

Feb. 13, 1940.

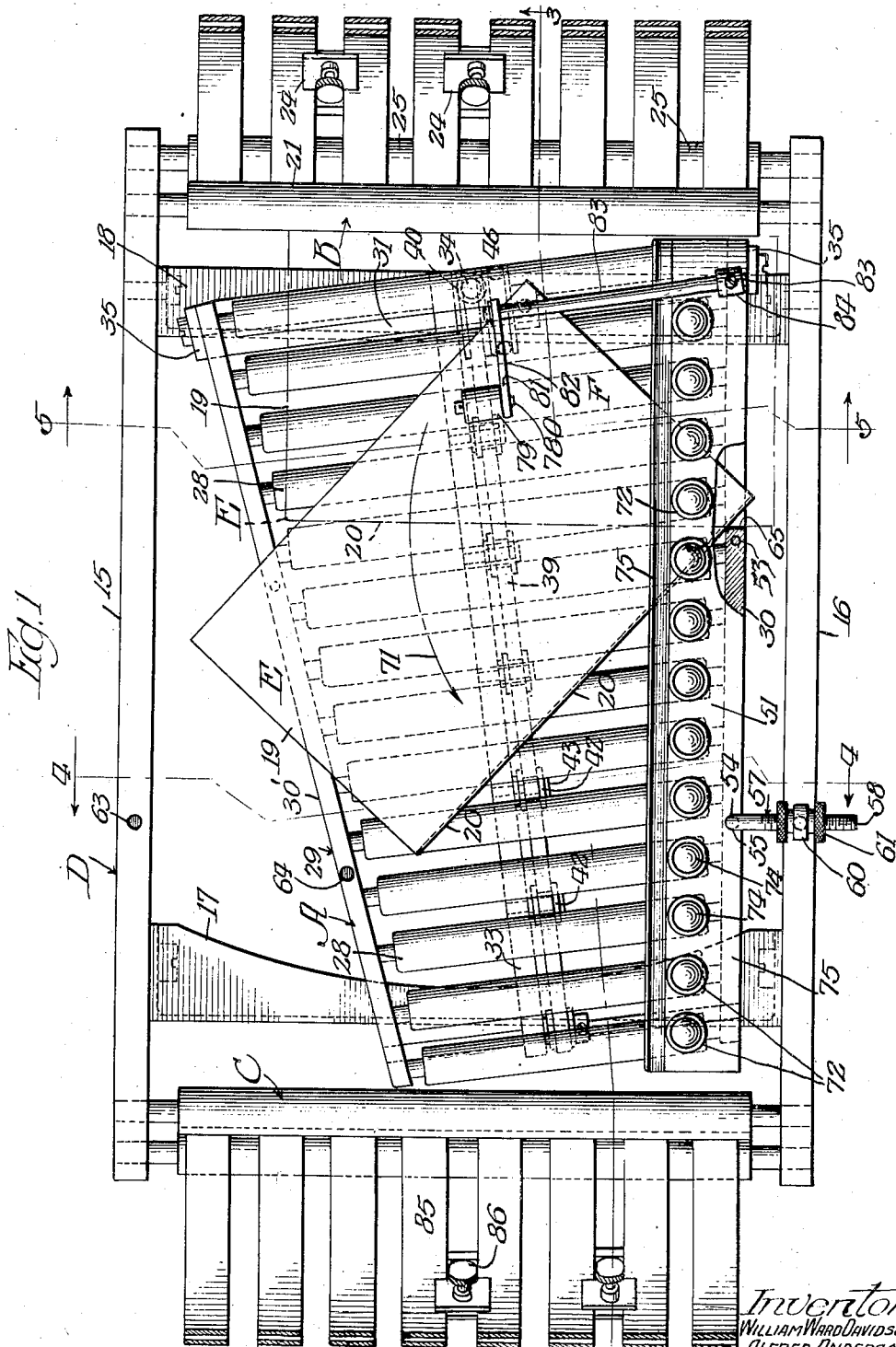
W. W. DAVIDSON ET AL

2,190,418

SHEET CONVEYER

Original Filed Feb. 24, 1936

6 Sheets-Sheet 1



Feb. 13, 1940.

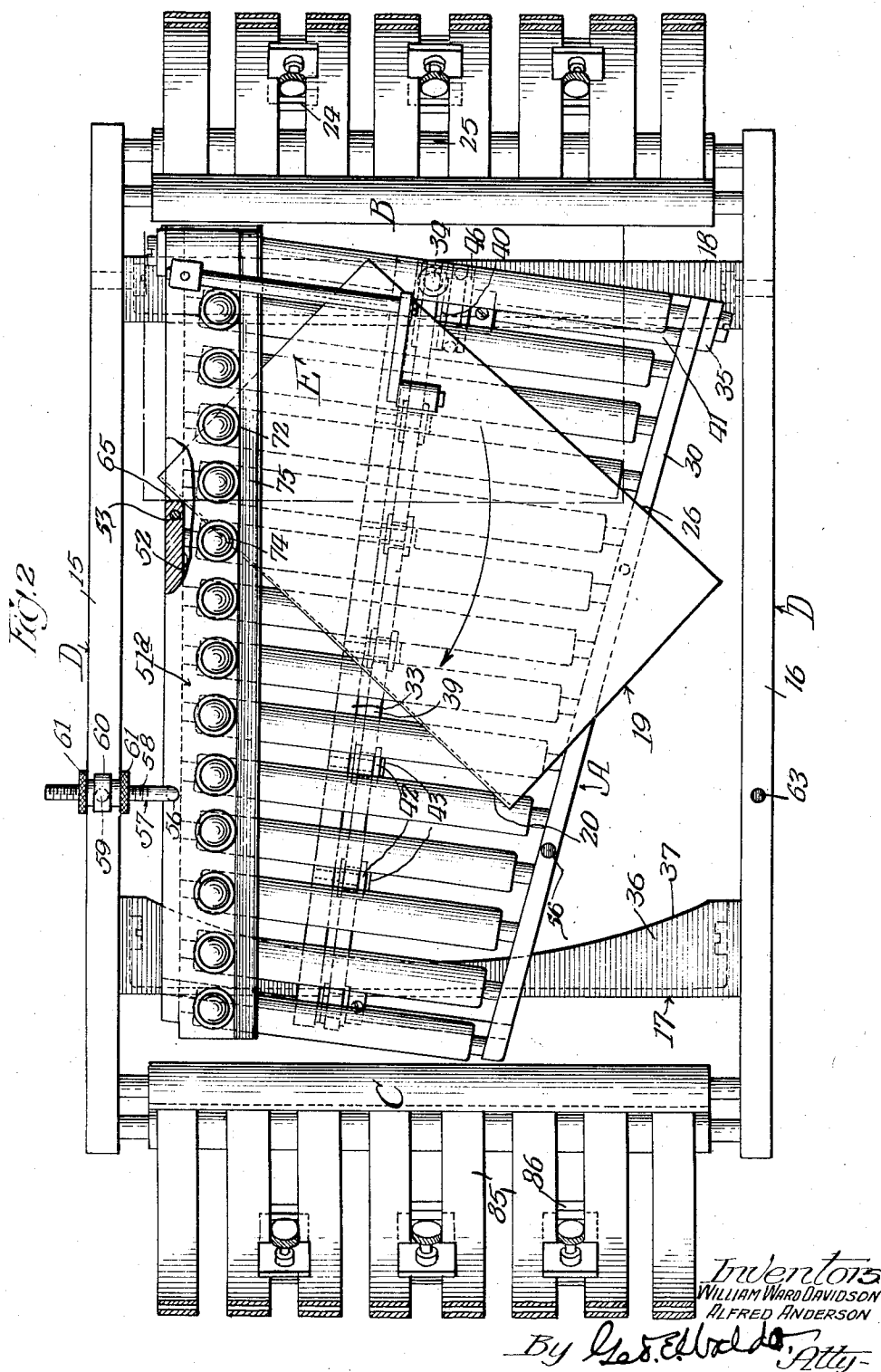
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SHEET CONVEYER

Original Filed Feb. 24, 1936

6 Sheets-Sheet 2



Feb. 13, 1940.

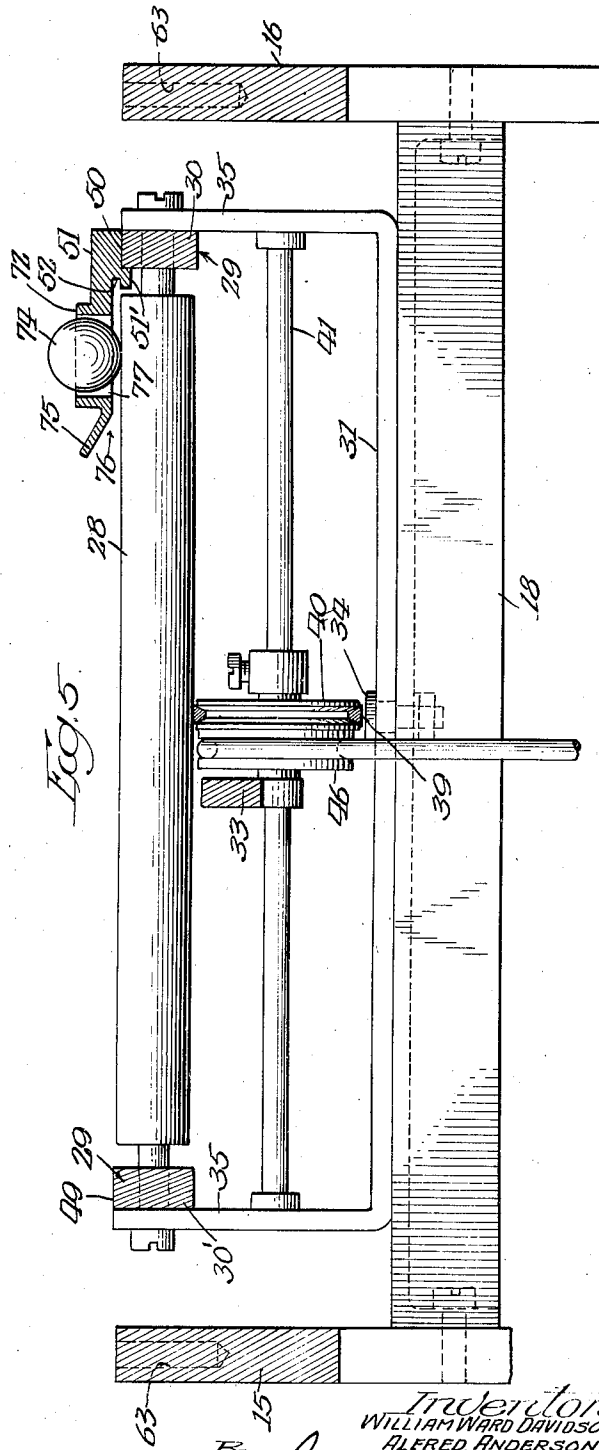
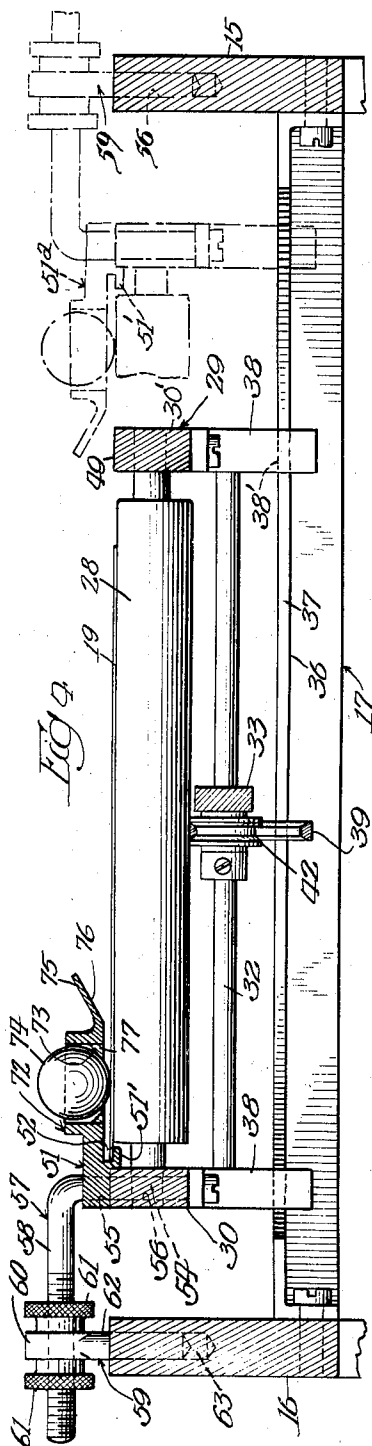
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SHEET CONVEYER

Original Filed Feb. 24, 1936

6 Sheets-Sheet 4



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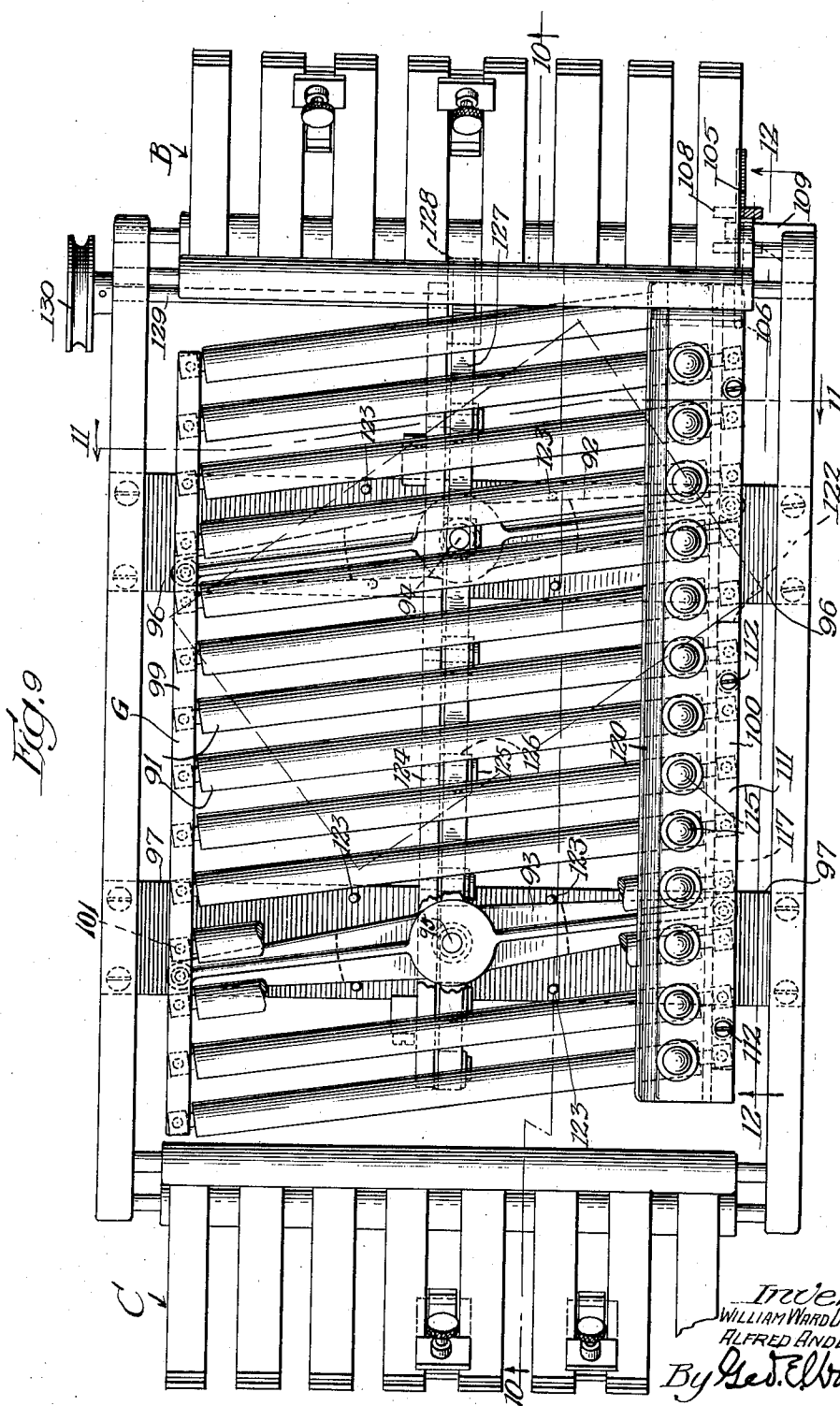
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SHEET CONVEYER

Original Filed Feb. 24, 1936

6 Sheets-Sheet 5



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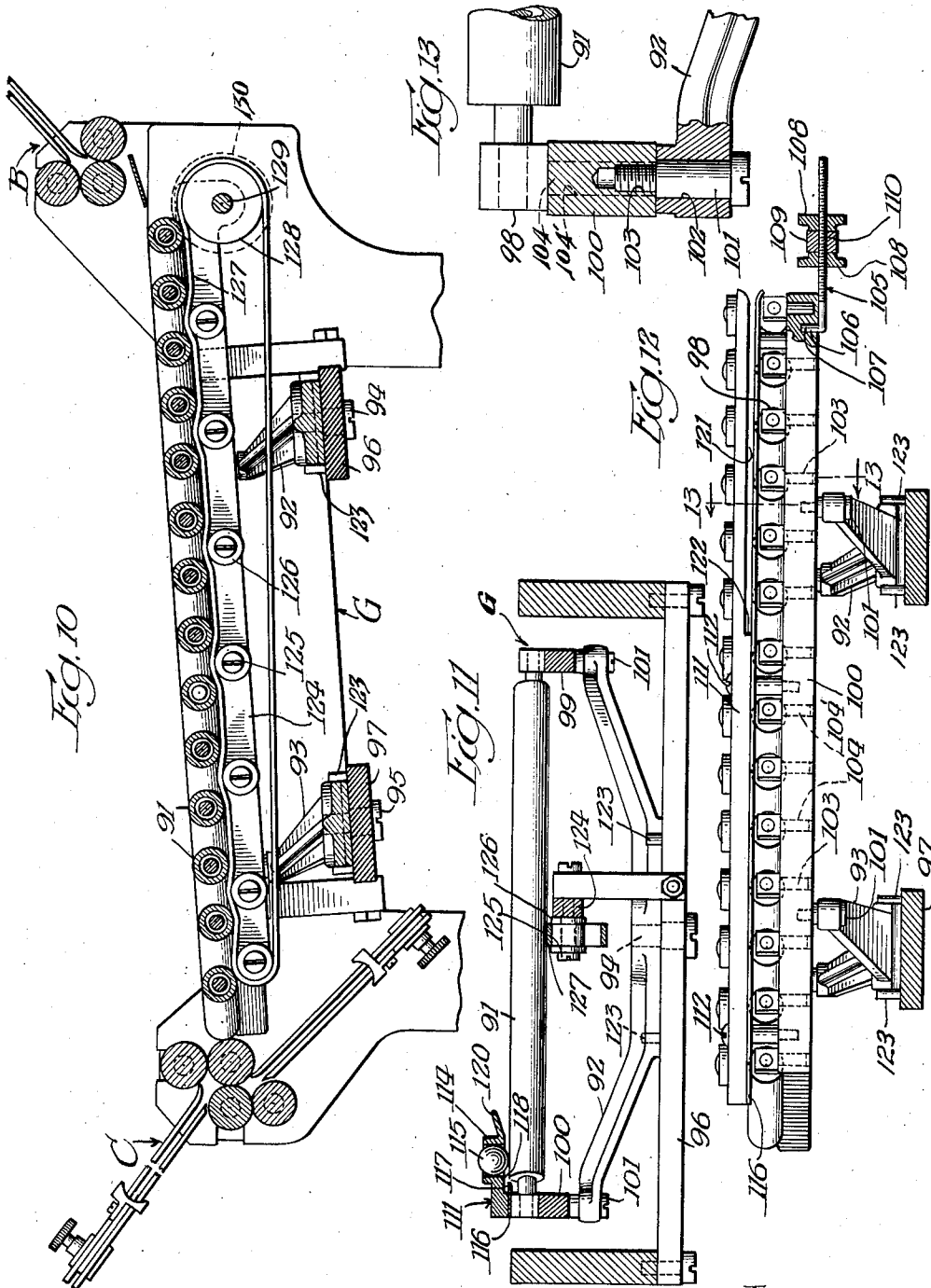
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SHEET CONVEYER

Original Filed Feb. 24, 1936

6 Sheets-Sheet 6



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UNITED STATES PATENT OFFICE

2,190,418

SHEET CONVEYER

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5 Claims. (Cl. 271—52)

This invention relates to improvements in conveyers especially adapted for conveying sheets of material such as sheets of paper and has special relation to a conveyer for causing the conveyed sheets to be aligned with an aligning means arranged selectively at one side or the other side of the conveyer.

An important feature of the invention relates to means associated with the conveyor for causing a conveyed sheet to be turned selectively clock-wise or anti-clock-wise through a desired angle, preferably 90 degrees, before it is delivered by the conveyer.

The turning of the sheet is usually for the purpose of presenting a different edge of the sheet as the forward edge, than the edge which was the forward edge as the sheet was fed to the turning device.

A further object is to combine such a conveying means with sheet folding devices capable of imparting folds to such a sheet some of which are at right angles to others and exposing either side of an outer flap as desired.

A further feature, which tends toward simplicity of construction, is that the folding devices are so arranged that the sheet travels continuously in the same direction through the machine, being turned thereby through the angle at which the folds are related, which is usually 90 degrees.

The folding devices with which the improved conveyer means is usually associated comprise a folding device of the buckle chute form to which the sheets are fed in flat form and which may be arranged to fold the sheet once or possibly a second time with a second fold parallel with the first fold, and a second folding device, preferably in the form of a buckle chute device arranged to produce two parallel folds in the partly folded sheet as delivered from the first folding device and which second folding device is arranged in parallel relation to the first folding device and the improved conveyer means arranged between the two folding devices for rotating or turning the partly folded sheet to the right or to the left through 90 degrees to present either end, as desired, to the second folding device with the object that the last fold imparted to the sheet shall present the desired flap to the outside.

In so far as this present invention relates to folding machines it is an improvement on the folding machine described and claims in U. S. Patent No. 1,620,444 issued March 8, 1927 to William Ward Davidson, one of the joint inventors hereof.

In said early machine means were provided for turning the partly folded sheet in either direction but the devices for aligning the sheet for proper presentation to the second set of folding devices required the turned sheet to be directed to a single aligning device at one side of the machine, this sometimes involved such a bodily side-wise movement of the sheet as it was carried forward by the conveyer as to be difficult if not impossible of accomplishment.

In the present machine the sheet, as it is turned, either to the right or to the left is arranged to be turned toward an aligning device and not require any excessive bodily sidewise movement before it reaches the second folding device.

The movement of sheets towards and into proper contact with the aligning devices may be accomplished by means of multiple roller conveyers, the rollers of the conveyer being preferably parallel with each other and set at a slight angle to the aligning device or bar but it should be understood that the present invention is not thus limited.

In the present invention as shown in the drawings, such a roller conveyer is made use of but the machine is arranged to provide an aligning device at either side and the conveyer is shiftable to alternately set the conveying rollers at the proper angle to the aligning device in accordance with the direction in which the partly folded sheet is turned or rotated as it passes from one end of the conveyer to the other end for the purpose of properly presenting the partly folded sheet to the device which is next to operate on the sheet, such as a second folding device.

For accomplishing the above and other objects the invention consists in the features of construction and combinations of parts, devices and mechanisms as illustrated by the accompanying drawings taken in conjunction with the following description and the appended claims, such disclosure of the invention, constituting, however, merely an exemplification of the invention, and it should be understood that the invention is not limited thereby to such specific constructions and combinations of specific devices except within the scope of the appended claims.

The invention will be more readily understood by reference to said drawings, in which:

Fig. 1, is a top plan view of the machine with the associated buckle chutes being shown in horizontal section (except the lower chute at the left end of the conveyer, this chute being omitted for the sake of clearness), and the sheet turning

mechanism being shown as arranged for rotating the passing sheet to the left, in other words in an counter-clock-wise direction;

Fig. 2 is a view similar to Fig. 1, but showing the turning mechanism arranged to turn a passing sheet to the right or in other words in a clock-wise direction;

Fig. 3 is a vertical longitudinal section on the line 3—3 of Fig. 1;

Figs. 4 and 5 are transverse, vertical sections on the lines 4—4 and 5—5 respectively of Fig. 1;

Fig. 6 is a fragmentary side elevation particularly showing the sheet guide and abutment for effecting the turning of the sheet;

Figs. 7 and 8 are perspective views illustrating sheets completely folded, Fig. 7 showing the sheet folded to place one end flap on the outside, and Fig. 8 showing the sheet folded to place the other end flap on the outside;

Fig. 9 is a top plan view, similar to Fig. 1, partly broken away, and showing a slight modification of the means for shifting the rollers of the conveyer;

Fig. 10 is a vertical, longitudinal section on the line 10—10 of Fig. 9;

Fig. 11 is a vertical, transverse section on the line 11—11 of Fig. 9;

Fig. 12 is a vertical, longitudinal section substantially on the line 12—12 of Fig. 9; and

Fig. 13 is a fragmentary, detail, vertical section on the line 13—13 of Fig. 12.

In said drawings A represents generally the conveyer mechanism arranged between a folding mechanism B at the entering end of the sheet conveyer and a second folding mechanism C at the delivery end of the conveyer.

The machine as shown has a rigid frame D comprising longitudinally extending side frame members 15 and 16 rigidly held together by horizontal cross frame members 17 and 18 secured at their ends to the side frame members, and the various operative devices and mechanism are suitably mounted on said frame D. As shown in Figs. 1, 2, 3 and 6 the sheets enter the conveyer at the right hand end and as illustrated are delivered folded at the left hand end.

The machine, as shown, is arranged and adapted, primarily to receive flat sheets as shown at 19 (Fig. 3) which are folded once by the folding mechanism B, and then delivered by the folding mechanism B with the folded edge 20, in advance. The turning mechanism of the conveyer then operates on the sheet to turn the fold 20 either to the left, as shown in Fig. 1, or to the right, as shown in Fig. 2, to position the fold at the left hand side or at the right hand side thus presenting either one end E or the opposite end F of the once folded sheet to the second folding mechanism, as may be desired, in order to place one end flap or the other end flap on the outside of the completely folded sheet as indicated in Figs. 7 and 8.

The sheet 19 as delivered by the first folding mechanism B to the conveyer, and as shown in dot and dash lines on Fig. 1, is delivered with its fold 20 at the forward edge of the partly folded sheet and this is also the situation as shown on Fig. 2, and also Fig. 9.

The right hand end of the folded sheet as delivered to the conveyer is designated as E and the opposite end as F and for clearness these same designations are applied in Figs. 7 and 8. In one instance the end portion or flap E is outside as shown in Fig. 7 and in the other instance

as shown in Fig. 8, the other end portion or flap F is outside.

It should be understood that while a sheet is shown as being folded once with a cross fold and twice with folds at right angles to the first fold, which is the usual manner of folding an ordinary business letter sheet to be placed in an ordinary small envelope, the invention is not limited to such specific folds but is useful in connection with folding mechanisms arranged and adapted to produce other sequences of folds, the fundamental idea involved being that by means of adjusting or setting the conveyer and the turning mechanism the arrangement of the overlapping end flaps E and F can be reversed without making any especial adjustment or changes in the second folding mechanism except possibly such as would change the relative widths of the end flaps.

As shown in the drawings particularly Fig. 3 the first folding mechanism comprises what is known as a single fold buckle chute folder. This consists of an upper feed roll 21, a cooperating lower feed roll 22 a buckle chute 23 provided with an adjustable stop 24 and a third roll 25 arranged to cooperate with the lower feed roll 22 to produce the fold in the passing sheet and discharge the sheet, with one transverse fold, to the sheet conveyer A. A downwardly inclined guide plate 25' is arranged to receive the folded sheet from the first folder B and guide the sheet down upon the top of the conveyer.

It should be understood that the folding mechanism is typical of any machine or device for operating on the sheets and preferably delivering them one by one to the conveyer A.

It should also be understood that such delivery of the sheets to the conveyer might conceivably be manually accomplished.

The first folding mechanism B, as shown, is arranged at a higher level than the second folding mechanism C and they are arranged parallel with each other. The conveyer is arranged between these two folding mechanisms and is constructed to act as a turning mechanism to receive the sheet with its first or initial fold 20 and deliver it to the second folding mechanism C to be given the remaining folds as shown at 26 and 27 respectively on Figs. 7 and 8. This turning and conveying mechanism A is provided with a series of conveying rollers 28 arranged parallel with each other in a plane which is slightly inclined downwardly from the entrance end to the delivery end to assist in the forward movement of the sheets.

It is well known that when a series of conveyer rollers are used to advance a sheet to another device, such as the folder C, it is desirable that the rollers be so arranged, relatively to the desired direction of travel of the sheet, that the sheet is carried into contact with a guide member to straighten the sheet and direct it to the next device at the proper place and in its desired relative position, and that this action of the rollers is attained by inclining the rollers slightly relatively to the aligning guide so that, as the sheet is advanced by the conveyer, it will be carried into contact with the sheet guide with enough force to cause the moving sheet to be aligned therewith.

In the present device as shown in Figs. 1 to 8 inclusive the several conveyer rollers 28 are mounted in a generally rectangular frame 29 having side bars 30 and 30' which are rigidly connected by a cross bar 31 at one end and a

spacer rod or bar 32 at the opposite end, and these two cross bars are rigidly connected together by a longitudinal bar 33 which is beneath the rollers 28 and substantially midway transversely of the frame 29.

The cross bar 31 is pivotally mounted at substantially the midpoint of the transverse frame member 18, to swing in a horizontal plane, by means of a vertical pivot bolt 34. This cross bar 31 has upturned ends 35 which are rigidly secured at their upper ends to the side bars 30 and 30' of the frame 29.

The opposite or delivery end of the conveyer frame 29 is so supported that while the conveyer frame 29 can swing from side to side on the pivot bolt 34 the conveyer frame will be maintained in a slightly downwardly inclined plane to properly deliver the sheets to the second folding mechanism C. For thus supporting the frame 29, the cross bar 17 of the machine frame has an upper horizontal flange 36, which projects toward the opposite end of the machine and its free edge 37 is curved on a radius struck from the pivotal point 34 of the frame 29, and the center longitudinal bar 33 of the frame 29 has secured thereto and dependent therefrom a rigid support bar 38 which is provided with a notch 38' to receive the rear edge 37 of the bar 17 and thus support the forward end of the conveyer frame 29 in its true position as it is swung from side to side.

In order that the rollers 28 shall carry the sheets received by the conveyer and deliver them to the second folding mechanism C, the rollers must be continuously rotated in anti-clock-wise direction, as portrayed in Fig. 3 of the drawings. For this purpose a drive belt 39 is provided which extends longitudinally of the conveyer and preferably midway transversely of the conveyer. This belt contacts with the undersides of the rollers 28 and at the pivoted end of the conveyer frame it is trained around a drive pulley 40 carried on a cross shaft 41, and its upper stretch is adapted to be pressed against the several conveyer rollers 28 by idling pulleys 42, mounted on horizontal bearing studs 43 carried by the longitudinal bar 33. These idling pulleys are arranged, one between each two of the rollers 28, as best shown in Fig. 3, and they are so arranged that the belt 39 is pressed up so as to embrace substantial circumferential portions of the rollers 28. The belt 39 as best shown in Figs. 4 and 5 is a V-shaped belt and its outer flat surface is in position to be pressed against the rollers 28 to rotate them.

Power for driving the belt pulley 40 is preferably derived from a horizontal shaft 45 rotatably carried in suitable bearings on the side frames 15 and 16 below the shaft 41. The shaft 45, which may be rotated by any suitable means not shown, has a belt pulley 44 and the shaft 41 carries a second pulley 46 rigidly connected with the belt pulley 40 (on the same shaft) to rotate therewith and these two pulleys 46 and 44 are operatively connected by a belt 48. Preferably the belt 48 is a round belt and will properly drive the upper pulley and the conveyer even when the conveyer frame is swung for use to either side out of its central position.

As explained the conveyer rollers 28 are parallel with each other and when the conveyer frame is centrally located these rollers extend substantially exactly transversely of the machine.

It will now be evident that when the conveyer frame is swung to the left, as shown in Fig. 1,

the conveyer rollers 28 will be set in inclined position relative to the direction of travel of the sheets along the conveyer. The inclination of the rollers 28, as shown in Fig. 1, is such that their right hand ends when viewed in the direction of paper travel are in advance of their left hand ends and they would consequently tend to shift the conveyed sheets toward their left hand ends and they will conversely tend to shift the sheets toward their right hand ends when the conveyer frame is swung to the opposite side of the machine as shown in Fig. 2.

As shown in Figs. 1 and 2 the conveyer frame 29 is tapered longitudinally, the forward or delivery end being narrower than the other end, and the taper is sufficient so that as the frame is swung to either side, the outer side bar, either 30 as shown in Fig. 1 or 30' as shown in Fig. 2, is set substantially parallel with the desired line of travel of the sheets, that is, at substantially a right angle, to the rollers of the second folding mechanism C.

The side bars 30 and 30' have top surfaces 49 and 50 respectively which are arranged substantially in the plane of the tops of the conveying rollers 28 and left and right guide members 51 and 51a, respectively, which have inner longitudinal, vertical guide surfaces 52 with which the sheets are caused to contact as they are carried along by the conveyer, are adapted to be removably secured on these top surfaces 49 and 50. Each of these guide members is adapted to be rigidly secured on top of one of the side bars 30 or 30' of the conveyer frame as by a screw-bolt 53 near one end and a dowel pin 54 near the other end. The guide member is provided with a vertical hole 55 and the side bar 30 is provided with a registering hole 56 for receiving the dowel, and likewise the side bar 30' and guide member at the other side.

As shown in Fig. 4, each of the guide members 51 is provided with a longitudinally extending horizontal guard ledge or lip 51' extending inwardly just below the guide surface 52. This guard ledge 51' projects toward the adjacent ends of the rollers 28 and just below the tops of the rollers, and fills in the clearance space at the ends of the rollers thus preventing the edges of the conveyed sheets from curling down into this space, but on the other hand this guard ledge causes the edges of the sheets to be properly directed to contact with the guide surface 52.

While stops might be provided to limit the swinging of the conveyer frame in each direction it is preferred to provide an adjustable device in order to be able to set the conveyer accurately in relation to the folding mechanism C in order to produce a folded sheet in which the folds are substantially perfect.

This adjusting device for the conveyer comprises an L-shaped rod 57 one end portion of which constitutes the dowel pin 54 and the other end portion 58 is received in an upstanding post 59 which is provided, at its upper end, with an eye 60 through which eye or perforation the end 58 passes. The end 58 is screw-threaded to receive adjusting nuts 61 which engage the eye 60 on opposite sides and by which the accurate side-wise adjustment of the conveyer frame and consequently of the sheet guiding surface is accomplished in an obvious manner. The post 59 has a shank 62 which is received in holes 63 provided in the side frame members 16 or 15 of the machine frame according to the side of the machine toward which the conveyer is

swung. The frame adjusting device is located towards the end of the frame opposite to the pivoted end (the right end, Fig. 1) and it not only serves for accurately adjusting the aligning surface but also as a means for firmly holding the frame in its adjusted position.

As shown in Fig. 1, the conveyer frame adjusting and holding device is arranged at the side of the machine toward which the conveyer has been swung that is at the left side, as shown in Fig. 1 and when the conveyer is swung over to the right, the adjusting device as well as an aligning member are arranged at the right side of the machine.

As explained, preferably, the conveyer is tapered longitudinally being of greatest width at its receiving end and being of less width at its delivery end the taper being such that when the conveyer is swung to the left as shown in Fig. 1 the side bar 30 of the conveyer frame will be substantially parallel with the side bar 15 of the machine frame and when swung to the right the side bar 30' of the conveyer frame will be substantially parallel with the side bar 16 of the machine frame.

It is to be noted that the two side frame members 15 and 16 of the machine frame are provided with the holes 63 for receiving the post 59 and that the two side bars 30 and 30' of the conveyer frame are provided with threaded holes 56 for receiving the dowel 54 and thus the change of the conveyer from one position, as shown in Fig. 1, to the opposite position, as shown in Fig. 2, can be readily accomplished.

The inclination of the conveyer rolls 28 to the sheet alignment guide, as shown in the drawings, and as usual in the operation of such conveyers is such as to constantly urge or shift, the sheet being conveyed transversely against the aligning surface.

As shown the rollers 28 extend out from the aligning surface 52 at a slight forward angle thereto, and as the pivot 34 upon which the conveyer frame swings, is midway between the side bars 15 and 16 of the machine frame, the inclination of the rollers will be reversed as the conveyer frame is swung from one side to the other so that the rollers will act to cause the sheets to contact with the guide in both positions of the conveyer, that is, toward the guide at the left when the conveyer is swung to the left and toward the guide at the right when the conveyer is swung to the right.

As explained the fold 20, as produced in the sheet 19 by the first folding device B is the forward edge of the partly folded sheet as it is delivered to the conveyer A, and in order to cause the sheet to turn through a desired angle to place the fold 20 at one side or the other a stop or abutment 65 is provided against which the sheet 19 contacts near one end of the sheet as the sheet is carried forward by the conveyer.

As shown in the drawings the stop or abutment 65 is formed on the guide member 51, the member 51 being provided with a guide slot 66 which at the entrance end of the conveyer is open as shown 67, Fig. 6, to freely receive the sheet as it is delivered to the conveyer. The lower wall 68 of the slot 66 is substantially in the plane of the top surfaces of the rollers 28 and at the opening of the slot 66 the wall 68 is rounded down as shown at 69 and the upper wall of the slot 66 is rounded up as shown at 70 so as to avoid any obstruction to the sheet freely entering the slot

66.

As shown in dotted lines Fig. 1, the sheet 19 is carried substantially straight forward at the entrance end of the conveyer except that it will be shifted slightly to the left by the conveyer rolls until it is carried against the abutment 65, but such slight shifting of the sheet is desirable to avoid any possibility of the sheet passing the abutment 65 without contacting it.

Once the sheet 20 has been carried into contact with the abutment 65 the further action of the conveyer will be to tend to carry the sheet forward, but one end being stopped by the abutment 65 against forward movement, the sheet will be swung around on the abutment 65 as upon a pivot as indicated by the curved arrow 71 on Fig. 1.

Such swinging or turning of the sheet 19 continues until its forward edge, which in the form shown is the fold 20, is brought substantially parallel to the guide surface 52, at which time the side wise shifting action of the conveyer rolls is brought into action and the sheet is forced into contact with the longitudinal guide surface 52 and is properly directed thereby to the second folding device C.

For the purpose of holding the sheet down on the rollers 28 with sufficient pressure to cause the rollers to carry the sheet forward, the inner edge portion 72 of the guide member 51 is extended inwardly throughout its length and at such a height as to permit the sheet 20 to slide along freely beneath same, and said inward extension is provided with vertical pockets 73 open top and bottom and of such diameter as to freely receive balls 74 and permit them to freely rise and fall therein.

These balls 74 being on the conveyer side of surface 52 are in position to contact with the sheet 19 as it passes beneath same. The balls 74 are spaced longitudinally of the machine to correspond with the spacing of the rollers 28 beneath same and the balls are arranged directly over the rollers so that each ball will tend to press the sheet down on the corresponding roller and produce sufficient friction to cause the rollers to drag or move the sheet forward.

The free inner edge portion 75 of the inwardly projecting part of the guide member is inclined upwardly to avoid any obstruction which might hinder the turning movement of the sheet and the under side 76 of this inclined edge 75 provides an inclined guide to direct the sheet beneath the guide member and beneath the balls 74. Preferably the ball sockets 73 are decreased in diameter slightly at their lower ends, as shown at 77, just sufficient to prevent the balls 74 from dropping out of the sockets when the guide member 51 is removed from the conveyer preparatory to placing a similar guide such as guide 51a 60 on the opposite side of the conveyer as shown in Fig. 2.

It is obvious that the guide member 51 shown in Fig. 1 and that shown in Fig. 2 are similar to each other except that they are the reverse of each other that is, one is a left hand guide and the other is a right hand guide. The left hand guide 51 is shown in full lines in Fig. 4 and the right hand guide is shown in the same figure in dotted lines.

In Fig. 2 the right hand guide is in place and is held in proper alignment by the guide holding and adjusting device shown and described in relation to Figs. 1 and 4. In this Fig. 2 the operation of the conveyer as it turns the sheet to the

right is illustrated, the sheet 19 being turned as indicated by the curved arrow 78.

Ordinarily the traction on the sheets produced by the balls 74 is sufficient to cause the proper conveying and turning of the sheets but in some instances it is necessary to add to this function and for this purpose there is a simple traction device added as illustrated in Fig. 1. This comprises a relatively short roller 79 arranged to normally rest on one of the conveyer rollers 28 and mounted for free rotation on a horizontal bearing pin 80 carried in the free end 81 of a vertically swinging lever 82 which is pivotally mounted at its opposite end on a horizontal bearing pin 83 carried at the top of a post 84 rigidly secured to and upstanding on the guide member 51. The arm or lever 81 extends rearwardly of the conveyer A and the roller 79 is preferably held yieldingly pressed down on one of the rollers 28 by gravity. This traction roller is free to rise to let a sheet 19 pass beneath it and then it presses the sheet against the underlying roller 28 and thus assists in applying conveying force to the sheet. The roller 79 not being very long offers practically no hindrance to the turning movement of the sheet.

It will be obvious that the traction roller 79 with its support can be readily shifted to the other side when the conveyer frame is shifted to the position shown in Fig. 2, and though not shown in Fig. 2, would normally be used.

By reference to Fig. 1, it will be seen that the partly folded sheet is being turned, to place the end portion which will later form the flap E, as shown in Fig. 7, at the forward end to be first presented to the second folder C.

This folder C has a first buckle chute 85 provided with an adjustable buckle chute stop 86 and a second buckle chute 87 also provided with an adjustable stop 88. The folder C also comprises the usual pairs of rollers for carrying the sheet through the folder, folding it as it passes through and delivering the sheet in its folded condition.

To complete the folding of the partly folded sheet as illustrated in Fig. 7, with the flap E on the outside, the stops on the buckle chutes of the folder C are set so that the fold 89 see Fig. 7, will be first made by the assistance of the first buckle chute 85 and afterward the second fold 90 is made by the operation of the lower buckle chute 87, the buckle stops being adjusted to cause this result.

The forward end E of the partly folded sheet is first presented to the folding mechanism and the fold 89 at the opposite end is first produced forming the flap F, then when the end E is folded down by the operation of the second buckle chute 87 the end or flap E will be on the outside as shown in Fig. 7.

The result as shown in Fig. 8, is attained by turning the sheet 19 to the right as shown in Fig. 2 and first presenting the end F or flap F on the outside of the completely folded sheet.

All of the flaps or panels of the completely folded sheet, as shown in Figs. 7 and 8, need not be substantially equal to each other, but as well known, to those versed in the art, the sheets can be folded to produce the panels and flaps of different relative widths, as desired, within the limits of the folder.

The special function of this present invention, so far as it relates to associated folders, is that of enabling the operator to readily cause either

end of the sheet, as delivered to the conveyer, to be presented to the second folder C.

It will be obvious, as those skilled in the art know, that if the opposite side of the once folded sheet is to be finally exposed it is only necessary to turn the sheets end for end before they are fed to the first folder B.

In the form of the machine, so far described, the rollers of the conveyer are changed in their angular relation to the conveyer guide by the swinging of the roller frame, from one side of the machine to the other side.

In Figs. 9 to 13 inclusive another way is shown of changing the inclination of the conveyer rollers for the same purpose as in the form already described, that is, for effecting the aligning of a conveyed sheet selectively with a longitudinal guide at the left or the right and to present one end or the other end of the partly folded sheet to the second folding mechanism C, with the result of placing one end flap on the outside as shown in Figs. 7 and 8.

In the form shown in Figs. 9 to 13 inclusive a sheet turning and conveying mechanism designated by "G" is arranged similarly to the conveyer A, that is, between a first folding mechanism B and a second folding mechanism C both as shown being of the buckle chute kind. As before, and as shown in Fig. 10, the conveyer mechanism is lower than the folder B to receive partly folded sheets therefrom and is higher than the folder C to deliver the partly folded sheets thereto. The conveyer G has a series of conveyer rollers 91 arranged in a plane and this plane inclined downwardly slightly, from its entrance end, adjacent the folder B, to its delivery end, adjacent the folder C, to assist in the forward movement of the sheets.

For changing the inclination of these rollers to turn the fed sheets to the left or to the right as desired they are not mounted in a rigid frame as in the first form described but are so mounted that each individual roller is shifted from one relative inclination to the opposite inclination but they are so related that the whole series is shifted simultaneously.

This mounting consists of two cross bars 92 and 93 extending transversely of the machine and pivotally mounted at their transverse middle points, as shown at 94 and 95 respectively, to swing horizontally. These pivots 94 and 93 are carried by machine frame cross bars 96 and 97 respectively.

The conveyer rollers 91 are rotatably mounted at their ends in pivotally mounted bearing boxes 98 which are carried by longitudinally extending conveyer side bars 99 at one side of the machine and 100 at the other side of the machine. The side bars are carried on the ends of the swivel cross bars 92 and 93 being mounted thereon and secured thereto by pivot bolts 101, one for each end of each swivel bar and which bolts are mounted in suitable holes 102 in the ends of the cross bars 92 and 93 and holes 103 in the longitudinal bars 99 and 100.

The boxes 98, in which the ends of the rollers 91 are rotatably mounted, have shanks 104 which are received in vertical holes 104' in the side conveyer bars 99 and 100.

The rollers 91 are changed from an inclination in one direction, to the normal direction of travel of the sheets, to an opposite inclination by shifting the longitudinal bars 99 and 100 longitudinally of the machine one in one direction and the other in the other direction by swinging

the cross bars 92 and 93 on their center pivots 94 and 95, and the rollers are held in their inclined positions by a rod 105 (Fig. 12) which is arranged to extend longitudinally of the machine and has a hook 106 formed at one end which engages in a hole 107 in the lower side of the longitudinal bar 100. The body of the rod 105 extends lengthwise of said bar 100 and is screw-threaded to receive adjusting nuts 108 which are adapted to engage opposite sides of a post 109 which is rigidly carried by the frame of the machine. The post has a hole 110 through which the rod freely passes. This rod is long enough and sufficient adjustment is provided to change the inclination, of the rollers 91, from one extreme to the other. By means of the screw-threaded rod 105, the cooperating nuts 108 and the rigid post 109 the adjustment of the rollers relative to the second folding device C can be made to properly feed the sheets to said folding device.

As in the form heretofore described it is necessary to provide a guide member at the ends of the conveyer rollers towards which the sheets are turned and carried to guide the sheets as they pass to the second folding device C.

In this modified form a guide member 111 is provided which extends longitudinally of the machine and is carried on one of the longitudinal side bars of the conveyer, as shown in the drawings, it is arranged on the side bar 100. The guide member 111 is secured to the side bar 100 by vertical screw bolts 112 which are received in suitable threaded holes provided in side bar 100, and pass through suitable spacers 113 arranged to set the guide member above and free of the bearing boxes 98 so that the guide will not interfere with the adjustment of the rollers 91.

As in the former instance the guide member is provided with sockets 114 for receiving balls 115 the lower ends of the sockets being slightly contracted to prevent the balls falling out when the guide is removed from the machine.

In this form of the machine there is a guard plate 116 provided, which is clamped between the bottom of the guide member 111 and the spacers on which it is secured, and has a free edge 117 projecting inwardly towards the ends of the rollers 91 to prevent the edges of the passing sheets curling down into this clearance space.

The guide member 111 projects inwardly over the rollers 91 and its under side 118 is spaced slightly above the rollers to permit the sheets to enter freely beneath same and beneath the traction balls 115, and the guide member is provided with a vertical longitudinally extending guide surface 119 against which the edges of the sheets are carried by the rollers 91 as the sheet is conveyed forward by same.

The inner edge 120 of the guide member 111 is inclined upwardly as in the form first described and for the same purpose.

As in the first described form the guide member is provided with a slot 121 at its receiving end and a stop or abutment 122 against which the sheet is carried and by the co-operation of which the sheet is turned by the conveyer.

It will be obvious, without illustration or description, that a traction roller similar to the roller 79 could be applied to this present form of device.

In order to prevent the swivel bars 92 and 93 being moved too far in either direction, rigid stops 123 are provided at each side of each end of said

swivel bars rising from the machine frame cross bars 96 and 97.

The folding mechanisms B and C shown in connection with the second form of device operate the same as with the first form.

When it is desired to reverse the turning of the sheets by the second form of device it is only necessary to shift the rollers as described to the reverse inclination and to apply a guide member to the right hand side of the machine similar to that shown on the left hand side in Fig. 9.

The method of driving the conveyer rollers 91 is similar to that already described in reference to the first form. A rigid central longitudinally extending bar 124 is provided rigidly carried by the frame cross bars 96 and 97 on which horizontal studs 125 are rigidly mounted for carrying idler belt pulleys 126 which are rotatably mounted thereon and which serve, as best shown in Fig. 10, to press a belt 127 against the undersides of the rollers 91.

This belt is trained around a driving pulley 128 secured on a cross shaft 129 mounted in suitable bearings on the machine frame. This shaft 129 may be driven by any suitable means and as shown as provided at one end with a belt pulley 130 for this purpose.

It should be understood, while roller conveyers are shown in cooperation with folding devices that our invention is not limited to this specific form of conveyers or associated mechanisms but contemplates the use of any form of conveyer which can be selectively arranged to carry a conveyed sheet against a guide at either side of the conveyer, and in cooperation with means for turning a conveyed sheet through a desired angle either to the left or to the right as desired, as such a conveyer can be used with associated mechanisms other than those shown.

We claim:

1. A substantially horizontal sheet conveyer adapted to receive sheets at one end and deliver them at its directly opposite end, sheet turning mechanism associated with the conveyer capable of being arranged to turn conveyed sheets through ninety degrees either to the right or to the left as may be desired, a sheet guide toward which the sheets are turned and arranged at an angle to the uncontrolled line of travel of the sheets on the conveyer so that the turned sheets will be carried into contact with the guide, an associated machine to which the conveyer is adapted to deliver the sheets, the conveyer having a frame which is narrower at its delivery end than at its entrance end and movable so as to cause the guide to properly direct the sheets to the associated machine whether the guide is at the right or the left side thereof, the narrowed end of the frame minimizing the necessary clearance space between the conveyer and the associated machine.

2. A sheet conveyer adapted to receive sheets at one end and deliver them at the opposite end, the conveyer comprising a series of feed rollers graduated in length from end to end of the series and shorter at the delivery end of the conveyer, the conveyer pivotally mounted to swing sidewise to set the rollers at an angle either to the left or to the right, to carry the sheets either toward the left or toward the right as they are conveyed, a longitudinal guide adapted to be arranged in the path of the sheets and means adapted to be arranged adjacent the entrance end of the conveyer to cause the sheets to be

turned through substantially 90 degrees and toward said guide as they are conveyed.

3. The invention as defined in claim 2 and adjustable holding means arranged near the delivery end of the conveyer as and for the purpose specified.

4. In a device of the kind described, sheet conveying means which defines a substantially flat horizontal conveying surface, arranged and adapted to receive sheets at one end and discharge them at the opposite end, means for operating said conveyer means to advance a sheet in a predetermined direction from the entrance end to the discharge end of the conveyer, means associated with the conveyer means for causing the sheets to be turned in a horizontal plane through substantially 90 degrees selectively clockwise or counterclockwise, a guide adapted to be arranged in the path of the sheets as they are turned, and provided with a groove opening towards the conveyer means, the bottom of the groove serving as a sheet guide and arranged with its lower wall below the flat conveying surface defined by the conveyer means and projecting into close proximity with the adjacent edge thereof, said conveyer means being capable of being selectively arranged to urge the conveyed sheets towards the sheet guide (that is in the direction in which the sheets are selectively turned), said conveyer means comprising a series of parallel conveyer rolls graduated in length from the entrance end to the delivery end of the conveyer and the sheet guiding surface of the guide means arranged and adapted to depend slightly below the tops of said rolls and to project close to the adjacent ends thereof.

5. In a device of the kind described, sheet conveying means which define a substantially flat horizontal conveying surface, arranged and adapted to receive sheets at one end and discharge them at the opposite end, means for operating said conveyer means to advance a sheet in a predetermined direction from the entrance end to the discharge end of the conveyer, means associated with the conveyer means for causing the sheets to be turned in a horizontal plane through substantially 90 degrees selectively clockwise or counterclockwise, a guide adapted to be arranged in the path of the sheets as they are turned, and provided with a groove opening towards the conveyer means, the bottom of the groove serving as a sheet guide and arranged with its lower wall below the flat conveying surface defined by the conveyer means and projecting into close proximity with the adjacent edge thereof, said conveyer means being capable of being selectively arranged to urge the conveyed sheets towards the sheet guide (that is in the direction in which the sheets are selectively turned), an associated machine adapted to receive the delivered sheets, the conveyer means comprising a series of parallel conveyer rolls graduated in length from end to end of the series, the shortest roll being at the delivery end of the series, means pivotally mounting the conveyer to swing from side to side to arrange the conveyer so that it will urge the sheets towards the guide and to arrange the guide so as to cause the delivered sheets to properly register with the associated machine.

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