

**Aug. 13, 1935.**

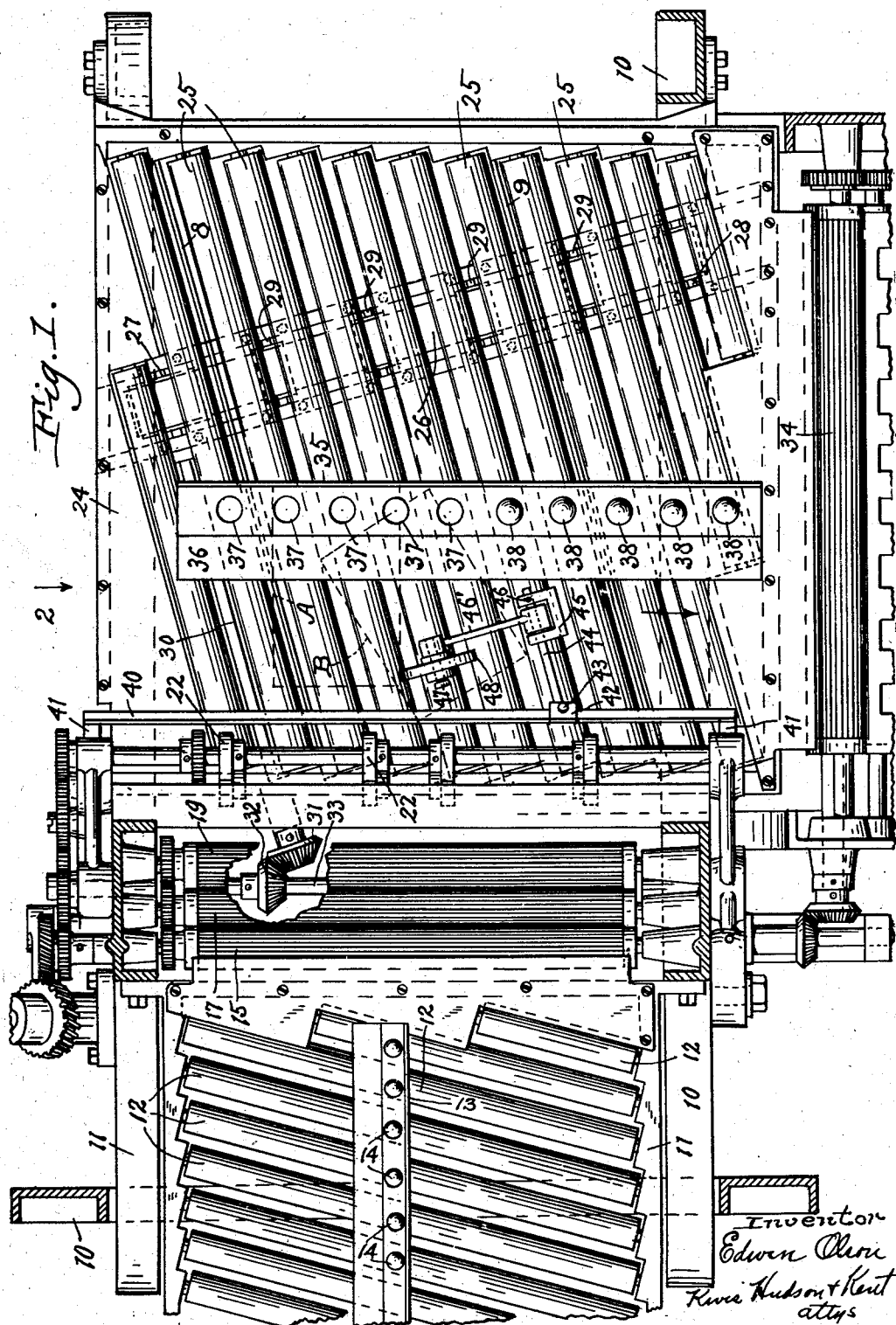
**E. OLSON**

**2,011,231**

# SHEET TURNING DEVICE

Filed Jan. 23, 1931.

2 Sheets-Sheet 1



Aug. 13, 1935.

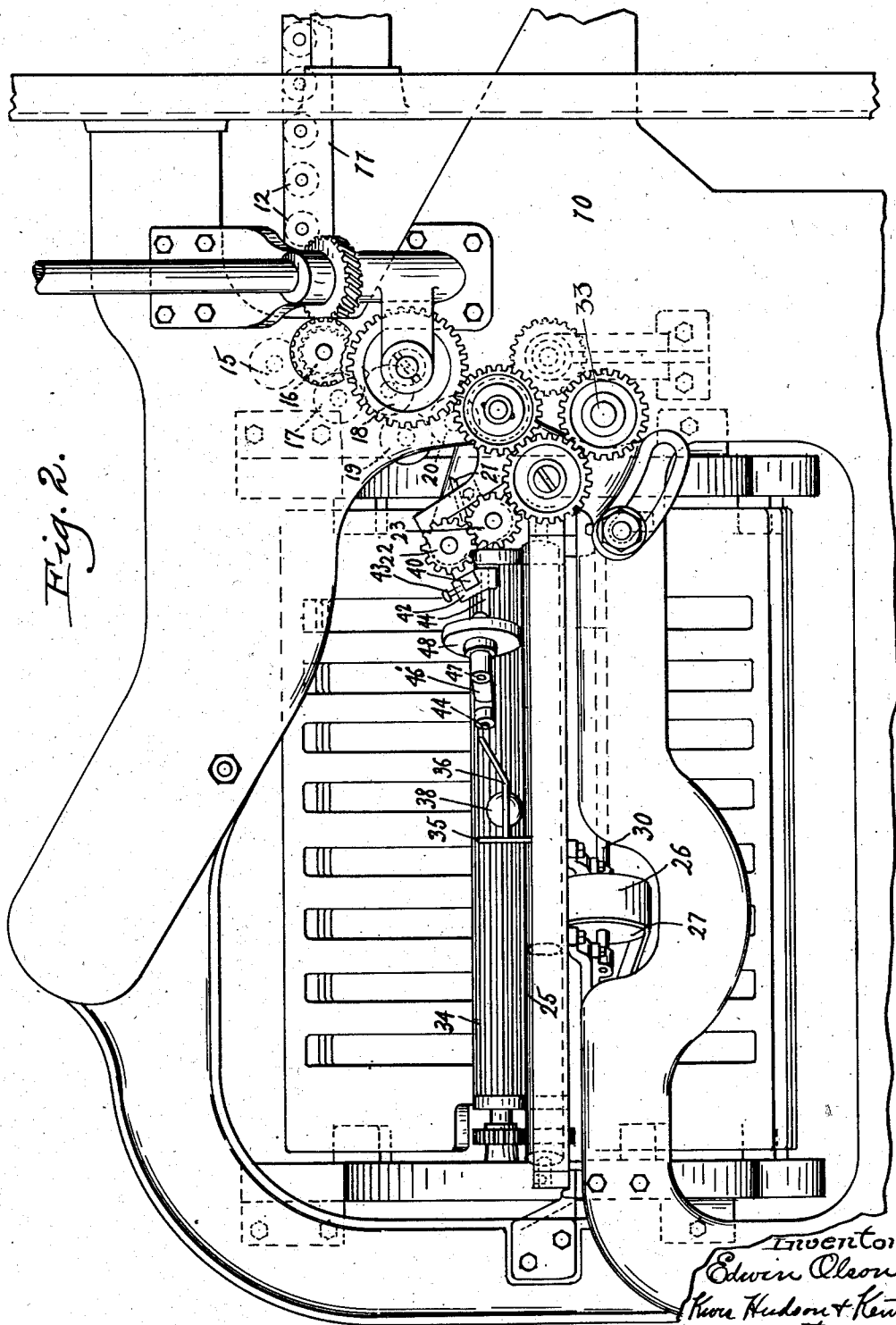
E. OLSON

2,011,231

SHEET TURNING DEVICE

Filed Jan. 23, 1931

2 Sheets-Sheet 2



## UNITED STATES PATENT OFFICE

2,011,231

## SHEET TURNING DEVICE

Edwin Olson, Wickliffe, Ohio, assignor, by mesne assignments, to Dexter Folder Company, New York, N. Y., a corporation of New York (1934)

Application January 23, 1931, Serial No. 510,661

43 Claims. (Cl. 271—52)

This invention relates to improvements in sheet turning devices, that is to say, devices which are adapted to impart motion to a sheet to turn it in its own plane through an angle of 90° as the sheet is traveling upon a conveyor. The principal utility for the device is in folding machines where it sometimes becomes desirable to control the direction of a fold or folds in this manner.

One of the objects of the invention therefore is the provision of readily removable and replaceable means for imparting quarter turns to sheets traveling upon a conveyor or feed table of the diagonal driven roller type.

Other objects and features of novelty will appear as I proceed with the description of that embodiment of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawings, in which

Figure 1 is a plan view of a buckle type folding machine with roller feed tables in which my invention is employed, and

Fig. 2 is a side elevational view of the machine looking in the direction of arrow 2, Fig. 1.

The machine illustrated in the drawings comprises a suitable frame 10 carrying a horizontal primary or other feed table 11 in which are mounted diagonally arranged feed rollers 12 that are driven in any suitable manner. These rollers tend to direct sheets traveling over the table 11 toward the right, as viewed in Fig. 1, against a side guide 13 which may or may not be adjustable. Preferably this guide carries a series of balls 14 which rest upon the rollers 12 or upon sheets being fed over the rollers, and serve to increase the traction of the rollers so as to impart to the sheets a more positive driving force.

At the delivery end of table 11 there is located a fold section comprising a series of rolls 15, 16, 17, 18, 19 and 20 indicated by broken lines in Fig. 2. Buckle plates or grids (not shown) are associated with these rolls for imparting buckle folds in a manner well known in the art. As the sheets leave this fold section they are delivered by the rolls 19, 20 over a sheet deflector 21 into feed rolls 22, 23, and from these latter rolls onto a cross feed table 24. In the cross feed table there are mounted a series of diagonally arranged rollers 25, which are driven from beneath by the upper run of a belt 26 that is mounted at its ends upon pulleys 27 and 28. The area of contact between the intermediate rollers 25 and the belt is increased by idler pulleys 29. The pulley 27 is operatively connected with a shaft 30 which may

be driven through bevel gearing 31 and 32 from a shaft 33 associated with the driving means for the rolls of the above described fold section. At the delivery end of this cross feed table there is a further or second fold section which is adapted to make folds at right angles to the folds made in the first described fold section. One roll only of this second fold section is shown in the drawings at 34.

Above the cross feed table 24, and running lengthwise thereof, is a sheet guide 35 which is preferably adjustable transversely of the table, being mounted for this purpose to slide upon two rods 8 and 9 which extend across the table between successive rollers 25 below the top level thereof. The guide 35 carries a laterally extending metal plate 36 with an upwardly directed edge which acts as a deflector to guide sheets downwardly toward the table rollers. This plate is provided with a series of holes 37, one for each roller 25, these holes being adapted to receive balls 38 which rest upon the rollers or upon sheets of paper fed over the rollers. Their function is to depress the sheets and hold them firmly against the driven rollers, whereby the traction of the latter is increased and they are enabled to transmit driving force to the sheets more positively. These balls are shown in Fig. 1 in a part of the holes only, their omission from the remainder being for a purpose which will presently appear.

A square rod 40 is mounted in brackets 41 on the frame of the machine and extends across the machine in advance of the feed rolls 22, 23. Upon this rod there is slidably mounted a bracket 42 which may be held in various positions of adjustment along the rod by means of a set screw 43 or the like. This bracket 42 carries a rod 44 which extends horizontally in a direction parallel to the rollers 25. It supports slidably a yoke 45 which may be fastened in desired positions of adjustment by a set screw 46. Rotatably mounted upon the rod 44 within the yoke 45 is a bar 47 which carries at its free end a pin or pintle 47 upon which is rotatably mounted a circular weight 48 that is adapted to rest upon one of the rollers 25 and be rotated thereby. It will be apparent that, by the adjustability of the bracket 42 upon the rod 40 and the adjustability of the yoke 45 upon the rod 44, it is possible to position the weight 48 above any one of a series of the rollers 25 and at various positions along the length of any of said rollers. It will of course be obvious that the length of the rod 44 may be greater than

that shown, if desired, although a short rod will generally be sufficient.

When the character of the work to be done requires more parallel folds than can be properly imparted in the first described fold section, the sheet turning device is so mounted upon the machine as to turn the sheets through an angle of 90° after they begin their travel over the cross feed table, whereby the second fold section, instead of imparting one or more folds at right angles to the folds imparted in the first fold section, merely adds one or more folds parallel to the folds made in the first described fold section.

Of course it should be understood that the invention in its broader aspects is not limited to use upon a cross feed table, but may be employed in folding machines generally wherever there is occasion to present a sheet to a fold section, at right angles to the direction previously traveled by the sheet, and in fact the use of the device is not necessarily limited to folding machines at all.

In the operation of the machine illustrated, the sheets are fed over the table 11 along the guide 13 into the first described fold section, where one or more folds in parallel are imparted to the sheets. The folded sheets are then delivered onto the table 24 transversely thereof and caused to impinge against the guide 35 which is then acting as a stop, this position of the sheet being indicated in Fig. 1 at A. The rollers 25 beneath the sheet then impart driving force, starting the travel of the sheet toward the right. As one corner of the sheet comes beneath the wheel 48, that portion of the roller 25 which is directly beneath the wheel is given better traction upon the sheet than can be exerted by the remainder of that roller or by any other roller then in contact with the sheet. Consequently that corner of the sheet moves more rapidly than any other part of the sheet, that is to say it has imparted to it a turning movement in its own plane, one corner of the sheet engaging against the guide 35 in the meantime, as indicated in Fig. 1. A position of the sheet while undergoing this turning movement is shown at B in Fig. 1. The turning movement is brought to a stop of course by the edge of the sheet impinging against the guide 35, and the travel of the sheet from that point on, as well as its movement sideways against the guide, is assisted by the balls 38. The omission of the balls from the holes 37 over that part of the table traversed by the sheet prior to the completion of the turning movement is resorted to in order not to counteract the influence of the wheel 48 by increasing the traction of the rollers against the opposite side or end of the sheet. When the turning device is not in use the balls may of course be employed in all of the holes 37.

In the foregoing description I have necessarily gone somewhat into detail in order to explain fully the particular embodiment of the invention herein illustrated, but I desire it to be understood that any detail disclosures herein are not to be construed as amounting to limitations, except as they may be included in the appended claims.

Having thus described my invention I claim:

1. In a machine of the class described, a sheet conveyor comprising a series of driven feed rollers arranged in parallel relation in a substantially horizontal plane, a sheet guide extending transversely of said rollers and along which sheets are fed thereby, and means having turning relation with one of said rollers and cooperating therewith to impart a quarter turn to said sheets.

2. In a machine of the class described, a sheet

conveyor comprising a series of substantially horizontal driven feed rollers arranged in parallel relation, and means for imparting a quarter turn to sheets traveling over the conveyor and comprising one of said rollers and a device adjacent thereby and actuated thereby.

3. In a machine of the class described, a sheet conveyor comprising a series of driven feed rollers extending diagonally of said machine in parallel relation, a sheet guide extending transversely of said rollers and along which sheets are fed thereby, and rotatable means associated with one of the rollers and cooperating therewith to impart a quarter turn to said sheets.

4. In a machine of the class described, a sheet conveyor comprising a series of horizontal driven feed rollers extending diagonally of said machine in parallel relation, and means mounted above the conveyor and cooperating with one of said rollers for imparting a quarter turn to sheets traveling over said conveyor, said means including an element for checking the travel of one corner of the sheet.

5. In a machine of the class described, a sheet guide, a sheet conveyor comprising a plurality of driven rollers extending diagonally of the sheet guide, and means spaced laterally from said guide and cooperating with said conveyor for imparting a quarter turn to sheets fed thereby.

6. In a machine of the class described, a side guide, a sheet conveyor comprising a plurality of driven rollers extending diagonally of the side guide, and adjustable means adapted to be mounted in different positions to cooperate with one of said rollers for imparting a quarter turn to sheets fed by said conveyor.

7. In a machine of the class described, a side guide, a sheet conveyor comprising a plurality of driven feed rollers extending diagonally of the side guide, and means mounted adjacent a point on one of said rollers adapted to increase the traction thereof at that point in its length only when acting on a sheet engaged with said guide, whereby sheets fed by the conveyor have a turning force imparted to them.

8. In a machine of the class described, a side guide, a sheet conveyor comprising a plurality of driven feed rollers extending diagonally thereof, and a rotatable device positioned opposite one of said feed rollers at a point along the length thereof and adapted to engage the same and be rotated thereby, so that the traction of said feed roller is increased at that point only when acting on a sheet engaged with said guide and sheets fed by the conveyor thereby have a turning force imparted to them.

9. In a machine of the class described, a sheet conveyor comprising a plurality of horizontal driven feed rollers extending diagonally thereof, a sheet guide extending lengthwise of the conveyor, and a rotatable weight having a circular periphery positioned above one of said feed rollers at a point spaced from said guide, said weight being adapted to rest upon the roller and be driven thereby or by the travel of a sheet thereover, whereby the traction of said roller is increased at that point only when acting on a sheet engaged with said guide and sheets traveling over the conveyor thereby have a quarter turn imparted to them.

10. In a machine of the class described, a sheet conveyor comprising a plurality of horizontal driven feed rollers extending diagonally thereof, a sheet guide extending lengthwise of the conveyor, a rotatable weight having a circular pe-

riphery adapted to rest upon and be driven by one of said rollers or a sheet traveling thereover, and means for mounting said weight at any one of a plurality of points along the length of said roller, whereby sheets of different dimensions may be turned without varying the adjustment of the sheet guide.

11. In a machine of the class described, a sheet conveyor comprising a plurality of horizontal driven feed rollers extending diagonally thereof, a sheet guide extending lengthwise of the conveyor, a rotatable weight having a circular periphery adapted to rest upon and be driven by one of said rollers or a sheet traveling thereover, and means for mounting said weight at any one of a plurality of points along the length of any one of a series of said rollers, whereby sheets of different dimensions may be turned without varying the adjustment of the sheet guide or the path of delivery of sheets fed onto said conveyor.

12. In a machine of the class described, a feed table, a cross feed table comprising a series of driven rollers onto which sheets are delivered after leaving said first named feed table, a sheet guide running lengthwise of said cross feed table, said guide being adapted to stop the transverse movement of sheets delivered onto said cross feed table as well as to guide them lengthwise thereover, and means cooperating with one of said rollers and driven thereby for imparting a right angle turn to the sheets on said cross feed table, said guide carrying individually removable means adapted to cooperate with the several rollers for imparting traction to the sheets traveling over the cross feed table.

13. In a machine of the class described, a sheet guide, a conveyor comprising a plurality of driven feed rollers extending diagonally thereof, and means rotatably cooperating with the conveyor for enabling the latter to impart a turn to a sheet fed thereby, so that a different edge of said sheet is presented to the guide than would be presented were said turning means omitted.

14. In a machine of the class described, a sheet guide, a conveyor comprising a plurality of driven feed rollers extending diagonally thereof, and means rotatably cooperating with one of said rollers for enabling the latter to impart a turn to a sheet fed by the conveyor, so that a different edge of said sheet is presented to the guide than would be presented were said turning means omitted.

15. In a machine of the class described, a sheet conveyor comprising a plurality of horizontal driven feed rollers extending diagonally thereof, a sheet guide for said conveyor, and means mounted above said conveyor and cooperating with one of said rollers for imparting a turn to a sheet traveling over the conveyor, whereby a different edge of said sheet is presented to the guide than would be presented were said turning means omitted.

16. In a machine of the class described, a sheet conveyor comprising a series of driven parallel rollers, means for guiding sheets that are conveyed one after another by said rollers, and means for turning each of said sheets on said conveyor and comprising one of the rollers and a turning device rotatably associated therewith.

17. In a machine of the class described, a sheet conveyor and a guide associated therewith, said conveyor comprising a series of parallel driven rollers and one of said rollers being provided adjacent thereto with rotatable sheet turning means.

18. In a machine of the class described, a sheet

feeding table extending in a substantially horizontal plane and comprising a series of parallel rollers, means for guiding sheets that are fed one after another along said table, and means for turning each of said sheets on said table and comprising one of the rollers and a rotatably mounted device associated therewith.

19. In a machine of the class described, a sheet conveyor and a guide adapted for engagement by a sheet on the conveyor, the conveyor comprising one or more driven rollers extending diagonally of said guide and said roller or rollers being provided adjacent thereto with means arranged in turning relation therewith for turning said sheet thereon when it engages the guide.

20. In a machine of the class described, a sheet guide, a sheet conveyor comprising a series of horizontally disposed parallel driven rollers, said guide being adapted for engagement by a sheet on the conveyor and one of said rollers being provided with means for turning said sheet in engagement with the guide whereby a different edge of the sheet is presented to said guide than would be presented thereto were such means omitted.

21. In a machine of the class described, a sheet guide, a sheet conveyor comprising a plurality of driven rollers, said guide being adapted for engagement by a sheet on the conveyor and one of said rollers being provided with means for turning said sheet in engagement with the guide whereby a different edge of the sheet is presented to said guide than would be presented thereto were said means omitted.

22. In a machine of the class described, a sheet conveyor, a sheet guide associated therewith, the conveyor being provided with means for turning a sheet thereon and said conveyor comprising one or more driven rollers arranged diagonally with respect to said guide.

23. In a machine of the class described, a sheet conveyor and a sheet guide associated therewith, said conveyor comprising driven rollers arranged diagonally with respect to said guide and one of said rollers being provided with means for turning a sheet on the conveyor.

24. In a machine of the class described, a sheet conveyor and a guide adapted for engagement by a sheet on the conveyor, the conveyor comprising a series of rollers arranged diagonally with respect to said guide and said conveyor being provided with means for turning said sheet thereon when it engages the guide.

25. In a machine of the class described, a sheet guide, and a conveyor comprising a plurality of driven rollers extending diagonally of said guide and adapted to feed a sheet therealong to a part of said machine, said conveyor being provided with means for turning said sheet thereon before it reaches said part.

26. In a machine of the class described, a sheet guide, a sheet conveyor comprising a plurality of driven rollers extending diagonally with respect to the sheet guide, said guide being adapted for engagement by a sheet on the conveyor and said conveyor being provided with means for turning said sheet in engagement with the guide whereby a different edge of the sheet is presented to said guide than would be presented thereto were such means omitted.

27. In a machine of the class described, a sheet guide, a sheet conveyor comprising a plurality of driven rollers extending diagonally with respect to the sheet guide, said guide being adapted for engagement by a sheet on the conveyor and one of said rollers being provided with means for

turning said sheet in engagement with the guide whereby a different edge of the sheet is presented to said guide than would be presented thereto were said means omitted.

28. In apparatus of the character described, a sheet conveyor including one or more driven rollers, and sheet registering or guiding means disposed diagonally with respect to said roller or rollers, said conveyor being provided with means for turning a sheet thereon.
29. Sheet feeding and turning means comprising a table having driven feed rollers extending diagonally thereof and a rotatable sheet engaging device, said table being provided with a sheet abutment and said rotatable device being disposed in feeding and turning relation with respect to said abutment and one of said rollers.
30. Sheet feeding and turning means comprising a table having driven feed rollers extending diagonally thereof and a rotatable sheet engaging device, said table being provided with a sheet guide and said rotatable device being disposed in turning and feeding relation with the guide and one of said rollers to turn the sheet while it is in engagement with the latter and said guide.
31. In a machine of the class described, driven rollers for feeding a sheet, and stop means associated with the rollers and engaged by the sheet when it is delivered thereon, one roller being provided with means for turning the sheet on said rollers after said sheet engages said stop means.
32. In a machine of the class described, a table over which a sheet is moved transversely and longitudinally, driven rollers for moving the sheet longitudinally of the table, and stop means engaged by the sheet when it is moved transversely of the table, one of said rollers being provided with means for turning the sheet on said table after said sheet engages said stop means.
33. In a machine of the class described, a sheet guide along which a sheet may be fed, driven rollers for feeding the sheet along the sheet guide, and means cooperating with one roller to turn the sheet on said rollers while said sheet is in engagement with said sheet guide.
34. In a machine of the class described, a sheet guide along which a sheet may be fed, driven rollers for feeding the sheet along the sheet guide and extending diagonally thereof, and rotatable means cooperating with one roller to turn the sheet on said rollers while said sheet is in engagement with said sheet guide.
35. In a machine of the class described, driven rollers for feeding a sheet, stop means associated with the rollers and engaged by the sheet when it is delivered thereon, and means for turning the sheet on the rollers after said sheet engages said stop means.
36. In a machine of the class described, a set of driven rollers for feeding a sheet, stop means adjacent one side of the set of rollers, means adjacent the opposite side of the set of rollers for delivering the sheet across the rollers into engagement with said stop means, and means for turning the sheet on the rollers after said sheet engages the said stop means.
37. In a machine of the class described, a guide along which a sheet may be fed, driven rollers for feeding the sheet along the guide, means for turning the sheet on the rollers while it engages

said guide, and means cooperating with one or more of said rollers to impart traction to the turned sheet.

38. In a machine of the class described, a guide along which a sheet may be fed, driven rollers for feeding the sheet along the guide and extending diagonally thereof, means for turning the sheet on the rollers, and means cooperating with one or more of said rollers to engage the turned sheet with said guide.

39. In a machine of the class described, a set of driven rollers for feeding a sheet, a sheet guide adjacent one side of the set of rollers, means adjacent the opposite side of the set of rollers for delivering the sheet thereacross against the sheet guide, means for turning the sheet on the rollers after it engages the sheet guide, and means cooperating with one or more of said rollers to impart traction to the turned sheet.

40. In a machine of the class described, a set of driven rollers for feeding a sheet, a sheet guide adjacent one side of the set of rollers and toward which the latter extend diagonally, means adjacent the opposite side of the set of rollers for delivering the sheet thereacross against the sheet guide, means cooperating with one roller to turn the sheet after it is delivered as aforesaid, and means cooperating with one or more of the remaining rollers to engage the turned sheet with the guide and impart traction to said sheet.

41. In a machine of the class described, a table along which a sheet may be fed, a sheet guide extending longitudinally of the table and initially engaged by the sheet through movement thereof transversely of the table, driven rollers for feeding the sheet longitudinally of the table, means cooperating with one roller to turn the sheet on the table after said sheet initially engages said sheet guide and starts to move along the latter and the table, and means associated with the sheet guide spaced longitudinally from the portion thereof which is initially engaged by the sheet and in the line of travel of the sheet from said portion, said last named means cooperating with one or more of the remaining rollers to impart traction to the turned sheet.

42. In a machine of the class described, a table along which a sheet may be fed, a sheet guide extending longitudinally of the table and toward which the sheet is delivered on the table transversely thereof, driven rollers for feeding the sheet longitudinally of the table and extending diagonally of the latter and the sheet guide, a rotatable device cooperating with one roller to turn the sheet on the table after the sheet is delivered as aforesaid, and a plurality of members freely mounted in the sheet guide spaced longitudinally from the portion thereof which is initially engaged by the sheet and in the line of travel of the sheet from said portion, said members rotatably cooperating with certain of the remaining rollers to engage the turned sheet with said guide.

43. In a machine of the character described, a conveyor for feeding a sheet to a part of said machine and comprising a series of driven parallel rollers, means for guiding the sheet as it is fed by the conveyor, and means cooperating with one of said rollers for turning the sheet on said conveyor before said sheet reaches said part of the machine.