Oct. 15, 1935. P. R. WHELAN 2,017,191

SHEET HANDLING MACHINE

Filed Sept. 12, 1932 3 Sheets-Sheet 1

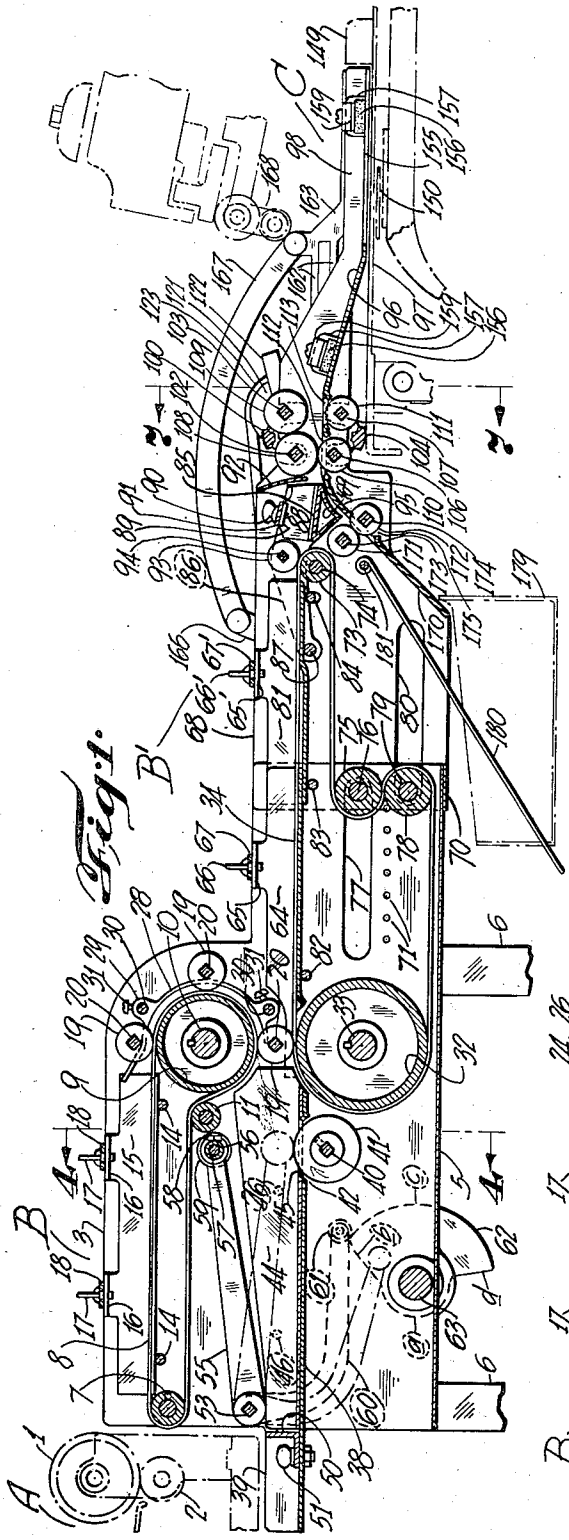

Fig. 1.

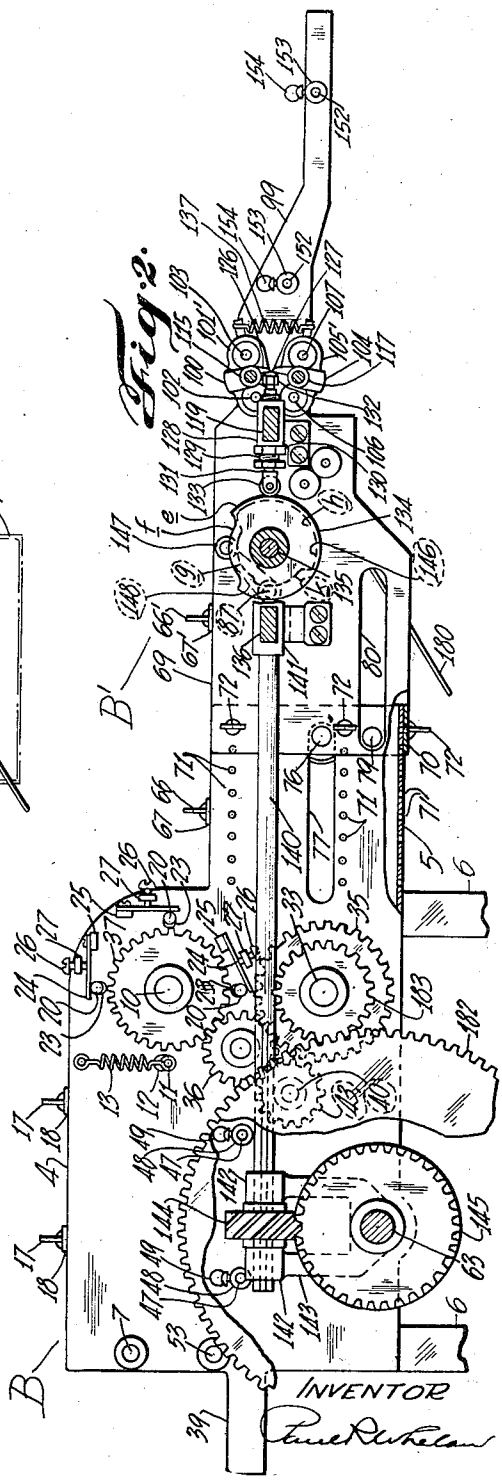

Fig. 2.

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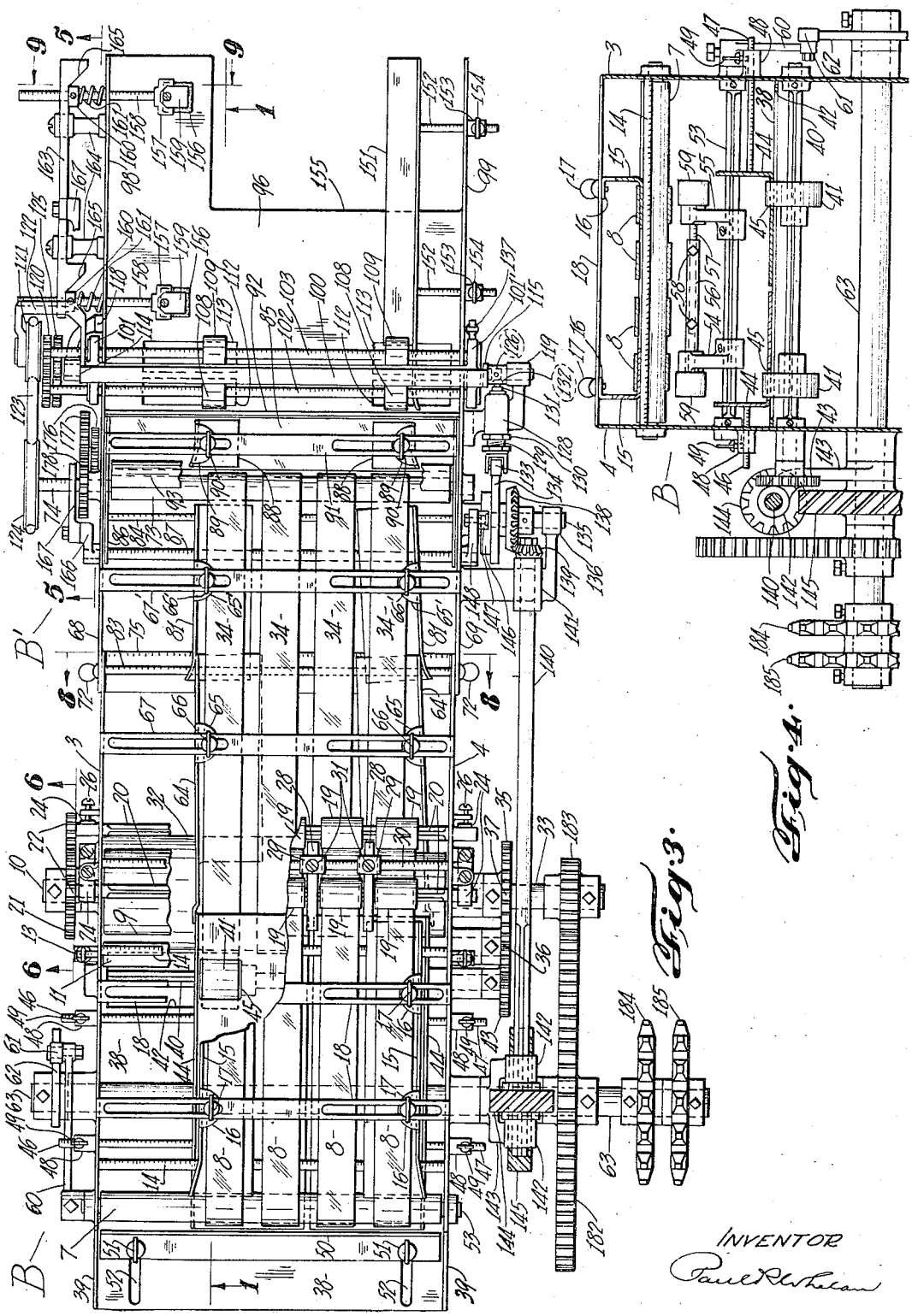

Fig. 4.

Fig. 3.

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Fig. 5.

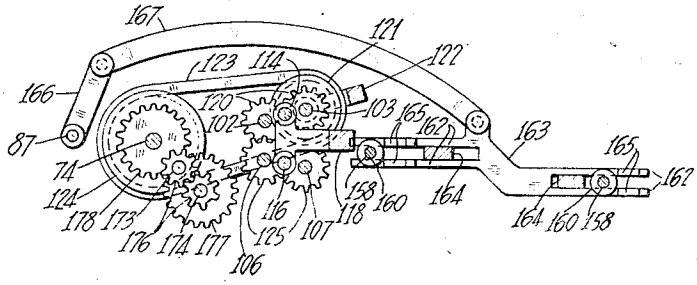


Fig. 6.

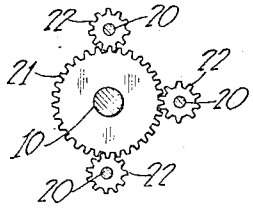


Fig. 7.

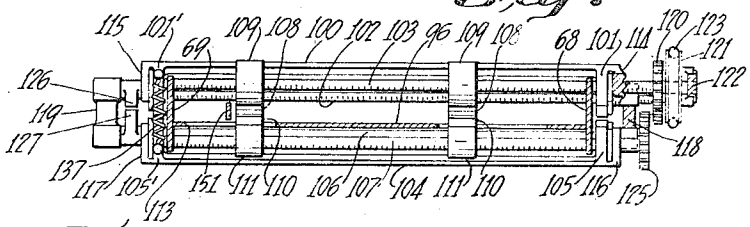
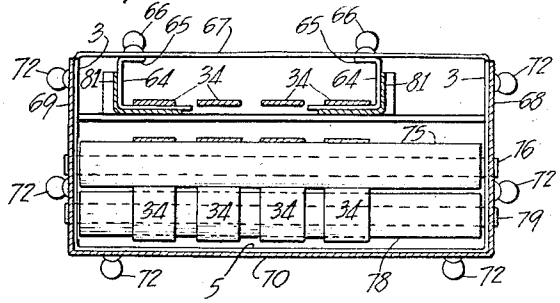


Fig. 8.



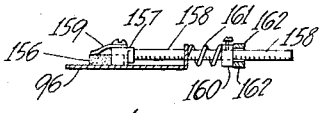


Fig. 9.

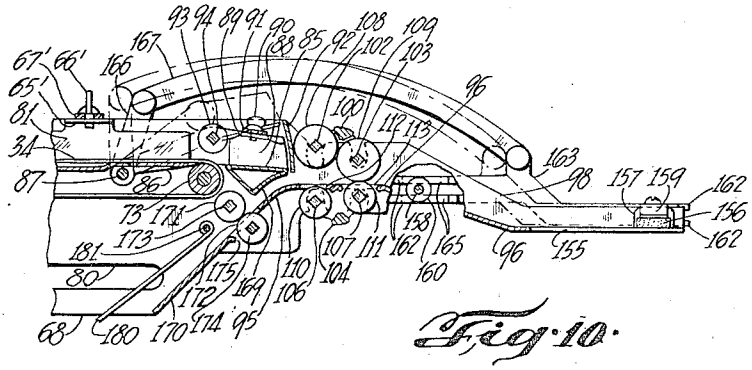


Fig. 10.

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Patented Oct. 15, 1935 2,017,191

UNITED STATES PATENT OFFICE

2,017,191

SHEET HANDLING MACHINE

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Application September 12, 1932, Serial No. 632,716

27 Claims. (Cl. 271—3)

This invention relates generally to the printing art and has more particular reference to an improved sheet handling machine, for manipulation of printed sheets and the like.

In some processes of the printing art, the printing of a sheet involves the impression of part of the printed mater, as the body of a letter or advertising circular, on a cylinder-press machine, and the printing of another part of the printed matter, as the date, name, address and salutation, on a flat-bed machine, which procedure has heretofore, so far as I am aware, been carried forth in separate steps or stages, most of them hand operations, on the respective machines.

Having the foregoing in mind, my invention has for its prime object the provision of an efficient, reliable and practical mechanism or machine of the character described, for receiving the partly printed sheet from the cylinder machine, inverting or reversing the sheet, feeding the inverted sheet to the flat-bed machine, and removing the finished printed or addressed sheet therefrom.

And with the above and other objects in view, my invention resides in the novel features of form, construction, arrangement, and combination of parts hereinafter described and set forth in the appended claims.

In the accompanying drawings (three sheets),—

Figure 1 is a longitudinal sectional view of a sheet-handling machine of my invention, taken approximately along the line 1—1, Figure 3, portions of associated printing machines being indicated in dot-dash lines;

Figure 2 is a side-elevational view of the machine;

Figure 3 is a top plan view of the machine, portions thereof being broken away for disclosing the interior construction;

Figure 4 is a fragmentary transverse sectional view taken approximately along the line 4—4, Figure 1;

Figure 5 is a sectional view taken approximately along the line 5—5, Figure 3;

Figure 6 is a sectional view taken approximately along the line 6—6, Figure 3;

Figure 7 is a sectional view taken approximately along the line 7—7, Figure 1;

Figure 8 is a sectional view taken approximately along the line 8—8, Figure 3;

Figure 9 is a fragmentary sectional view taken approximately along the line 9—9, Figure 3; and

Figure 10 is a fragmentary longitudinally sectional view of the sheet-feeding and removing mechanism of the machine, the several parts being shown in position for discharging a printed sheet from the machine.

Referring now more in detail and by reference characters to the drawings, which illustrate a preferred embodiment of my invention, 1 and 2 designate respectively, a pair of cooperating sheet-discharging rollers of a conventional printing machine A, of the type which makes its printing impression on the upper face of the printed sheet, as a cylinder-press or the like.

B designates the sheet-handling machine of my invention, the main-frame thereof comprising a transversely spaced pair of upstanding side walls 3, 4, respectively, preferably connected at their lower longitudinal margins by a transverse bottom wall 5, the frame being supported on respective corner posts or legs 6 for engaging the floor or other suitable support (not shown).

Mounted for rotation transversely in and between the side-walls 3, 4, for sheet-receiving registration with the discharge rollers 1, 2, is a belt-carrying roller 7, over which is trained a series of, or in the present instance four, sheet-conveying belts or endless carriers 8. The upper runs of the carriers 8 extend, tangentially from the roller 7 forwardly, between the side walls, 3, 4, for engaging a sheet-turnover drum 9, of relatively large diameter, suitably disposed on a shaft 10 rotarily mounted in and between the side-walls 3, 4. The carriers 8 pass forwardly and downwardly over the drum 9 and return to the roller 7 over a tightener-pulley 11, disposed adjacent the drum 9, the opposite end-axles of the pulley 11 being presented through respective slots 12 in the side-walls 3, 4, where suitable springs 13, attached to the walls 3, 4, engage said pulley-axles for yieldingly supporting the pulley 11 for tensing the carriers 8 over the roller 7 and drum 9, as best seen in Figures 1 and 2.

Spanning between the side-walls 3, 4, beneath, and for in part supporting, the series of belts 7 is a pair of tie-rods 14, the rods 14 also slidably supporting a pair of transversely spaced sheet-guides 15, preferably of angle-section, and extending longitudinally for projecting their horizontal legs supportingly under the respective outside ones of the series of carriers 8, the latter being marginally bounded by the upstanding legs of the guides 15 for providing a sheet-guiding channel therebetween. The upper margins of the guides 15 are provided with ears 16 for threaded engagement by thumb screws 17 adjustably mounted in respective suitably slotted bars 18 disposed transversely between and on the upper

margin of the frame side-walls 3, 4, whereby the spacing between the guides 15 may be varied suitably to the width of the sheet being handled, as will be understood from Figure 4.

Surrounding the forward half circumference of the turnover-drum 9 is a series of, or in the present instance, three groups of sheet feeding rollers 19, each group thereof comprising four rollers mounted on a suitably squared, rotary shaft 20 disposed substantially parallel with the face of the drum 9. The rollers 19 are preferably made of rubber or other similar composition, and are provided with squared axial apertures for fitting snugly on the shaft 20, whereby, a particular group of the rollers 19 may be adjusted on the shaft 20 in longitudinally spaced relation with respect to the drum 9 for peripherally engaging the respective carriers 8 trained thereover, the rollers 19 being driven from and at the same peripheral speed as the drum 9 by means of a gear 21, mounted on one end of the drum-shaft 10 projecting from the frame-wall 3, for meshing with pinions 22 mounted on the respective shafts 20, as best seen in Figures 3 and 6.

The opposite ends of each shaft 20 project guidably through slots 23 provided in the respective frame-walls 3, 4, and are each yieldingly engaged by one end of a resilient element or spring 24, whose other end is mounted on a lug 25 projecting from the frame-wall, 3 or 4 as the case may be, a suitable screw or the like as 26, being adjustably mounted in a lug 27 projecting from the adjacent frame-wall for engaging the spring 24 intermediately its end, for tensionally biasing the shaft 20 toward the axis of the drum 9, as best seen in Figure 2.

Between each pair of circumferentially aligned series of rollers 19 is vertically disposed a sheet-guide 28, having its upper end suitably flared upwardly from the upper face of the drum 9. In the present instance there are three guides 28, each being arcuately curved or bent in suitably spaced relation with the forward half-periphery of the drum 9 and terminating substantially at the lower one of the shafts 20. Each guide 28 is provided with upper and lower ears or lugs 29 slidably engaging suitable transverse rods 30 mounted between the frame-walls 3, 4, the lugs 29 having suitable set-screws or the like, as at 31, for adjustably varying the spacing of the guides 28 longitudinally of the drum 9, as best seen in Figures 1 and 3.

Disposed below and preferably in vertical registration with the drum 9 is a second drum 32, carried by a shaft 33 rotarily supported in and between the frame-walls 3, 4. Trained over the rear half-circumference of the drum 32, for extending therefrom forwardly in the machine, is a series of, or in the present instance four, sheet-conveyor belts or endless carriers 34, presently to be more particularly described, the drum 32 being disposed suitably in relation with the lowermost group of rollers 19 for engaging the upper run of the belts 34 therebetween, as best seen in Figure 1.

In order, therefore, that the drum 32 and rollers 19 may have the same peripheral velocity, an end of the shaft 33 is projected through the frame wall 4 and carries a gear 35 which meshes with a suitably mounted idler-gear 36, the latter in turn meshing with a gear 37 mounted on an end of the shaft 10 likewise projecting through the wall 4, as best seen in Figure 2.

A horizontal intermediate wall or sheet support plate 38 is mounted between the frame side-walls 3, 4, suitably in position for receiving a sheet from between the upper drum 9 and the lower group of rolls 19, and for in turn supporting, for delivery of the sheet to and between said group of rolls 19 and the lower drum 32, the top of the drum 32 preferably, however, projecting a suitably small distance above the plane of the plate 38, for a purpose presently appearing. The front margin of the plate 38 terminates at the drum 32, and it is rearwardly extended in the machine a suitable distance beyond the side-walls 3, 4, the latter having projecting bracket portions 39 for supporting the overhanging portion of the plate 38, as best seen in Figure 1.

Mounted for rotation in and between the frame walls 3, 4, and spaced rearwardly from the drum 32, is a shaft 40, suitably squared as shown, for adjustably supporting a pair of longitudinally spaced rollers 41, the tops of the rollers 41 projecting upwardly through suitable transverse slots 42 provided in the plate 38. An end of the shaft 40 is projected through the side-wall 4 and carries a gear 43 of suitable dimensions for meshing with the idler-gear 36, for driving the rollers 41 at a peripheral speed corresponding to the linear speed of the belts 34.

44 designates a pair of opposing sheet-guides disposed longitudinally of the plate 38 for shiftable movement transversely thereover, the guides 44 being preferably of angle section with the horizontal legs thereof provided with approximately rectangular apertures 45 for receiving the upper portions of the rollers 41. The upstanding legs of the guides 44 are provided with longitudinally spaced pairs of outwardly projecting plungers 46, 47, respectively, slidably mounted in and through suitable hubs or bosses 48 attached to the outer face of the wall 3 or 4, as the case may be, suitable retaining members or thumb-screws 49 being threaded into the bosses 48 for engaging the plungers, 46 or 47, for retaining the guides 44 in adjustably spaced sheet-guiding relation on the plate 38.

Disposed across the rear portion of the plate 38 is a stop 50, suitable thumb-screws or the like, as 51, working in slots 52 provided longitudinally in the plate 38, being provided for adjustably positioning the stop 50 in the plate 38 suitably to the length of the sheet being handled, as best seen in Figure 3.

A suitably squared shaft 53 is mounted for oscillation in and between the frame-sides 3, 4, for shiftably supporting the correspondingly apertured hub-ends of a pair of swingable arms 54, 55, forwardly projecting over the plate 38. Slidably mounted through the front end of the arm 54 is an inwardly extending tubular shaft 56 having telescoping engagement with the opposing end of a shaft 57 in turn slidably mounted through the free end of the arm 55, suitable set-screws or like fastening elements 58 being employed for retaining the shafts 56—57, adjustably in telescoped relation as best seen in Figure 4.

On the outer end of each shaft 56, 57, is mounted a roller 59, the arms 54, 55, being adjusted on the shaft 53 for disposing the rollers 59 in vertical registration with the respective rollers 41. Normally, the shaft 53 is oscillated for elevating the arm-carried rollers 59 a suitable distance above the plate 38, as shown in solid lines in Figure 1, for free passage therebetween of a sheet discharged from engagement between the drum 9 and the lower rollers 19 for reposing on the plate 38 over the rollers 41. The arms 54, 55, however,

are of suitable length for, on contrary oscillation of the shaft 53, dropping the rollers 59 on the sheet for engaging the same between the rollers 59 and 41, as shown in dot-dash lines in Figure 1, for shifting the sheet forwardly for feeding the sheet to and between the lower drum 32 and the lower roller 19.

For effecting such oscillation of the shaft 53, the same is extended through the frame-side 3 and provided with a crank 60, the free end thereof carrying a roller 61 cooperating peripherally with a cam 62 mounted preferably, though not necessarily, on the corresponding frame-projecting end of the main or drive-shaft 63 of the machine, the latter being suitably mounted for rotation in and between the frame-sides 3, 4, adjacent the bottom wall 5 thereof, the cam 62 comprising an "arm-dropped" dwell *a*, an arm-lifting or rising portion *b*, an "arm-lifted" dwell *c*, and an arm-dropping or falling portion *d*, the several proportions of the cam 62 and the revolution thereof by and with the shaft 63 being in timed relation with the cyclic period of operation of the particular printing machine A, as will presently more particularly appear.

The sheet thus fed to the drum 32 is in turn engaged by the belts 34 and moved forwardly between a pair of suitably spaced longitudinal guides 64, the guides 64 being preferably of angle section, and having their horizontal legs extending under the respective outside ones of the series of belts 34, the latter being marginally bounded by the upstanding legs of the guides 64 for providing a sheet-guiding channel therebetween. The upper margins of the guides 64 are provided with ears or lugs 65 for threaded engagement by thumb-screws 66 adjustably mounted in a suitably slotted bar 67 disposed transversely between and on the upper margin of the frame side-walls 3, 4, the latter being suitably reduced in height at this point, as shown in Figures 1, 3 and 8.

B' designates an extensible front end portion of the machine B, the frame of the extension B' comprising a pair of upstanding side-walls 68, 69, respectively, for overlapping outside engagement with the frame side-walls 3, 4, also respectively, of the main machine-portion B, the rear lower margins of the side-walls 68, 69, being joined by a bottom-wall 70, for overlapping outside engagement with the main bottom wall 5, as best seen in Figures 1 and 8.

The side-walls 3, 4, are provided with upper and lower series of horizontally spaced apertures 71 and the bottom wall 5 is provided adjacent its side margins, likewise with respective series of longitudinally aligned apertures 71. Mounted through the extension frame walls 68, 69, 70, in registration with the respective series of apertures 71, are suitable fastening elements or thumb-screws 72, the apertures 71 being preferably suitably tapped for threaded cooperation with the thumb-screws 72, whereby the extension B' may be telescopically shifted forwardly from or rearwardly toward the main machine B and then rigidly attached thereto, by suitably manipulating the thumb screws 72 into a particular transversely aligned group of the apertures 71, as will be understood from Figures 2 and 8.

Disposed a suitable distance forwardly in the extension B' is a transverse roller 73, mounted on a shaft 74 journaled in and between the side-walls 68, 69, the series of belts 34 being extended forwardly to and downwardly over the roller 73. From the roller 73 the belts 34 extend rearwardly to and pass downwardly over a pulley or roller 75, mounted on a shaft 76, journaled in and between the side-walls 68, 69, the intervening side-walls 3, 4, of the machine-section B being provided each with a longitudinal slot 77 for receiving the shaft 76. From the pulley 75 the belts 34 extend forwardly, more or less, to a second pulley 78 mounted on a shaft 79 journaled, however, in and between the side-walls 3, 4, the opposite end of the shaft 79 working in longitudinal slots 80 provided in the side walls 68, 69, of the extension B'. From the pulley 78 the belts 34 rearwardly extend to the drum 32 for return movement upwardly thereover, as best seen in Figure 1.

It will be seen that, on telescoping movement of the section B' relatively to the section B, the pulleys 75, 78, become correspondingly overlapped or spaced one relatively to the other for stretching the common run of the belt-series therebetween, thus automatically compensating for variations in the length of the belt 34 resulting from changes in the distance between the drum 32 and roller 73. Most conveniently during telescoping manipulation of the frame sections B, B', the shaft 76, 79, working in the slots 77, 80, respectively, serve for more or less effectively supporting the section B' until the same is again attached to the section B.

81 designates a pair of extension sheet-guides preferably of angle-section and adapted for outside telescoping or overlapping engagement with the sheet-guides 64, for marginally bounding the portion of the series of belts 34 which extend into the section B', the guides 81 terminating forwardly at the roller 73. Similarly to the guides 64, the guides 81 are equipped with ears 65' engaged by thumb-screws 66' mounted in a suitably slotted bar 67' disposed transversely between and on the upper margin of the extension side-walls 68, 69, respectively, as best seen in Figures 1 and 3.

A tie-rod 82 is mounted between the side-walls 3, 4, for supporting the rear portions of the guides 64, another rod 83 is similarly mounted between the front ends of the walls 3, 4, for supporting the belts 34 and the overlapping portions of the guides 64, 81, and a third rod 84 is disposed between the walls 68, 69, adjacent the roller 73 for supporting the front ends of the guides 81, as best seen, again, in Figures 1 and 3.

A sheet conveyed on and by the belts 34 is discharged over the roller 73 on or into a vertically shiftable so-called pan or valve 85 disposed transversely between the side-walls 68, 69, immediately in front of the roller 73. The opposite upstanding end walls of the pan 85 are extended rearwardly in the form of suitably curved arms 86 each closely adjacent a respective frame-wall 68, 69, the rear end of each arm 86 being mounted on an oscillatory shaft 87 journaled in and between the walls 68, 69, a suitable distance rearwardly of the roller 73, as best seen in Figures 1 and 3.

The pan 85 is equipped with a pair of opposing sheet-guides 88, preferably of angle-section, the horizontal legs thereof resting on the pan 85 and being turned inwardly thereof one toward the other. The upstanding legs of the guides 88 are provided with ears 89 threadedly receiving suitable thumb-screws 90 working in a suitably slotted bar 91 supported by and between the end-wall arms 86 of the pan, whereby the guides 88 may be adjustably positioned in the pan 85 for providing a sheet-guiding channel therebetween in registration with that between the guides 81 as best seen in Figure 3.

Mounted between the side-walls 68, 69, is an approximately vertical stop-plate 92 arcuately curved in its vertical plane complementary to the path of movement of the front or free margin of the pan 85, the latter being adapted, as presently appearing, for swinging upwardly in close adjacence to the concave face of the stop-plate 92 for at such time effectively blocking the movement of a sheet over the pan 85, as best seen in Figure 10.

Normally, however, the pan 85 is disposed in downwardly swung position with its lip or front margin vertically spaced from the lower margin of the plate 92 providing a throat therebetween through which a sheet may freely pass, a pair of rollers 93, adjustably mounted on a shaft 94 journaled suitably between the pan-arms 86, being brought into peripheral engagement with the side margins of the sheet for depressing or bending the same as it passes over the roller 73 for directing the sheet onto the pan and toward the throat between the pan 85 and the plate 92 as will be understood from Figure 1.

When in its down position the lip or front margin of the pan 85 rests upon an upwardly convex chute 95 which merges horizontally into a feed-plate 96, the plate 96 extending forwardly and downwardly for flatwise reposing its front end on the feed table 97 of a conventional form of flat-bed printing machine C, the latter comprising, in the present instance, an addressing machine which makes its printing impression on the underface of the sheet, as will presently appear, the feed-plate 96 being supported by and between suitably formed bracket-arm extensions 98, 99, of the side-walls 68, 69, respectively, as best seen in Figures 1 and 2.

An oscillatory inverted approximately U-shaped frame 100 comprising an elongated transverse bar extending over the feed-plate 96 above the bracket-arms 98, 99, is provided at its opposite ends with depending members 101, 101', respectively, each suitably provided with bearings for rotarily supporting the respective opposite ends of a pair of shafts 102, 103, disposed transversely of the feed-plate 96 and spaced longitudinally thereof. In a similar manner, a second oscillatory approximately U-shaped frame 104, comprising an elongated transverse bar extending beneath the feed-plate 96 below the bracket-arms 98, 99, is provided at its opposite ends with upstanding members 105, 105' respectively, each suitably provided with bearings for rotarily supporting the respective opposite ends of a pair of shafts 106, 107, in vertical registration with the shafts 102, 103, respectively, as best seen in Figures 2 and 7.

Slidably mounted on the shafts 102, 103, are pairs of rollers 108, 109, respectively, of suitable rubber or other like composition. Likewise, slidably mounted on the shafts 106, 107, are pairs of rollers 110, 111, respectively, also of suitable rubber composition, the rollers 110 on the shaft 106 being disposed in vertical registration with the rollers 108 on the shaft 102, and the rollers 111 on the shaft 107 being disposed in the vertical registration with the rollers 109 in the shaft 103. The feed plate 96 is provided with pairs of suitably elongated transverse slots 112, 113, the rollers 110 being adopted, on rearward oscillation of the frame 104, for presentation, through the slots 112, suitably above the plate 96 for peripheral engagement with the rollers 108 which are shifted or lowered, as will presently appear, toward the plate 96 on corresponding rearward oscillation of the frame 100, as shown in Figure 1. Similarly, on the reverse or forward oscillation of the frames 100, 104, the rollers 111 emerge upwardly through the slots 113 for engaging the rollers 109, as shown in Figure 10.

The frame 100 is provided with opposite end or terminal depending axle-hubs 114, 115, respectively, and in similar manner the frame 104 is provided with opposite end upstanding axle-hubs 116, 117, respectively. The axles of the hubs 114, 116, are journaled suitably in a bearing-bracket 118 supported from the adjacent frame-wall 68, and the axles of the hubs 115, 117, are journaled suitably in a bearing bracket 119 supported from the adjacent frame-wall 69, as best seen in Figures 3 and 7.

The shafts 102, 103, in the frame 100 are suitably extended beyond the axle-hub 114 and respectively support similar gears 120 meshing at a one-to-one ratio. The shaft 103 is further extended for supporting a pulley 121, the extreme end of the shaft 103 being journaled in a suitably formed bearing bracket 122 projecting from the axle-hub 114. The pulley 121 is engaged by a flexible member or belt 123 which is trained over another pulley 124 mounted on the suitably projected end of the shaft 74, whereby the peripheral speed of the rollers 108, 109, is made substantially equal to the linear speed of the belts 34, as best seen in Figures 1 and 5, the rollers 108 being driven in a direction for moving a sheet forwardly over the feed-plate 96 while the rollers 109 are driven in a direction for moving the sheet rearwardly from the plate 96, as will presently more particularly appear.

The shafts 106, 107, of the frame 104 are likewise extended beyond the axle-hub 116 and carry similar gears 125 meshing at a one-to-one ratio, the shafts 106, 107, however, being rotated by means of the alternate engagement of the rollers 110, 111, with the rollers 108, 109, as the case may be, the gears 125 serving to drive the shafts 106, 107, one from the other for maintaining substantially continuous revolution thereof during the operation of the machine, as best seen in Figures 5 and 7.

Mounted suitably on the axle-hub 115 of the frame 100 is a depending arm 126, and likewise mounted on the axle-hub 117 of the frame 104 is an upstanding arm 127 in vertical registration with the arm 126. The bracket 119 includes a longitudinal cylindrical guide 128 in and through which is adjustably threaded a sleeve 129, a suitable jam-nut 130 being mounted on the sleeve for engagement with the rear end of the guide 128 for locking the sleeve 129 in the guide 128 with the forward end of the sleeve 129 projecting a suitable distance forwardly of the guide 128, as will presently appear.

A plunger 131 is reciprocably mounted in and through the sleeve 129 and carries at its forward end a cap-screw 132, adjustably threaded into the plunger 131, for cooperative engagement with the free ends of the arms 126, 127. The rear end of the plunger 131 is provided with a roller 133 engageable with a cam 134 mounted on a rotatory shaft 135 supported by and between the adjacent wall 69 and a bracket 136 projecting suitably therefrom. The cam 133 includes a dwell *e* which when engaging the roller 133 shifts the plunger 131 forwardly in the sleeve 129 for engaging the cap-screw 132 with the arms 126, 127, for effecting rearward oscillation of the frames 100, 104, such movement of the frames 100, 104, being regulated by suitably varying the distance from

the cap-screw 132 to the roller 133, as best seen in Figure 2.

The cam 134 is also provided with a drop-portion or dwell *f*, which when opposite the roller 133 permits a suitable tensional member or spring 137, resiliently connecting the forward ends of the bearing members 101', 105', to act for oscillating the frames 100, 104, to forwardly swung positions, the plungers 131 being meanwhile rearwardly shifted in the sleeve 129 until the cap-screw 132 impinges the end of the sleeve 129, the forward oscillation of the frames 100, 104, being regulated by varying the projection of the sleeve 129 from the guide 128.

A bevel-gear 138, mounted on the shaft 135, meshes with a bevel-pinion 139 mounted on one or the adjacent end of a cam-actuating shaft 140, journaled in a bearing 141 carried by the bracket 136, as best seen in Figure 3.

The shaft 140 extends longitudinally rearwardly of the machine adjacent the side-wall 4, and has its other or rear end journaled in and endwise slidably through a pair of spaced bearings 142 provided on the upper end of a suitably forked frame 143 upstanding from, and suitably oscillatorily supported on, the main drive-shaft 63, as best seen in Figures 2 and 3.

The rear portion of the shaft 140 is suitably squared for engaging the correspondingly apertured hub of a helical gear 144 slidably mounted on the shaft between the bearings 142. The gear 144 meshes with a complementary helical gear 145 mounted on for rotation with the drive-shaft 63, whereby the cam 134 is driven in timed relation with the cyclic period of operation of the printing machines A and C, as will presently appear.

Also mounted on, for actuation by, the shaft 136, is a cam 146, having three dwells, *g*, *h*, *k*, of different elevations, as may be said, the cam 146 being peripherally engaged by a roller 147 supported on the free end of an arm 148 mounted on the adjacent projecting end of the pan-shaft 87. The pan 85 is disposed in lowered position on the chute 95 when the roller 147 is engaged with the dwell *g*, the cam 146 being synchronized with the cam 134 so that the pan 85 is lowered for passage of a sheet thereover as the cam-portion *e* of the cam 134 engages the plunger roller 133 for rearwardly swinging the frames 100, 104, thereby engaging the rollers 108, 110, with the sheet for feeding the same to and over the feed-plate 96, as will be understood from Figure 1.

The machine B is set in such relative position with respect to the addressing machine C that the sheet so fed by the rollers 108, 110, over the plate 96 will with its forward margin impinge the usual stop 149 of the machine C just as the rear margin of the sheet escapes from the rollers 108, 110, the latter therefore acting as a "back-stop", as may be said, for holding the sheet firmly against the stop 149 in longitudinal registration with the printing plate 150 of the machine C, as best seen in Figure 1.

A guide 151, preferably of angle section, is longitudinally mounted on the plate 96 for transversely adjustable movement thereover toward and from the bracket-wall 99, the guide 151 being provided with a pair of outwardly projecting plungers 152 slidably mounted in bosses 153 carried by the wall 99 and having suitable retaining elements or thumbscrews 154 for retaining the guide 151 in adjusted position. The plate 96 is provided in its forward margin with a cut-out or notch 155 for exposing the printing plate 150 therethrough, the guide 151 more or less overhanging the notch 155 for guiding a sheet into proper transverse registration of the sheet with the printing plate 150.

Oppositely to the guide 151 is a pair of so-called "joggers" 156, each comprising a felt pad or brush mounted in a head 157 supported on one end of a plunger 158 slidably mounted in and through the adjacent bracket-wall 98, suitable tensional members or springs 159 being mounted on the head 157 in engagement with the jogger 156 for pressing the inner margin thereof firmly on the plate 96 in order that the jogger 156 may be effective for engaging the adjacent margin of a sheet residing on the plate 96 as will shortly appear.

Adjustably mounted on the outer end of the plunger 158 is a collar 160, a suitable tensional member or spring 161 being mounted on the plunger 158 between the collar 160 and the adjacent bracket 98 for biasing the plunger 158 outwardly thereof for retracting the jogger 156 from the path of movement of a sheet traversing the plate 96. The plungers 158 are embraced by respective pairs of upper and lower forks 162 provided at the opposite ends of a cam-bar 163, each pair of the forks 162 also slidably engaging respective guide-brackets 164 projecting from the adjacent wall 98 for supporting the cam-bar 163 for movement longitudinally of the machine, as best seen in Figure 5.

The forks 162 normally slidingly engage the outer face of the respective collars 160, the latter being adjusted on the plungers 158 for thus limiting the spring-biased outward movement of the joggers 156. The respective forks 162 of each pair thereof are provided with vertically registering inwardly presented cam-lugs 165 adapted, on rearward shifting movement of the cam-bar 163, for engaging the adjacent collar 160.

The pan-shaft 87 is projected suitably through the frame-wall 68 and carries a crank 166 having operative connection, as by a link 167, with the cam bar 163. When the dwell *h* of the cam 146 engages the roller 147, the shaft 87 is oscillated for rearwardly swinging the crank 166 and correspondingly shifting the cam-bar 163, as shown in dot-dash lines in Figure 10, for thus, in turn, shifting the particular plunger 158 inwardly, the joggers 156 then engaging the adjacent margin of a sheet reposing on the plate 96 for shifting the sheet transversely of the plate until the opposite margin of the sheet is substantially engaged with the guide 151, thereby effecting transverse registration of the sheet with the printing plate 150, as will best be understood from Figure 3. This sheet registering action occurs just before the impression-head 168, of the machine C drops on the sheet for printing-engagement thereof with the printing plate 150. On completion of the impression-movement of the head 168, the dwell *k* engages the roller 147 for oscillating the shaft 87 sufficiently for releasing or retracting the joggers 156 from the now-addressed or printed sheet, the pan 85 meanwhile taking a position with its front margin or lip sufficiently elevated above the chute 95 for providing an exit throat therebetween, the pan 85, however, being at such time opposed to the stop 92 for preventing discharge of a sheet from the pan onto the plate 96, as best seen in Figure 10.

The drop portion *f* of the cam 134 having been meanwhile presented to the roller 133 and the frames 100, 104, forwardly oscillated, the sheet

reposing on the plate 96 is engaged between the rollers 110, 111, and rearwardly shifted into the throat between the pan 85 and the chute 95. The pan 85 is provided with a deflector 169 which, when the pan 85 is elevated as described, is suitably spaced from a downwardly rearwardly inclined discharge apron or extension 170 of the chute 95, as best seen in Figures 2 and 10.

Disposed in the path of a sheet moving between the deflector 169 and apron 170 are suitably registering pairs of upper and lower rollers 171, 172, respectively, mounted on correspondingly preferably squared shafts 173, 174, journaled in and between the frame side-walls 98, 99, the lower rollers working through slots, as 175, provided in the apron 170, for projecting a suitable distance thereabove, the rollers 171, 172, being preferably of rubber composition or the like, and adjustable on the shafts 173, 174, for peripherally contacting the opposite side margins of a sheet passing therebetween.

The shafts 173, 174, are suitably projected through the frame-walls 68 and carry similar gears 176 meshing at a one-to-one ratio, the shaft 174 also carrying a gear 177 meshing with a gear 178 mounted on the shaft 74 for driving the rollers at the same peripheral speed as that of the sheet-discharging rollers 109, as best seen in Figure 5.

From the apron 170 the sheet may most conveniently be discharged into a box or tray 179 supported for such purpose by any convenient means (not shown). Suitable so-called strippers 180, supported from a rod 181 disposed between the frame-walls 68, 69, are provided for extending into the box 179 for neatly stacking the sheets therein as best seen in Figure 1.

As has been said, the shaft 63 is the main driving member of the machine B, and carries a gear 182 meshing at a suitable "step-up" ratio with a gear 183 mounted on the shaft 33 for motivating the several rollers, and belts of the machine B at a suitable speed for the proper performance of its intended functions in timed relationship with the machine A. For such purpose, preferably, motive power for the machine B is supplied from the machine A, the shaft 63 carrying, for example, a sprocket 184 for operative connection with the machine A as by a chain or the like, not shown. In a similar manner, the shaft 63 carries another sprocket 185 for operative connection with the machine C, also as by a chain (not shown) for driving the latter in suitable synchronism with the machines A and B.

In the use and operation of my improved sheet handling machine, a printed sheet is discharged from the machine A, as has been said, with the printed side of the sheet uppermost. The sheet is transported by the carriers 8 to and around the drum 9 and deposited on the plate 38 with the printed side of the sheet inverted or on the bottom side thereof. The rollers 59 are then dropped on the sheet for engaging the same with the rollers 41, which feed the sheet to the belts 34, the latter in turn transporting the sheet to and through the pan 85 onto the plate 96, the rollers 108, 110, feeding the sheet over the plate 96 and retaining the sheet thereon longitudinal in registration with the machine C as described. The sheet is then jogged by the members 156 for effecting transverse registration of the sheet with the machine C, whereupon the head 168 thereof effects the printing of the address, or the like, on the sheet. This operation being completed, the sheet is removed from the plate 96 by means of the rollers 109, 111, and drawn over the apron 170 by the rollers 171, 172, for discharge of the sheet from the machine B into the receptacle or stacker-tray 179.

Meanwhile, approximately at the time the first sheet is on the belts 34, another sheet is discharged from the machine A, is turned over, and deposited on the plate 38. As the first sheet is being removed from the plate 96, the second sheet is fed to the belts 34 and arrives at the pan 85 shortly after the latter has been lowered into the chute 95, the first sheet having meanwhile been discharged from the machine. Again, while the second sheet is on the belts 34, a third sheet is discharged from the machine A, onto the carrier 8, there being thus three sheets in the machine B at such particular moment, and so the cycle is repeated as long as the machine is in motion.

As will be understood, the machine B is set up between the machines A and C for receiving a sheet from the former and presenting a sheet to and in proper registration with the latter. It may sometimes occur that the type on the cylinder of the machine A, is not in linear alignment with the type on the bed of the machine C, requiring a lateral shifting of the sheet in its passage through the machine B for effecting proper marginal registration of the sheet with the type set-up of the machine C. For such purpose, the guides 64 and 81, which cooperate with the belts 34 for guiding the sheet thereover, may be adjusted in suitably oblique positions for laterally shifting the sheet during its movement on and with the belts 34, as clearly shown in Figure 3.

As has been said, the sheet is positioned in longitudinal registration with the machine C by the cooperation of the rollers 108, 110, with the stop 149. However, the sheets to be handled have different lengths, whereas, generally speaking, the stop 149 is shifted for different lengths of sheets merely sufficiently for accommodating the varying distance of the address from the top of the sheet. For hence accommodating the longer sheets between the rollers 108, 110, and the stop 149, the extension B' is telescoped into the machine B, the belts 34 being maintained tight by cooperation of the pulleys 75, 78, the shaft 140 sliding through the bearings 142 and gear 144, the guides 81 sliding upon the guides 64, and, the stop 56 being suitably adjusted on the plate 38, as described, the adjustment is effected without disturbing the relationship of the machines A, B, C.

Also, by suitably adjusting the several belts, rollers, guides and joggers of the machine B, various widths of sheets may be readily handled therein, my sheet handling machine being highly efficient in the performance of its intended functions and of practical utility in the printing art.

It will be understood that changes and modifications in the form, construction, arrangement and combination of the several parts of my improved sheet handling machine may be made and substituted for those herein shown and described without departing from the nature and principles of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is,—

1. Sheet-handling mechanism comprising sheet-inverting means, sheet-positioning means, and intermittently actuable means for feeding an inverted sheet to the sheet-positioning means.

2. Sheet-handling mechanism comprising sheet-inverting means, a support for receiving an inverted sheet, sheet-positioning means, and intermittently actuable means for feeding an in-

verted sheet from the support to the sheet-positioning means.

3. Sheet-handling mechanism comprising sheet receiving means, sheet-inverting means, sheet-positioning means, means for feeding an inverted sheet to the positioning means, and means for discharging a sheet from the positioning means.

4. Sheet-handling mechanism comprising sheet-inverting means, sheet-positioning means, means for feeding an inverted sheet to the sheet-positioning means and means for removing a sheet from the positioning means.

5. Sheet handling mechanism comprising in combination, a rotary drum, endless carrier elements engaging said drum, and series of rollers circumferentially disposed about the drum in peripheral cooperation with said elements for engaging a sheet therebetween.

6. Sheet handling mechanism, comprising, in combination, a rotary drum, a transversely spaced series of endless carriers longitudinally movable over the drum, and guide members marginally bounding the series of carriers for guiding a sheet to the drum.

7. Sheet handling mechanism comprising, in combination, a rotary drum, endles carrier elements engaging said drum, series of rollers circumferentially disposed about the drum in peripheral cooperation with said elements for engaging a sheet therebetween, and guide members marginally bounding the series of carriers for guiding a sheet to the drum.

8. Sheet handling mechanism comprising, in combination, sheet-carrier means, sheet supporting means, and sheet-guiding means cooperable with the carrier means for deposit of the sheet in inverted position on the supporting means.

9. Sheet handling mechanism comprising, in combination, sheet carrier means, sheet supporting means, sheet-guiding means cooperating with the carrier means for deposit of the sheet in inverted position on the supporting means, and means for discharging the deposited sheet from the supporting means.

10. Sheet handling mechanism comprising, in combination, superposed rotary drums, a support disposed between said drums, means for guiding a sheet over one of said drums for deposit of the sheet in inverted position on the support, and means for feeding the inverted sheet to the other of said drums for removal of the sheet from the support.

11. Sheet handling mechanism comprising, in combination, superposed rotary drums, rollers engaged therebetween, means for guiding a sheet over the upper drum for inversion of the sheet and discharge thereof between said upper drum and the rollers, means for feeding the inverted sheet to and between the lower drum and the rollers, a feed-plate, and conveyor means engaging the lower drum for deposit of the inverted sheet on the feed plate.

12. Sheet handling mechanism comprising, in combination, superposed rotary drums, rollers engaged therebetween, means for guiding a sheet over the upper drum for inversion of the sheet and discharge thereof between said upper drum and the rollers, means for feeding the inverted sheet to and between the lower drum and the rollers, a feed plate, a pulley adjacent thereto, conveyor means engaging the lower drum and the pulley for deposit of the inverted sheet on the feed plate, and means for varying the distance between the pulley and the lower drum.

13. Sheet-handling mechanism comprising, in combination, sheet conveyor means, a feed-plate, a stop, and a shiftable sheet-support actuable for alternatively directing a sheet from the conveyor-means against the stop or onto the feed-plate.

14. Sheet-handling mechanism comprising, in combination, sheet-conveyor means, a feed-plate, a stop, a shiftable sheet-support actuable for alternatively directing a sheet from the conveyor-means against the stop or onto the feed-plate, shiftable sheet-feeding members cooperable for engaging a sheet on the feed-plate, and means for synchronously actuating the sheet-support and the sheet-feeding members for moving a sheet onto and over the feed-plate.

15. Sheet-handling mechanism comprising, in combination, a feed-plate, a stop spaced from the feed-plate providing a throat therebetween, a chute leading from said throat, a shiftable sheet-support actuable for alternatively directing a sheet through the throat onto the feed-plate and for directing a sheet from the feed-plate through the throat into the chute, and means for feeding a sheet to and from the feed plate.

16. Sheet-handling mechanism comprising, in combination, a feed-plate, a stop spaced from the feed-plate providing a throat therebetween, a chute leading from said throat, a shiftable pan actuable for alternatively directing a sheet through the throat onto the feed-plate and for directing a sheet from the feed-plate through the throat into the chute, and means for feeding a sheet to and from the feed-plate, said means including cooperating pairs of alternately shiftable sheet-feeding members, one pair of said members being engageable with the sheet for moving the sheet onto the feed-plate, and the other pair of said members being engageable with the sheet for moving the same off of the feed plate.

17. Sheet-handling mechanism comprising, in combination, a feed-plate, a conveyor for feeding a sheet to the feed-plate, roller-members arranged in co-operably approachable pairs for alternately engaging a sheet peripherally therebetween, and means for successively engaging said roller-pairs with the sheet at predetermined intervals for respectively moving the sheet onto and off of the feed-plate.

18. Sheet-handling mechanism comprising, in combination, sheet inverting means, a feed plate, means for feeding a sheet from the inverting means to the feed-plate, and means operable in sequence with the inverting means for moving the inverted sheet onto and off of the feed-plate.

19. Automatic sheet-handling mechanism for feeding a printed sheet from one printing machine to another printing machine, comprising means for receiving a printed sheet from the first machine, means for turning the sheet for inverting its printed face, means for feeding the inverted sheet to printing position of the second printing machine, means for removing the sheet therefrom, and means for actuating said mechanism in cyclic synchronism with said printing machines.

20. Automatic sheet handling mechanism for feeding a printed sheet from one printing machine to another printing machine, comprising means for receiving a printed sheet from the first printing machine, means for turning the sheet for inverting the printed face, means for feeding the inverted sheet to printing position of the second machine, and means for intermittentiy

actuating the feeding means in cyclic synchronism with said printing machines.

21. Sheet-handling mechanism comprising, in combination, first and second sheet-carriers, a sheet support, sheet guiding means co-operable with the first carrier for deposit of a sheet in inverted position on the support, and means for feeding the deposited sheet from the support to the second carrier.

22. Sheet-handling mechanism comprising, in combination, a first sheet-conveyor, a first sheet support, sheet guiding means co-operable with the first carrier for deposit of a sheet in inverted position on the first support, a second sheet-conveyor, means for feeding the deposited sheet from the first support to the second conveyor, a feed-plate, a stop; a second sheet support shiftable for alternatively directing a sheet from the second conveyor against the stop or onto the feed-plate, and means for synchronously actuating the feeding means and shifting the second support for delivery of a sheet from the first support to the feed-plate.

23. Sheet handling mechanism comprising, in combination, first and second printing machines, conveyor means including spaced drums and an endless carrier engaged therebetween for feeding a sheet from the first printing machine to the second printing machine, and means for varying the distance between said drums.

24. Sheet handling mechanism comprising, in combination, first and second printing machines, conveyor means including spaced drums and an endless carrier engaged therebetween for feeding a sheet from the first printing machine to the second printing machine, and means for varying the distance between said drums, said last mentioned means including a pair of telescopic frame-members each for supporting a respective drum, and pulleys on the respective frame member for overlapping engagement of one run of the endless carrier between the drums.

25. Sheet handling mechanism comprising, in combination, a feed-plate, series of roller-members arranged in respective co-operably approachable pairs for alternately engaging a sheet peripherally therebetween, a pair of opposingly rockable frames each supporting respective ones of the pairs of roller-members, means for revolving the respective pairs of roller-members in opposite directions, and means for alternately rocking the frames in opposite directions for engaging the respective roller-pairs successively with the sheet for respectively moving the sheet onto and off of the feed-plate.

26. Sheet handling mechanism comprising, in combination, a feed-plate, roller-members arranged in co-operably approachable pairs for alternately engaging a sheet peripherally therebetween, and means for successfully engaging said roller-pairs with the sheet at predetermined intervals for respectively moving the sheet onto and off of the feed-plate.

27. Sheet handling mechanism comprising, in combination, a feed-plate, roller members disposed in the plane of the feed-plate and arranged in first and second co-operably approachable pairs for alternately engaging a sheet peripherally therebetween, a stop for engagement by the sheet on release thereof by the first pair of roller-members for positioning the sheet for engagement thereof by the second pair of roller-members, and means for successively engaging said roller-pairs with the sheet at predetermined intervals for respectively moving the sheet onto and off of the feed-plate.

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