machine.

The object of the present invention is to provide improved automatic means capable of (A) stopping all the sheets beyond unity which the feeding-roller may feed forward from off the pile and send forward along the path above mentioned and (B) returning them until their front edges are nearly flush with the front side of the pile.

In carrying the invention into effect there is a flat surface on one side of the path and adjoining it and constantly moving parallel with the said path, but in the reverse direction to that of the feed. It is immaterial on which side of the said path the said surface is arranged; but it is preferred that it should be below it. It is part of an endless band moved over a flat bar by a pair of rotary pressure-rollers, the flatness of the said bar giving the surface its desired flatness and the continuous motion of the pair of rotary pressure-rollers keeping a flat surface constantly moving in the necessary direction. On the other side of the path of the sheet there is a second flat surface, hereinafter called the "pressure-surface," adapted to be alternately moved toward the reversely-moving flat surface to press the sheet or sheets then between them against the said surface while the latter is returning the excess sheets to the pile and to be moved back again to allow of the free passage of the single sheet. This pressure-surface is directly opposite the reversely-moving one; but the motion of it to and from the latter is by no means to establish a gateway adjusted to the thickness of the sheets, the more so as the length of that motion has no relation at all to such thickness. Neither has either of the said flat surfaces any function of feeding the sheets forward. The reversely-moving surface has only to return excess sheets, and the pressure-surface has only to alternately pinch or press the sheet or sheets against it and to move away.

It is important (A) that the material of the two flat surfaces should be capable of retaining—*i. e.*, preventing motion in—the sheet in contact with it and (B) that the retaining action of the pressure-surface should be stronger than the returning action of the reversely-moving surface. If only one sheet is taken off the pile and fed toward the tape-roller, it passes above the reversely-moving surface as far as the tape-roller, and when the pressure-surface is lowered to touch the top side of the sheet it presses that sheet down on the reversely-moving surface and prevents the reversely-moving surface returning the sheet toward the pile, because the hold which the pressure-surface has upon the sheet is stronger than the hold which the reversely-moving surface has upon it; but if there is more than one sheet between the two surfaces—say two, for example—the reversely-moving surface takes hold of the lower sheet and returns it toward the pile clear of itself, because the presence of the sheet between the pressure-surface and the sheet to be pushed back to the pile prevents the pressure-surface having any hold on the lower sheet. Thus the invention concerns itself with three "surface-holds." They are so called because each one of them is a hold exerted by one surface upon another surface. The first is present only when there are more sheets than one fed forward by the feeding-roller, and it is, referring to the example given above, that of the sheet next the pres-

sure-surface on the one next the reversely-moving surface. The second is that of the reversely-moving surface on the sheet which it touches and must be stronger than the first. The third is that of the pressure-surface on the sheet which it touches and must be stronger than the first.

Referring to the accompanying drawings, which are to be taken as part of this specification and read therewith, Figure 1 is a side elevation of the invention and of the adjacent part of a cylinder printing-machine; Fig. 2, a vertical section on line 2 2 of Fig. 3; Fig. 3, a plan of Fig. 2; Fig. 4, a transverse vertical section on line 4 4 of Figs. 2 and 3; Fig. 5, a side elevation of Fig. 2 looking at it from the left hand, and Fig. 6 a side elevation also of Fig. 2 from the right hand. Figs. 2 to 6 are all on a scale double that of Fig. 1.

1 is a part of the frame of an ordinary cylinder printing-machine; 2, the intermediate gear-wheel; 3, the main driving-shaft of the machine; 4, the impression-cylinder; 5, its shaft; 6, the table on which is laid the pile of sheets 7 to be fed to the machine; 8, the feed-table between the pile of sheets 7 and the impression-cylinder 4; 9, the endless tapes traveling along the table 8; 10 11, the tape-rollers about which they are led; 60, the pressure-roller coöperating with the tape-roller 10; 12, the rocking frame for feeding the top sheet off the pile 7 onto the tapes 9 as the latter are traveling over the top of the roller 10; 13, one of the standards that carries the rod 14, upon which the frame 12 rocks, and 15 the sheet-feeding roller. The mechanism by which this feeding-roller is actuated is not shown.

31 is a sprocket fast on the main driving-shaft 3, and 32 a chain passed around it and a sprocket 33, loose on the shaft 34, turning in bearings on the main frame 1. 35 is a sprocket loose on the same shaft 34. Sprockets 33 and 35 are formed on one wheel.

36 is a sprocket fast on the shaft 5 of the impression-cylinder 4, and 37 is a chain around the sprockets 39 and 36, the former fast on the shaft 34. The printing-cylinder is driven by the intermediate gear-wheel 2 in the usual way.

38 is a sprocket on the shaft of the tape-roller 10.

35 is a sprocket on the shaft 34, and 50 is a driving-chain around both to drive the said tape-roller.

All the above-mentioned parts, as well as their respective functions and motions, are as heretofore.

16 16 are a pair of standards fast upon the frame 1.

17 is a flat bar fast upon a square one 18, which has its ends in bearings 19 19, vertically movable in slots 20 in the standards 16. 21 is a roller turning in bearings 22, likewise movable in the same slots 20.

23 is an endless sleeve or band passed around the flat bar 17 and the roller 21.

24 24 are changeable distance-pieces between the bearings 19 19 and 22 22 to keep the sleeves or band 23 tight.

25 is a second roller turning in bearings 26, likewise adjustable in the said slots 20. Its function is to bite the sleeve 23 between it and its fellow roller 21 to move it continuously over the bar 17. It is the face of this sleeve or band 23 that is the reversely-moving surface above mentioned. A flat bar 17 is preferred to an edge in order that there may be a wider surface to take hold of the sheet of paper.

28 28 are distance-pieces between the bearings 26 26 and 22 22.

29 29 are distance-pieces between the bearings 26 26 and the bottoms of the slots 20 20.

The desired reverse motion is communicated to the band 23 as follows: One end of the roller 21 is prolonged beyond the respective standard 16 and has a gear-wheel 27 fast on it. This wheel 27 is driven by a spur-wheel 30, fast on the shaft of the tape-roller 10.

40 40 are a pair of pressers carried by a horizontal bar 41, upon which they are adjustable lengthwise by set-screws 42 42. The bottom ends of these pressers are covered with pieces 43 43 of india-rubber or similar material and together constitute the pressure-surface above described.

The respective nature of the materials may be the same or differ for the pieces 43 and the band 23 or its equivalent roller 76, (the reversely-moving surface,) to the effect that when the two are pressed with equal pressures toward each other, a sheet of paper being at the time between them, the pieces 43 will hold the sheet they touch more strongly than or at least as strongly as the reversely-moving surface will, or, in other words, the last-mentioned surface will slip over the sheet, while the pieces 43 will prevent it being moved.

The bar 41 is carried by blocks 44 44, fitting in the slots 20 20 in the standards 16 16, and in which they can slide vertically in either direction.

45 45 are stops to adjust the degree of pressure which the pressure-surface 43 exerts upon the reversely-moving surface, sleeve, or belt 23. They consist of studs screwed into the bearings 19 19, from which they stand up vertically. They are held in their adjusted positions by lock-nuts 46 46. The pressure-surface 43 is moved toward the belt 23 by spiral springs 47 47, surrounding pins 48 48, screwed into the blocks 44 44 and passed upward through holes in the cap-plate 49, the said springs being compressed between the said cap-plate 49 and the respective block 44.

51 is a cam-groove in the face of the sprocket 39 and disk 52, both fast on the shaft 34.

53 53 are rods on either side of the machine-frame 1 and working in guides 54, fast thereto. The bottom end of each rod 53 carries a lateral stud 55, which engages in the respective cam-groove 51. The top end of each rod 53

terminates in a crutch 56, in which rests the respective end of the horizontal rod 41 above described.

60 is the pressure-roller over the tape-roller 10. It turns in bearings 61, capable of moving up and down vertical slots 62 in the standards 16.

63 is a vertical stop fast in and standing up from each bearing 64 of the tape-roller 10, the object of these stops being to adjust the degree of pressure which the roller 60 may exert upon the tape-roller 10. These stops 63 are adjustable vertically by means of their being screwed into the bearings 64 above mentioned. Each one is locked in its adjusted position by a lock-nut 65; but these stops may be dispensed with.

The pressure-roller 60 is moved toward the tape-roller 10 by spiral springs 66 66, surrounding pins 67 67, screwed into the bearings 61 61 and standing up through the cap-plate 49, the springs 66 66 being compressed between the said cap-plate 49 and the respective bearing 61.

70 is a rod on each side of the machine-frame 1 and working in a guide 71, fast thereto. The bottom end of each rod 70 carries a lateral stud 72, which engages in the respective cam-groove 73 in the face of the sprocket 39 and disk 52. The top end of each rod 70 terminates in a crutch 74, in which rests the respective end 75 of the pressure-roller 60, which ends project beyond the bearings 61 for that purpose.

The invention described above acts as follows: It has been already explained that the sheet-feeding roller 15, the mechanism by which it is actuated, and the way in which it works are as heretofore; but as that way has something to do with the way in which the present invention acts, it is deemed advisable to give a short description of it. The frame 12 is rocked on its pivot 14 once in each of the directions indicated by the double-headed arrow in Fig. 1 for each sheet fed from the pile 7. The position illustrated in Fig. 1 is the one which the feeding-roller 15 occupies at the commencement of the feeding-stroke—viz., down upon the top sheet and ready to move toward the tape-cylinder—*i. e.*, looking at Fig. 1 to the right hand. The roller 15 moves to the edge of the pile 7, keeping down upon the top sheet thereof during the whole of that motion. When it has got as far as that edge, it is raised off the pile 7 and the frame 12 returned to the position from which it started. As soon as it reaches that position—the one illustrated in Fig. 1—the roller 15 is dropped upon the pile 7 again, ready to feed forward the next sheet. The feeding motion of the feeding-roller 15 suffices to move the leading edge of the top sheet of paper past the tape-roller 10, leaving it in the position shown in Fig. 4. During that feeding motion the pressure-surface 43 and pressure-roller 60 are held off the reversely-moving surface 23 and tape-roller 10, respectively, by the respective cams 39 and 52, so that there is a clear way for the top sheet to be fed from the position illustrated in Fig. 1 into the one illustrated in Fig. 4. The cam-grooves 51 then let the pressure-surface 43 down toward the surface 23, pinching the sheet between them. The pressure then exerted by the surface 43 is the same as the pressure exerted by the surface 23; but the holding power of the pressure-surface 43 is greater than the moving power of the reversely-moving surface 23, resulting in holding any single sheet in the position to which it has been carried by the feeding-roller 15, and the surface 23 slips over the sheet without moving it backward; but if the feeding-roller 15 sends forward more than one sheet—say two—the invention deals with them in the following way: As soon as the surface 43 is down on the sheets the surface 23 takes hold of the bottom face of the sheet next it and moves that sheet back toward the pile 7 until the front edge of it is to the rear of the said surface 23 and nearly flush with the front edge of the pile, and it can do that because it has a stronger hold upon the bottom face thereof than the bottom face of the sheet above it has upon the top face of it. This returning is effected in a very short time and leaves the remaining sheet in the position described. The cam-grooves 73 then let the pressure-roller 60 down upon the said sheet, and the latter is at once fed onto the tapes 9, traveling down the table 8.

I claim—

1. The hereinbefore-described combination of a flat non-feeding pressure-surface on one side of the path of the sheet or sheets being fed from the pile forward and a flat surface on the other side thereof opposite to the said non-feeding pressure-surface, and regularly moving in the reverse direction to that of the feed, the material of the said flat pressure-surface adapted to exert a stronger hold on the sheet which it touches than is the reversely-moving flat surface, and the material of the latter adapted to exert a stronger hold on the sheet which it touches than does the sheet nearer to the said pressure-surface on the said sheet.

2. The hereinbefore-described combination of a flat non-feeding pressure-surface on one side of the path of the sheet or sheets being fed from the pile forward; a flat non-feeding surface on the other side thereof, opposite to the said non-feeding pressure-surface, and regularly moving in the reverse direction to that of the feed, the material of the said pressure-surface adapted to exert a stronger hold on the sheet which it touches than is the said regularly-moving surface and the material of the latter adapted to exert a stronger hold on the sheet which it touches than does the sheet nearer to the said pressure-surface on the said sheet; and means for so actuating the regularly-moving surface.

3. The hereinbefore-described combination

of a flat non-feeding pressure-surface on one side of the sheet or sheets being fed from the pile of sheets forward; means for feeding the sheets from the said pile to the tape-roller; a flat non-feeding surface on the other side of the sheet or sheets opposite to the said non-feeding pressure-surface and regularly moving in the reverse direction thereto, the material of the said pressure-surface adapted to exert a stronger hold on the sheet which it touches than is the constantly-moving surface and the material of the latter adapted to exert a stronger hold on the sheet which it touches than does the sheet nearer the said pressure-surface upon the said sheet; and means for so actuating the regularly-moving surface.

4. The hereinbefore-described combination of a flat non-feeding pressure-surface on one side of the path of a sheet or sheets being fed from the pile of sheets forward, a flat non-feeding surface on the other side thereof opposite to the said non-feeding pressure-surface and regularly moving in the reverse direction to that of the feed, the material of the said flat pressure-surface adapted to exert a stronger hold on the sheet which it touches than is the regularly-moving flat surface and the material of the latter adapted to exert a stronger hold on the sheet which it touches than does the sheet nearer to the said flat pressure-surface upon the said sheet; means for moving the said flat pressure-surface alternately toward the reversely-moving surface and away from it and means for actuating the said reversely-moving surface.

5. The hereinbefore-described combination of a flat non-feeding pressure-surface on one side of the path of a sheet or sheets being fed from the pile forward, a flat non-feeding surface on the other side thereof opposite to the said non-feeding pressure-surface and regularly moving in the reverse direction to the said sheet or sheets, the material of the said pressure-surface adapted to exert a stronger hold on the sheet which it touches than is the regularly-moving surface and the material of the latter adapted to exert a stronger hold on the sheet which it touches than does the sheet nearer to the said pressure-surface upon the said sheet; a tape-roller; a pressure-roller to coöperate with the said tape-roller; means for actuating the said reversely-moving surface; means for moving the pressure-surface alternately toward the reversely-moving surface and away from it and means for alternately moving the pressure-roller toward and away from the said tape-roller.

6. The hereinbefore-described combination of a flat pressure-surface on one side of the path of a sheet or sheets being fed from the pile forward; an endless non-feeding band on the other side thereof and parallel with the said surface and opposite to it; a bar parallel with the said pressure-surface and held within the said band; a pair of rollers gripping the said band between them to traverse it over the flat bar; means for moving the said pressure-surface alternately toward and away from the said band; and means for causing the pair of rollers to traverse the endless band over the said bar in a direction the reverse of that in which the sheet or sheets pass from the pile to the tape-roller.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

JOSEPH ARTHUR NICHOLS.

Witnesses:
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ROBERT EDWARD MCLAREN.