

March 22, 1932.

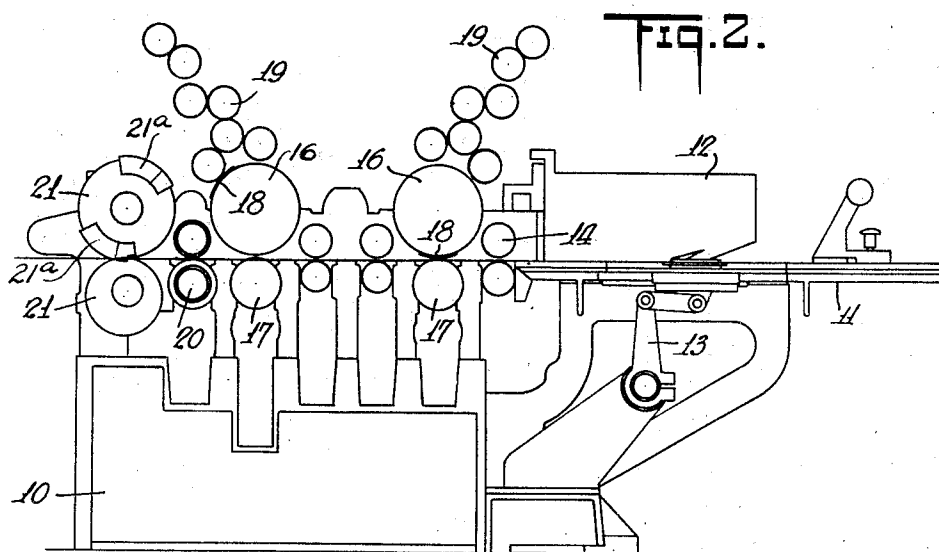
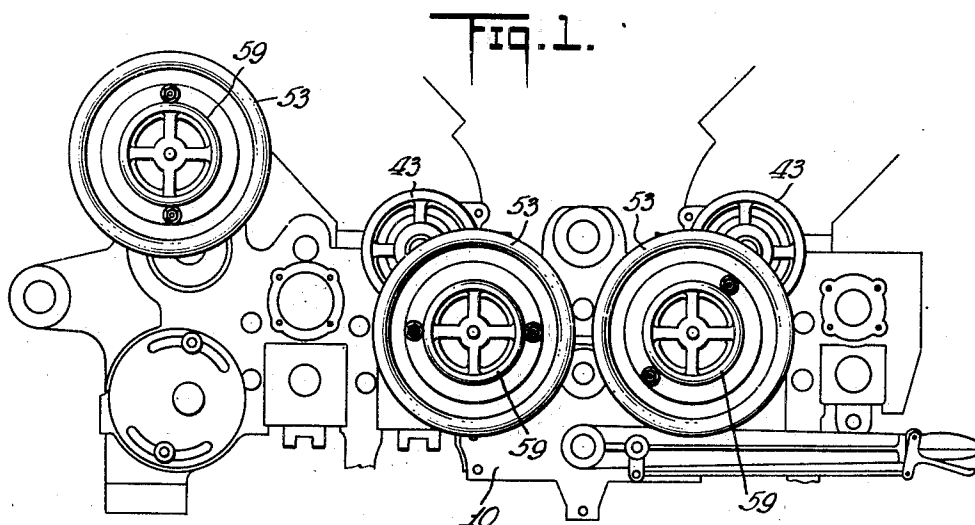
S. M. LANGSTON ET AL

1,850,800

PRINTER AND SLOTTER

Filed Nov. 12, 1930

4 Sheets-Sheet 1



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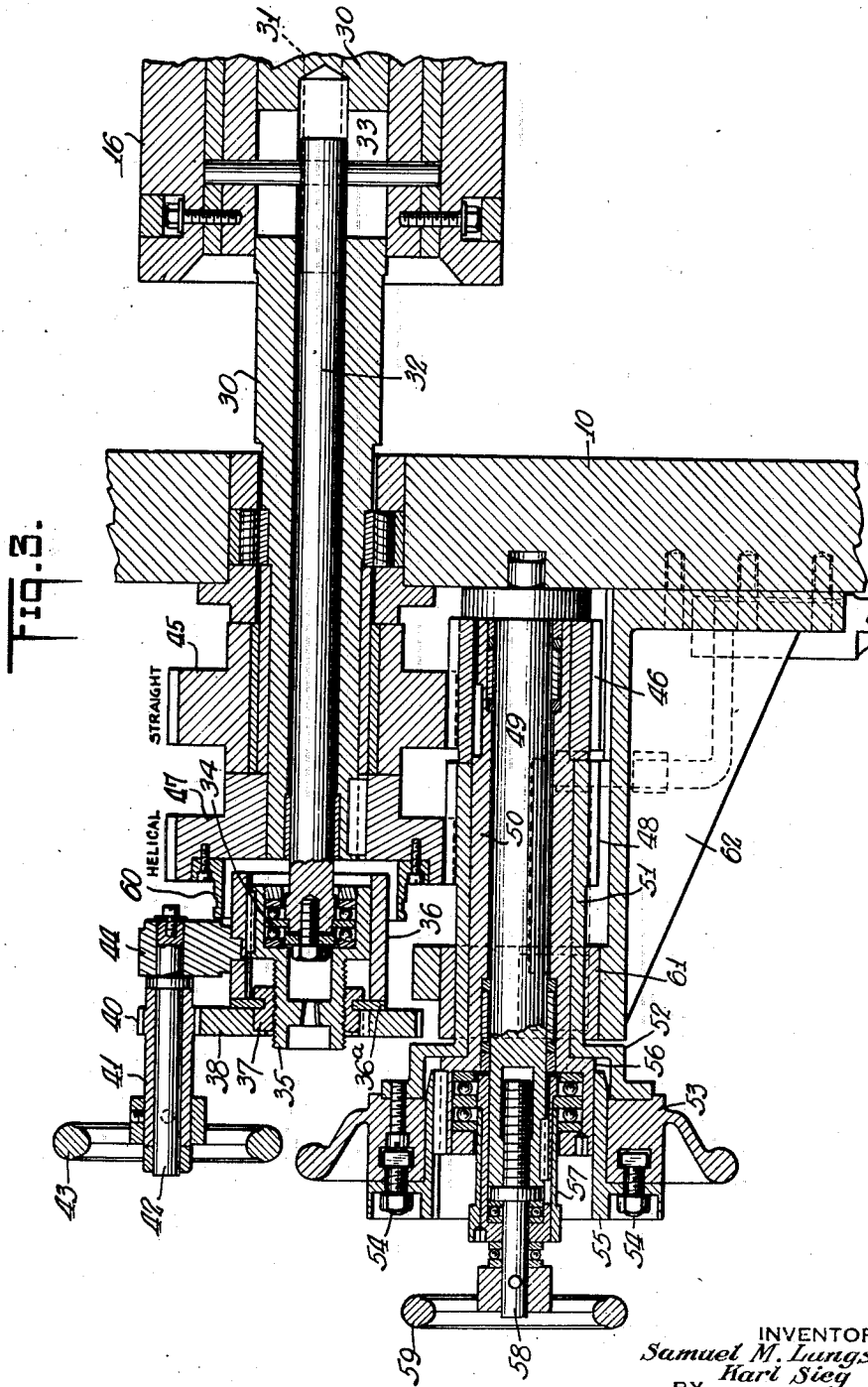
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PRINTER AND SLOTTED

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4 Sheets-Sheet 2



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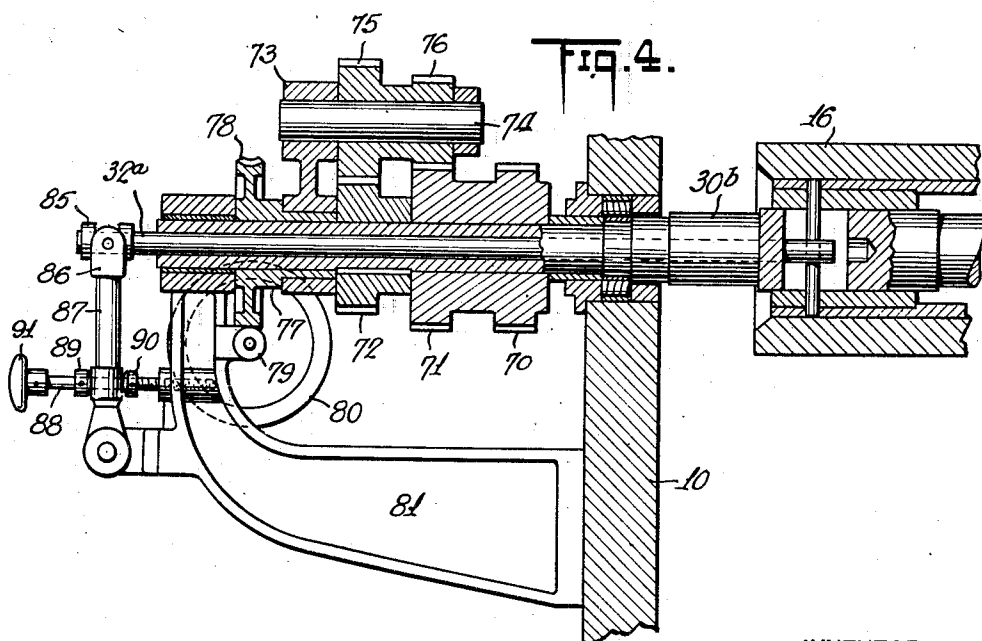
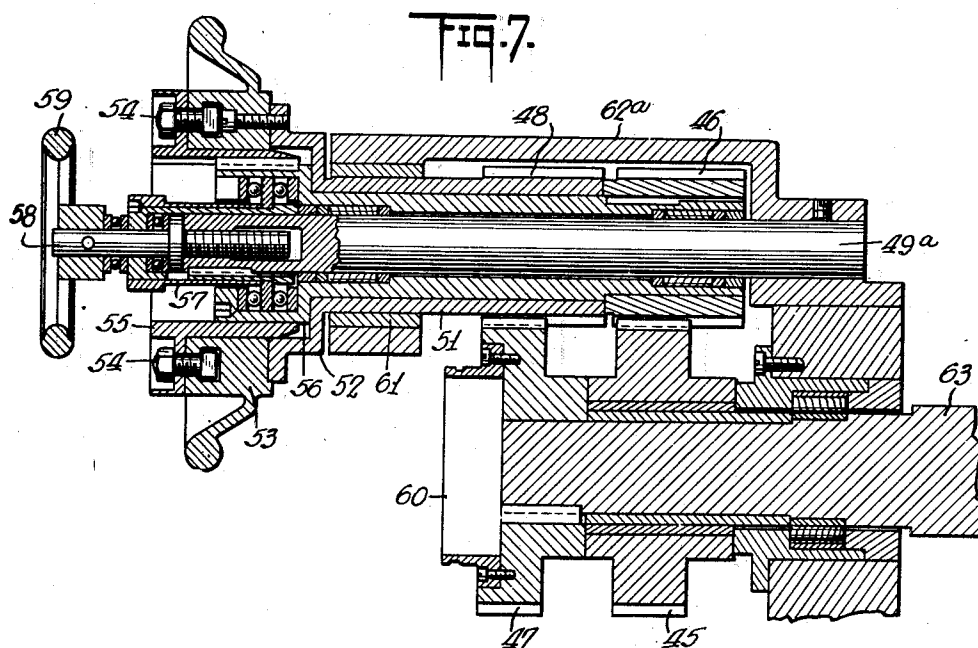
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4 Sheets-Sheet 3



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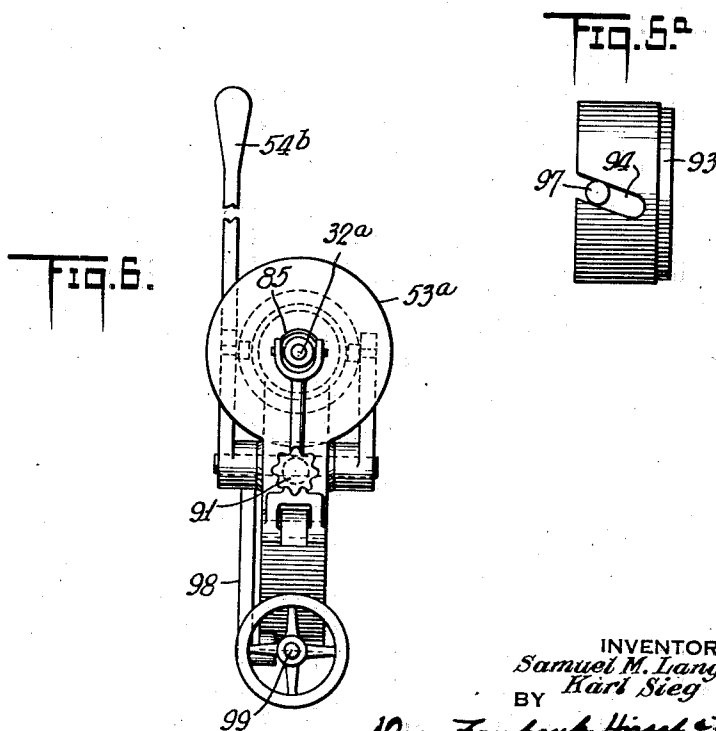
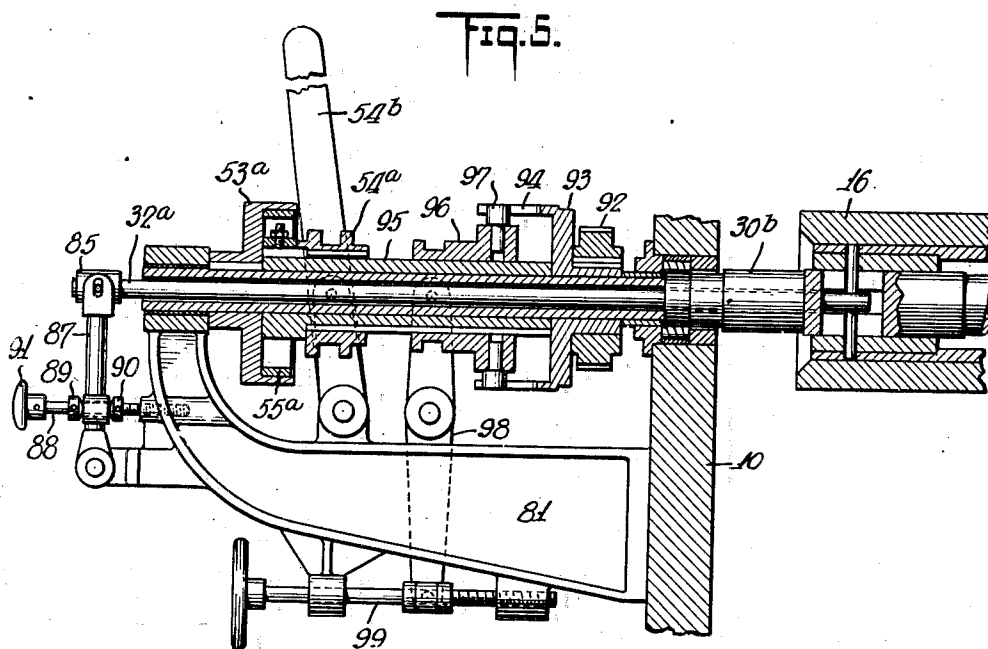
S. M. LANGSTON ET AL

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PRINTER AND SLOTTER

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

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PRINTER AND SLOTTER

Application filed November 12, 1930. Serial No. 495,158.

This invention relates to machines for use in the treatment of advancing sheet material by means of two or more operating mechanisms which must be relatively adjusted so that the necessary or desired registry of operations is obtained on the sheet.

In many types of machines of this general character, it is necessary to make frequent changes or readjustments to obtain products having different specific characteristics and dependent upon the size of the sheet or the kind or location of the printing, slotting or the like which is desired. For instance, in the making of box blanks there is usually provided a sheet feeding mechanism, cooperating slotting heads to form slots extending in to a predetermined distance from the edges of the blank to form end closure flaps, and a printing cylinder carrying a type plate for printing on one or more panels of the blank. In cases where printing is to be in more than one color it is customary to provide two or more of these printing cylinders operating in succession on the blank. The relative positions of the slotting mechanism and the printing mechanism must be varied both axially and circumferentially for making box blanks of different sizes and proportions and with different printing or different position of the printing on the blank and in proper relationship to the scored lines on which the blank is folded in making up the box.

The axial adjustment of the slotting and scoring mechanisms is comparatively easily effected through the manipulation of readily accessible adjusting members when the machine is at rest, and this adjustment is not disturbed by the stopping, starting or speed variations of the machine.

Circumferential adjustment of the slotting heads, and both the circumferential and axial adjustment of the printing cylinders, particularly if two color printing is to be done, present a much more serious problem.

In practically all machines there is a certain amount of lost motion or back lash in the gear train or other driving connections between the operating parts and which is taken up when the machine starts in operation. In spite of the exercise of all reason-

able care in the adjustment of the parts to the proper relative positions when the machine is at rest the amount of this lost motion or back lash cannot be accurately ascertained and therefore accurate registry cannot ordinarily be secured in the first adjustment of the machine made when the machine is at rest. Obviously this back lash or lost motion is a materially greater factor after the parts become somewhat worn than it is when the machine is new.

In setting the machine for a different size or kind of blank it is customary in practice to adjust the parts to as nearly the correct position as can reasonably be done and to then start up the machine and run off a few blanks. The lack of proper registry of the operations on the blank is noted and the machine is stopped. The lack of proper registry may be due to the taking up of the back lash in the driving connections, when the machine is in operation, the inaccuracy in the initial setting of the parts, and possibly other causes.

With the machine at rest the parts are readjusted to such an extent as in the opinion of the operator will correct the inaccuracy and the machine is again started and a few blanks run off. The registry is again noted and if necessary the machine is again stopped and the parts readjusted. The number of times this sequence of operations is necessary depends upon the skill of the operator and the accuracy which is required.

In two color printing where hair line differences are noticeable greater care and greater accuracy is required than for one color printing or for proper length of slots between the end flaps.

In some machines where a combination of reciprocating parts and rotary parts are employed, or where momentum of the moving parts or product is a factor, or where slippage of the sheets may occur, the proper registry may be secured when the machine is running at one speed, but the parts no longer produce the desired register of operations when the machine is driven at a substantially higher or lower speed.

Shrinking or stretching of the sheet material being operated upon may also cause a

lack of proper registry at different times during the normal operation of the machine.

We have referred to a machine for making box blanks, but many of the same difficulties are encountered in other types of machines for operating on advancing sheet material, and particularly where it is necessary to make comparatively frequent readjustments to produce different sizes or proportions of the finished product.

By the operation of our improved mechanism rapid, easy and accurate readjustment of the operating parts may be made without necessity for stopping the machine or altering its speed. The parts of the machine may be set to the approximately correct position when the machine is at rest, and as soon as the machine is started in operation any inaccuracy of registration of operations may be noted on the product produced and the proper readjustment made immediately while the machine is running and without the labor, inconvenience and time loss heretofore experienced. It is possible that a slightly larger number of defective sheets may be produced immediately after starting and during the readjustment, but such loss is trivial compared to the time loss heretofore found necessary. Furthermore the machine may be readily readjusted at the time of any speed change or in case slipping, shrinking or stretching of the product occurs, so as to maintain proper registry regardless of operating conditions.

In carrying out our invention there is provided means whereby one rotary operating part may be circumferentially adjusted in respect to either another operating part or a reciprocating operating part while the machine is in operation. This may be employed to bring about proper registry of multi-color printing plates, the proper positioning of the printing on the panel of the box blank, the proper length of slot measured inwardly from the edge of the blank, or for other purposes. It may be employed for the adjustment of a single rotary operating part or for independent adjustment of each of a plurality of such rotary operating parts.

As one important feature of our invention there is provided means whereby the cylinder or other operating member is normally tightly secured to the adjusting means, but the securing means is of such a character that it may be easily released and the cylinder or other operating member freely rotated when the machine is at rest, to bring the printing plate, knives or like operating parts which act on the sheet to such a position that they are readily accessible. If said operating parts be spaced knives or other cutters for forming slots at opposite edges of the sheet, they may be loosened and resecured at the accurately predetermined spacing both circumferentially and axially of the supporting

member. If the operating part be a printing plate, this may be removed and shifted or replaced by another in approximately the proper position axially of the rotatable supporting member. The member may then be freely rotated to bring the operating part to approximately the correct position in respect to the feeding mechanism, the drive and other cooperating parts. The readily detachable securing means may then be tightly reconnected, the machine started and the knives, printing plates or the like given the final accurate adjustments while the machine is running to cure any defects or inaccuracy of registry noted on the product as it comes from the machine.

As a further important feature we mount a driving gear coaxial with the rotatable operating member and rotatable on the shaft thereof and transmitting power from said gear to said shaft through a pair of members having interengaging surfaces at least one of which is helically disposed whereby upon an axial movement of one of said interengaging members the rotatable operating member is circumferentially adjusted in respect to said driving gear.

As a further important feature, said interengaging members have helical gear teeth and one of said members is coaxial with and secured to said shaft so as to be held against rotation in respect thereto.

There is provided a hand wheel for effecting the axial adjustments of one of said interengaging members in the power transmitting train and thereby effecting circumferential adjustment of the cylinder which carries the printing plate, slotters, or the like, and as one important feature of the invention said hand wheel and one of said interengaging members are coaxial and connected against relative axial movement by a sleeve which permits relative rotation and free rotation of said member while the machine is running and the hand wheel is at rest.

As another important feature, the axial adjustment of the cylinder or other member which carries the operating parts, is accomplished by a rod extending coaxially through the cylinder shaft.

Other advantages and important features will be pointed out hereinafter or will be apparent from a consideration of the specific forms hereinafter described and illustrated in the accompanying drawings.

In the accompanying drawings our invention has been illustrated in several different embodiments in a combined slotter and printer for box blanks, but various other embodiments may be designed within the scope of our invention as defined in the appended claims, and the illustrated embodiments as well as others may be used in other types of machines for accomplishing other operations.

In these drawings:

Fig. 1 is a somewhat diagrammatic side elevation of a machine showing one form of the various adjusting members.

Fig. 2 is a diagrammatic vertical longitudinal section through the machine.

Fig. 3 is a transverse section showing part of a printing cylinder with circumferential and axial adjusting means therefor.

Fig. 4 is a transverse section showing another form of circumferential and axial adjusting means.

Fig. 5 is a section similar to Fig. 4, but showing still another form of circumferential and axial adjusting means.

Fig. 5a is an edge view of one operating member of the construction shown in Fig. 5.

Fig. 6 is an end view of the form shown in Fig. 5, and

Fig. 7 is a vertical section showing means for effecting the circumferential adjustment.

Like reference characters denote like parts in the several figures of the drawings.

In the following description and in the claims parts will be identified by specific names for convenience, but they are intended to be as generic in their application to similar parts as the art will permit.

In the specific form of machine which has been selected for purposes of illustration and to which the invention may be applied, there is provided the usual frame structure 10 which carries a feed table 11 upon which may be stacked a plurality of superposed sheets between guide members 12. These sheets are successively fed into the field of action of the machine by a feed mechanism operated by an oscillating lever 13. This mechanism may be of the type shown in the Langston Patent 1,150,210 or of other suitable construction, and therefore the details thereof are here omitted for the sake of simplicity.

The sheets pass between a pair of feed rollers 14 and between two pairs of printing units, each of which includes an upper printing cylinder 16 and a lower pressure cylinder 17. Each upper printing cylinder 16 carries a type plate 18 which is inked by a series of ink fountain rolls 19. Different inks are supplied to the type plates of the different printing cylinders and these plates and their cylinders are capable of being so positioned that, as the cylinders operate in succession, the two printings will be in the desired registry. The sheets that have been printed pass through a scoring unit 20 and then through a slotting unit 21. This includes a pair of slotting heads of suitable design. They may be constructed as shown in the Langston Patent 1,769,883, issued July 1, 1930, that is, one slotting head may have an annular groove and the other a pair of knives 21a relatively adjustable circumferentially of the head to vary the distance therebetween and thus control the length of the unslotted portion of

the blank between the ends of the slots extending in from opposite edges.

In carrying out our invention means are provided for effecting the adjustment of one, but preferably both of the printing cylinders 16 in respect to the sheet feeding mechanism. As shown in Fig. 3 said cylinder is slidably mounted on a hollow shaft 30, but is splined thereto by a key 31 shown in dotted lines, so as to rotate therewith. Passing through said hollow shaft 30 is a rod 32, one end of which is secured to the cylinder 16 by a transverse pin 33 extending through opposed radial slots in the shaft so that by moving the rod endwise the cylinder is adjusted axially on the shaft 30. The peripheral portion of the cylinder may be of wood so that the type plates may be tacked thereto in any desired position. The other end of this rod 32 is rotatably mounted in a sleeve 35, but is held against axial movement in respect thereto by a suitable double thrust bearing 34. The outside of this thrust sleeve has a spline connection with a stationary cylindrical bearing member 36 forming part of the frame structure of the machine, so that the thrust sleeve cannot rotate, but may move axially to force the rod 32 in or out.

Threaded on the thrust sleeve 35 is a collar or nut 37 which has keyed thereto a spur gear 38, meshing with a pinion 40 connected to a sleeve 41 loosely encircling a stud 42. One end of this stud 42 is fixedly connected to a bracket 44 constituting part of the frame structure of the machine. Pinned or otherwise connected to one end of the sleeve member 41 is a turning member which may take the form of a hand wheel 43. The nut 37 is locked against endwise movement, as for instance by a split collar 36a rigid with the end of the bearing member 36 and extending into a groove in the periphery of the nut.

The rotation of the hand wheel 43 effects the rotation of the interengaging gears 40 and 38 and the corresponding rotation of the sleeve or nut 37. This causes the axial movement of the thrust sleeve 35 and the corresponding endwise movement of the rod 32. The printing cylinder may thus be moved axially on its driving shaft 30 and entirely independently of whether it be rotating or at rest.

As one means for circumferentially adjusting the rotatable operating member without interfering with the continuous drive and rotation thereof there may be employed to advantage a pair of helical gears in the driving train to the cylinder or other rotatable operating part. By so mounting these gears that one may be adjusted axially in respect to the other, a relative rotation may be secured and the cylinder or other operating part advanced or retarded in its cycle.

In the form shown in Fig. 3 the driving connections to the cylinder include a pair

of straight toothed intermeshing gears 45 and 46 and a pair of helical intermeshing gears 47 and 48. The gears 45 and 47 are coaxial, the helical gear 47 being keyed to the shaft 30, and the gear 45 being on the shaft, but capable of relative rotation in respect thereto. The gear 45 receives the power and acts as a drive gear for the cylinder or other member carrying the parts which operate on the sheet.

At one side of the shaft 30 and parallel thereto there is provided a stud 49 rigidly secured to some part of the frame of the machine, and on this stud is a sleeve 50 carrying two gears 46 and 48 locked against relative endwise movement and normally locked against relative rotational movement. As a matter of simplicity in manufacture and assembly the gear 46 may be keyed to the sleeve 50, while the gear 48 may be formed integral with an outer sleeve 51 encircling the sleeve 50 and normally rigidly connected thereto.

Power is transmitted to the straight toothed gear 45 from any suitable driving part of the machine and this gear drives the two connected gears 46 and 48. The gear 48 drives gear 47 which is keyed to the shaft 30.

Two of the aligned gears are very much wider than the other two aligned gears and one pair is axially movable. The gears 46 and 48 are shown as the wider ones and the axially movable ones. As the gears 45 and 46 are straight toothed gears the axial movement of the gears 46 and 48 does not cause any relative rotation of the gears 45 and 46, but as the gears 47 and 48 are helical an endwise movement of the gear 48 causes a relative rotation of these two gears 47 and 48. Thus when the machine is running or at rest if the two gears 46 and 48 be moved endwise it will not interfere with the continuous transmission of power from the gear 45 through the gears 46, 48 and 47 to the shaft 30, but will advance or retard the shaft 30 in respect to the gear 45 depending upon the inclination of the helical gears and the direction in which the gears 46 and 48 are moved. Thus the cylinder 16 may be adjusted circumferentially in respect to the driving gear train and the other operating parts of the machine without disconnecting it from its source of power.

Fig. 3 shows a simple and convenient means for moving the gears 46 and 48 endwise while the machine is running. In the form shown the sleeve 51 which carries the gear 48 has a flange 52 bolted to a hand wheel 53 and this hand wheel is connected by bolts 54 to a sleeve 55 keyed to an enlarged outer end portion 56 on the outer end of the sleeve 50. The sleeve 51 is held between the end of the enlarged portion 56 and the gear 46. Thus the two sleeves 50 and 51 are locked against

relative axial movement and are normally bolted together against relative rotational movement.

The sleeve 50 may rotate on the stud 49 and such rotation is facilitated by suitable roller bearings. Means are provided for moving these two sleeves and their associated gears endwise on the stud 49 without interrupting the continuous transmission of power through the gears. As shown this means includes a sleeve 57 slidable upon the outer end of the stud 49 and extending into and connected to the enlarged portion 56 of the sleeve 50 by means of a two way thrust bearing. This permits relative rotation of the sleeves 57 and 50, but prevents relative axial movement.

The outer end of the stud 49 has a centrally threaded bore receiving a screw rod 58 and this screw rod is connected by two way thrust bearings with the sleeve 57 so as to permit relative rotation of the screw rod and sleeve, but prevent relative axial movement. The outer end of the screw rod is provided with a suitable hand wheel 59.

When the machine is running the screw rod 58 and its hand wheel 59 are normally at rest. By rotating the hand wheel the rod may be moved endwise by reason of its threaded engagement with the stud 49 and this will cause the endwise movement of the sleeve 57. The thrust connections between this sleeve and the enlarged portion 56 of the sleeve 50 cause a simultaneous equal endwise movement of the sleeve 50 and the two gears 46 and 48. As the hand wheel 59 is normally stationary it may be readily rotated in either direction to push in or pull out the gears 46 and 48 while the machine is running and this will cause a relative rotation of the two aligned gears 45 and 47. As the gear 45 is connected to the source of power and the gear 47 is connected to the cylinder 16, the cylinder may be advanced or retarded.

In ordinary operations the circumferential adjustment of the cylinder when the machine is running need be only through a comparatively few angular degrees, but this may be varied by varying the length of the gears 46, 48 and the pitch of the teeth of the helical gears 47, 48. The end thrust on the helical gears is taken up by the thrust bearing in the outer end of the sleeve 50 and the rotation of the sleeve and gears is not transmitted to the sleeve 57 and from the latter to the screw rod 58 because the sleeve 57 is keyed on the stud 49.

The mechanism above described has the further advantage in that it permits the freeing of the cylinder from the source of power and the free rotation of the cylinder when the machine is at rest. Thus when the machine is at rest the cylinder may be rotated to bring any portion thereof uppermost to facilitate the attachment of the type plate

thereto and then the rotation of the cylinder to bring the type plate to the approximately correct position. This free rotation of the cylinder is permitted by the clutch connections between the two sleeves 50 and 51.

When the clutch connections are released, the sleeve 50 may remain at rest, while the sleeve 51 is being rotated. By the term "clutch connections" we mean to include any well-known type of connection commonly employed between driving and driven members and which may be easily and quickly operated in the normal use of the machine to prevent or permit power transmission as desired. The hand wheel 53 has an under cut groove which receives the heads of the bolts 54 while the sleeve 55 which is keyed to the sleeve 50 has apertures through which the bolts extend and a countersunk groove to receive and protect the ends of the bolts. By loosening the bolts the connected sleeves 50 and 55 will be held against rotation by the intermeshing of the gear 46 with the gear 45 which latter is connected back to the source of power. The hand wheel 53 may be turned to rotate the sleeve 51 on the sleeve 50 and thus rotate the cylinder 16 through the gears 48 and 47.

When the type plate has been secured to the cylinder the cylinder is rotated to the approximately correct position, the bolts 54 are tightened and the machine is started. As soon as it starts any lack of proper registry or positioning of the printing on the blank is noted and by turning the hand wheels 43 and 59 the cylinder 16 is moved endwise in either direction and advanced or retarded until the desired accuracy of registry and positioning is obtained. It is not necessary to lock the hand wheels 43 and 59 after such adjustment because there is no rotational tendency transmitted to these hand wheels by the rotation of the shaft 30 and the sleeve 50 and 51 on the stud 49.

In order that the operator may determine the extent of the free rotation of the cylinder while turning the hand wheel 43 the gear 47 preferably carries a flange 60 having a groove in which a calibrated tape may be mounted. A pointer on some stationary part of the machine may terminate adjacent to this tape so that the operator before loosening the bolts 54 may note the position of the cylinder, and after the securing of the type plate in place may return the cylinder to approximately the same position or to any desired spacing from that position dependent upon any change in the position or the location of the type plate on the cylinder.

In case it is desired to provide for circumferential adjustment of a rotatable operating part and it is not necessary to provide for any axial adjustment, the mechanism shown in Fig. 3 for accomplishing such axial adjustment may be omitted. For instance, axial

adjustment of the slotting heads is seldom, if ever, necessary during operation of the machine, but some circumferential adjustment is often necessary to make the slots of the desired depth in from the end of the blank.

In Fig. 7 I have shown a construction similar to Fig. 3 so far as concerns circumferential adjustment, but with no provision for axial adjustment.

In Fig. 3 the sleeve 51 is mounted in a bearing 61 in a bracket 62 secured to the frame of the machine and the stud 49 is separately attached to the frame.

In Fig. 7 a somewhat similar bracket 62a is employed, but this also serves as the support for the stud 49a. The shaft 63 for the slotting heads is not hollow, but carries the gears 45 and 47 in substantially the same way as does the hollow shaft 30 shown in Fig. 3.

In the form shown in Figs. 3 and 7 only limited circumferential adjustment is possible while the machine is running, the limit being determined by the length and pitch of the helical teeth on the gear 47.

In some cases it is desirable to secure a very much greater range of circumferential adjustment when the machine is running. In Fig. 4 there is shown a construction in which the cylinder 16 may be rotated through any desired distance even through a complete revolution, and therefore it is not necessary to provide a separate clutch such as that effected by the members connected by the bolts 54, in Figs. 3 and 7 to permit free rotation of the cylinder. In Fig. 4 the circumferential adjustment is secured without the use of helical gears, there being employed in place thereof a differential. The hollow shaft 30b has rotatably mounted thereon a double gear 70, 71 and has keyed thereon a gear 72. Mounted for rotation around the hollow shaft is a bracket 73 carrying a stud shaft 74 on which is a pair of gears 75 and 76. The gear 75 is larger than the gear 76 and meshes with the gear 72 while the gear 71 is larger than gear 72 and meshes with the gear 76.

By swinging the bracket 73 around the hollow shaft 30b as an axis the two gears 75 and 76 will, of course, rotate at the same speed around their own axes, but they will cause a relative rotation of the gears 71 and 72. The gear 70 is connected to the source of power, and if the machine be at rest the gear 70 will be locked and the swinging of the bracket 73 will cause a rotation of the gear 72 and a corresponding rotation of the cylinder 16. If the machine be running the swinging of the bracket 73 will cause a relative rotation of the gears 71 and 72 and an advancement or retarding of the cylinder 16.

As a simple means for swinging the bracket 73 whether the machine be running or at rest, the bracket 73 is rigidly secured on a sleeve 77 which is rotatable on the hollow shaft 30b. The sleeve 77 has a worm wheel

78 meshing with a worm 79 connected to a hand wheel 80. A bracket 81 supports the outer end of the hollow shaft 30b and the bearings for the worm and hand wheel. The parts are so proportioned that the bracket 73
5 may swing completely around the hollow shaft and may be stopped in any position.

The amount of rotation of the cylinder 16 in respect to the driving gear 70 for a given movement of the bracket 73 may be varied
10 by properly selecting the relative sizes of the gears 75 and 76 and the gears 72 and 71 with which they mesh. By making a difference of only one tooth in the gears 75 and 76 a complete revolution of the bracket 73 around the
15 shaft 30b will advance or retard the cylinder 16 through an angular distance equal to the width of one tooth on the gear 71. Thus a very delicate and accurate adjustment may be secured through the movement of the bracket
20 through the desired distance.

In Fig. 4 there is also shown an alternative means for moving the cylinder 16 endwise. The rod 32a is provided with a grooved collar 85 at its outer end engaging the
25 pins of a yoke 86 on the end of a pivoted lever 87. A screw rod 88 is mounted in the bracket 81 and has a pair of collars 89, 90 engaging opposite sides of the lever 87. By rotating the hand wheel or handle 91 on the
30 end of the screw rod the lever 87 may be swung in either direction and the rod 32a and the cylinder 16 moved endwise in either direction.

If it is desired to use the mechanism for accomplishing circumferential adjustment as shown in Fig. 4 without any endwise adjustment, it will, of course, be obvious that the rod 32a and the parts 85 to 91 for operating the latter may be omitted and the cylinder 16 directly connected to the shaft 30b, or
40 a shaft similar to the shaft 63 in Fig. 7 may be employed.

It will be noted that in the form shown in Fig. 4 as well as in the form shown in Figs. 3 and 7 that there are two aligned gears, one of which is connected to the rotatable operating member and the other to the drive, and that there are a connected pair of gears meshing with the first mentioned gears for transmitting power from one to the other of the
50 latter and that this second mentioned pair of gears is bodily movable to effect relative rotation of the first mentioned gears.

The construction illustrated in Fig. 4 is disclosed and specifically claimed in our copending application Serial No. 553,980, filed July 30, 1931, although such construction forms one embodiment of the invention herein claimed.

In the form in Figs. 3 and 7 a relative endwise movement of two members at least one of which presents helical surfaces, is utilized for effecting relative rotation of the driving
60 gear and the operating member. This prin-

ciple may be employed in a somewhat different form as shown in Figs. 5 and 6. In this construction the details are similar to those shown in Fig. 4 except in the following particulars.

The driving gear 92 is keyed to a collar 93 which has a cylindrical flange provided with helically disposed slots 94. This collar is relatively rotatable in respect to the driving shaft 30b. Encircling the driving shaft and relatively rotatable in respect thereto is a sleeve 95 having keyed thereto a collar 96 having pins 97 slidable in the slots 94. The sleeve 95 is normally rigidly secured to the shaft 30b so that as the collar 96 is moved endwise it will cause a relative rotation of the driving shaft 30b and the driving gear 92. Any suitable means may be employed for effecting axial movement, as for instance, a pivoted lever 98 and an adjusting screw rod
70 75 80 85 90 95 99.

The clutch shown in Fig. 3 for preventing or permitting relative rotation of the driving gear which is connected to the gear 46 and the member 48 which has the inclined surfaces and which is connected through the gear 47 to the cylinder 16, includes the members 53 and 55 and the connecting bolts 54. This type of clutch is preferable as it prevents any possible slipping under the heavy strain to which the parts are subjected under high speed operations.

A different form of clutch is shown in Fig. 5 which is somewhat easier to engage and release. This clutch includes a clutch drum 53a and an internally expanding clutch band 55a which are connected together or released by a sliding collar 54a. This clutch operating collar is keyed to the sleeve 95 and may be moved into or out of operation in any suitable manner as for instance an operating lever 54b.

The construction illustrated in Figs. 5, 5a and 6 is disclosed and specifically claimed in our copending application Serial No. 553,981, filed July 30, 1931, although such construction forms one embodiment of the invention herein claimed.

It will be apparent that the various details of construction illustrated may be varied within a comparatively wide range within the spirit of our invention, and that various other forms may be designed to accomplish the desired result of axial adjustment or circumferential adjustment or both adjustments, of a rotatable operating member acting upon an advancing sheet, whereby the registry and proper placing of the results of such operation may be secured while the machine is in operation, and whereby when the machine is at rest the operating member may be released from the drive and freely rotated to bring the operating parts into readily accessible positions.

Having thus described our invention, what 130

we claim as new and desire to secure by Letters Patent is:

1. In combination, means for advancing a sheet of material, a printing cylinder for operating thereon, a driving gear, a helical gear secured to said printing cylinder, a second helical gear meshing with the first helical gear, means for transmitting power from said driving gear to said second helical gear for driving the first helical gear, means for moving one of said helical gears axially to thereby effect relative circumferential movement of said cylinder and said driving gear, and clutch connection for preventing or permitting relative rotation of said cylinder and said driving gear independent of any relative axial movement of said helical gears.

2. A machine for operating on an advancing sheet, including a rotatable member for acting on the sheet, a driving gear, a helical gear secured to said member, a second helical gear meshing with the first mentioned helical gear, means for transmitting power from said driving gear to said second mentioned helical gear, means operable while the machine is running for moving one of said helical gears axially to thereby rotate one helical gear in respect to the other and to turn said rotatable member in respect to said second driving gear, and clutch connections between said helical gear and said driving gear to permit freeing of said member from driving relationship with said driving gear.

3. A machine for operating on advancing sheet material, including a plurality of operating members acting in sequence, and means for securing predetermined relative positioning of the successive operations on the sheet, including a pair of coaxial gears, one constituting the driving gear and the other connected to one of said members, a second pair of coaxial gears, each meshing with a corresponding one of the first pair, a detachable clutch connected between said last mentioned gears, and means for moving one pair bodily in respect to the other to effect relative rotation of the two first mentioned gears but without effecting power transmission from the driving gear through the second pair to said member.

4. A machine for operating on advancing sheet material, including a rotatable member for operating on the sheet, a driving gear coaxial therewith, and power transmitting connections between said gear and said member, including a pair of members relatively movable endwise and one having a helical surface engaging the other to effect relative rotation upon relative axial movement, means operable while the machine is running for effecting said relative endwise movement, and a clutch in said power transmitting connections for permitting free rotation of said driving gear and said member.

5. A machine for operating on advancing

sheet material, including a rotatable member for operating on said material, a fixed rod, a pair of coaxial gears axially movable on said rod, means for driving one of said gears, a power transmitting connection between the other gear and said rotatable member, means connecting said gears to prevent relative rotational movement, a hand wheel having a threaded engagement with one end of said fixed rod for effecting axial movement of said gears, and means responsive to said axial movement for effecting the relative rotation of said rotatable member with respect to said driving means.

6. A machine for operating on advancing sheet material, including a rotatable operating mechanism, a fixed rod, a pair of coaxial rotatable members mounted for rotation about said rod, a power transmitting connection between one of said members and said mechanism, means for driving the other member, means connecting said members to prevent relative rotational movement, a hand wheel having threaded engagement with one end of said fixed rod, one of said members being connected to said hand wheel, and means responsive to the axial movement of said last mentioned member for effecting the relative rotation of said rotatable mechanism with respect to said driving means, without interrupting the transmission of power thereto.

7. A machine for operating on advancing sheet material, including a rotatable member for operating on said material, a drive gear, a pair of concentrically mounted sleeves, a gear connected to one of said sleeves and engaged by said drive gear, a drive connection between the other sleeve and said rotatable member, means connecting said sleeves together to normally prevent relative rotational movement, means connected to one end of one of said sleeves for moving it in an axial direction, and means responsive to the axial movement of said last mentioned sleeve for effecting the relative rotation of said rotatable member with respect to said drive gear.

8. A machine for operating on an advancing sheet, including a rotatable operating mechanism, a pair of rotatable members mounted coaxially with respect to said mechanism, one of said members serving to receive the driving power and, the other member being connected to said mechanism, power transmitting connection means between said members including readily disengageable means to permit or prevent relative rotation of said members, means for moving said connection means bodily with respect to one of said rotatable members, and means responsive to the movement of said connection means for circumferentially advancing or retarding one of said members with respect to the other to effect a corresponding circumferential adjustment of the rotatable mechanism without in-

interrupting the transmission of power to said rotatable mechanism.

9. A machine for operating on an advancing sheet, including a rotatable operating mechanism, a pair of rotatable members mounted coaxially with respect to said mechanism, one of said members serving to receive driving power and, the other member being connected to said mechanism, a power transmitting connection between said members, including means for permitting or preventing free relative rotation of said members, and means for circumferentially advancing or retarding one of said members with respect to the other to effect a corresponding circumferential adjustment of the rotatable mechanism without interrupting the transmission of power to said rotatable mechanism.

10. A machine for operating on advancing sheet material, including a rotatable member for operating on said material, a pair of intermeshing members having helical teeth, means for driving one of said members, a drive connection between the other member and said rotatable member, means for moving one of said pair of members to circumferentially advance or retard said rotatable member with respect to the other of said pair of members without interrupting the transmission of power to said rotatable member, and disengageable means for preventing or permitting the rotation of said rotatable member independently of said driving means without unmeshing said gears.

11. A machine for operating on advancing sheet material, including a rotatable operating mechanism, a pair of coaxial rotatable members, one of said members being shiftable axially, a power transmitting connection between one of said members and said mechanism, means for driving the other of said members, easily disengageable means connecting said members to permit or prevent relative rotational movement, and means responsive to the axial movement of said shiftable member for effecting the relative rotation of said rotatable mechanism with respect to said driving means without interrupting the transmission of power thereto.

12. A machine for operating on advancing sheet material, including a rotatable member for operating on said material, a pair of members having interengaging helical surfaces, means for driving one of said pair, a drive connection between the other member of said pair and said rotatable member, means operable while the machine is running for adjusting one of said members axially to effect relative rotation of said rotatable member in respect to said driving means, and means for disengaging said rotatable member from the driving means for permitting the rotation of said rotatable member independently of said driving means without disengaging said members.

13. A machine for operating on advancing sheet material, including a rotatable member for operating on said material, a pair of interengaging members, a gear coaxial with said rotatable member for driving one of said pair, a drive connection between the other of said pair and said rotatable member, one of said pair presenting a helical surface, means operable while the machine is running for adjusting one of said interengaging members axially to effect relative rotation of said rotatable member in respect to said driving means, and means for disengaging said rotatable member from the driving means for permitting the free rotation of said rotatable member independently of said driving means without disengaging said members.

14. A machine for operating on advancing sheet material, including a rotatable member for operating on said material, a pair of concentric sleeves, means for moving one of said sleeves axially to circumferentially advance or retard said rotatable member without interrupting the transmission of power thereto, a drive for one of said sleeves, a drive connection between the other sleeve and said rotatable member, and easily engageable and disengageable means for connecting said sleeves to prevent or permit relative rotation.

15. A machine for operating on advancing sheet material, including a rotatable member for operating on said material, a pair of concentric members, a pair of gears, one connected to each of said members, means for driving one of said gears, a drive connection between the other gear and said rotatable member, a hand wheel connected to said last mentioned gear, easily disengageable means connecting said hand wheel and the other gear, for permitting or preventing relative rotation of said gears, and means effecting axial movement of one of said gears for circumferentially advancing or retarding said rotatable member while the machine is running.

16. A machine for operating on advancing sheet material, including a rotatable member for operating on said material, a pair of concentric sleeves, a gear connected to one of said sleeves, a drive therefor, a drive connection between the other sleeve and said rotatable member, a fixed support loosely embraced by said sleeves, a hand wheel having threaded engagement with one end of said support, and connected to one of said sleeves for axial movement therewith, easily engageable and disengageable means connecting said sleeves for rotation in unison, and means responsive to the axial movement of said last mentioned sleeve for effecting the relative rotation of said rotatable member with respect to said drive.

17. A slotter for carton blanks, including

a rotatable slotting head, a drive therefor, and connection means therebetween, including readily disconnectible means whereby the head may be positively driven or may be released for free rotation independently of the drive to render any portion of the head readily accessible for adjustment, attachment or removal of the operating part of said head, and means in series with said first mentioned means for circumferentially adjusting said head in respect to said drive, when said first mentioned means is in driving position and the machine is running.

18. A machine for operating on advancing sheet material, including a rotatable member for operating on said material, a drive therefor, a rod connected to said rotatable member and coaxial therewith, a hollow shaft through which said rod extends, and connected to said rotatable member for driving the latter, a pair of interengaging members, one of which is connected to said shaft and the other connected to the drive, means operable while the machine is running for adjusting one of said interengaging members axially to effect relative rotation of said rotatable member with respect to said drive, and means connected to said rod for moving said rod axially, whereby said rotatable member is adjusted axially without disturbing the drive connection between said rotatable member and said drive.

19. A machine for operating on advancing sheet material, including a rotatable member for operating on said material, a rod connected to and coaxial with said rotatable member, means for moving said rod and member axially, a sleeve encircling said rod, and having one end thereof connected to said rotatable member for rotational movement therewith, a first helical gear connected to said sleeve, a second helical gear meshing with said first helical gear, a drive for said second helical gear, and means operable while the machine is running for adjusting one of said helical gears axially to effect relative rotation of said rotatable member with respect to said rod.

20. A machine of the character described, including a rotatable member for operating on a sheet of material, means for driving said rotatable member, a rod connected to said rotatable member, and coaxial therewith, a rotatable member externally threaded and connected to said rod, a gear having a threaded engagement with said threaded rotatable member, a pinion meshing with said gear, and a hand wheel connected to said pinion, whereby upon the rotation of said hand wheel, said first mentioned rotatable member is moved axially without interrupting the drive thereto.

21. A machine for operating on advancing sheet material, including a rotatable member for operating on said material, means for

driving said member, a rod connected to said rotatable member and coaxial therewith, a thrust bearing unit connected to one end of said rod, a member engaging said bearing unit, and having an external threaded portion, a gear coaxial with respect to said rod, and having a threaded engagement with said threaded member, a fixed rod, a pinion mounted for rotational movement around said rod, and meshing with said gear, and a hand wheel supported on said fixed rod, and connected to said pinion, whereby upon the rotation of said hand wheel, axial adjustment of said rotatable member is effected without interrupting the drive thereto.

22. A machine for operating on advancing sheet material, including a rotatable member for operating on said material, a drive therefor, a pair of concentric sleeves, a gear connected to one of said sleeves and engaged by said drive, a drive connection between the other sleeve and said rotatable member, a fixed rod encircled by said sleeves, a first hand wheel having threaded engagement with one end of said fixed rod, one of said sleeves being connected to said hand wheel for axial movement therewith, detachable bolt connections between said sleeves to permit or prevent relative rotation, and a second hand wheel connected to one end of the second mentioned sleeve, whereby upon releasing said bolt connections the rotatable member may be easily rotated independently of the drive.

23. A machine for operating on advancing sheet material, including a rotatable member operating on said material, a drive therefor, a rod connected coaxially to said rotatable member, means connected to said rod to move said rod axially, a sleeve loosely embracing said rod, and having one end thereof connected to said rotatable member for rotational movement therewith, a first helical gear connected to said sleeve, a second helical gear meshing with said first helical gear, means for moving said second helical gear axially to thereby effect the relative circumferential movement of said rotatable member with respect to said second helical gear, and an easily engageable and disengageable drive connection between said second helical gear and said drive, whereby said second helical gear may be freed from said drive, and said rotatable member adjusted independently of said drive.

24. A machine for making box blanks having aligned slots in opposite edges to form closure flaps therebetween, a reciprocatory mechanism for feeding the unslotted blanks in succession, a pair of slotting heads, one having a pair of cutters spaced apart to the desired distance between the slots in one edge and those in the other edge of the blank, manually operable means for rotatably adjusting said slotting head in respect to said feeding mechanism to vary the length of the

slots in one edge of the blank in respect to those in the opposite edge while the machine is running, and readily disconnectable means to prevent or permit free rotation of said last mentioned slotting head while the machine is at rest.

25. A printer and slotter for carton blanks, including a shaft forming a driven element, a gear loose thereon and forming a driving element, power transmitting means between said elements and including an axially movable member having a helical surface, and detachable connections to one of said elements to permit or prevent relative free rotation of said elements, and driving connections between said surface and the other element.

26. A printer and slotter for carton blanks, including a shaft forming a driven element, a gear loose thereon and forming a driving element, power transmitting means between said elements and including an axially movable member having a helical surface, and detachable connections to one of said elements to permit or prevent relative free rotation of said elements, driving connections between said surface and the other element, a fixed member, a hand wheel threaded to said fixed member, and connections between the hand wheel and said first mentioned member permitting relative rotation and preventing relative axial movement.

27. A printer and slotter for carton blanks, including a shaft having an operating part for engaging the blank, a drive gear, a pair of sleeves held against relative axial movement, a fixed threaded member, a hand wheel threaded to said member and held against relative axial movement in respect to said sleeves, but relatively rotatable in respect thereto, means for effecting relative rotation of one of said sleeves and said drive gear upon axial movement of said sleeves, means for driving the shaft from the other of said sleeves, and a readily detachable connection for permitting or preventing free rotation of said shaft in respect to said gear.

28. A machine for operating on advancing sheet material, including a rotatable member for imparting to the sheet a desired characteristic, a hollow shaft connected to said rotatable member for rotation therewith, a rod passing through said hollow shaft and connected to said rotatable member, and means connected to said rod for shifting said rod and said rotatable member axially.

29. A machine for operating on advancing sheet material, including a rotatable member imparting to the sheet the desired characteristic, a hollow shaft connected to said rotatable member, a pair of gears coaxial with said shaft, one being secured to said shaft and the other serving as a drive and loose thereon, gearing having a stationary axis and serving to transmit power between said

gears, means for moving said gearing axially to rotatably adjust one of said gears in respect to the other, a rod passing through said hollow shaft and connected to said rotatable member, and means for shifting said rod and said rotatable member axially.

Signed at Camden, in the county of Camden and State of New Jersey, this 22nd day of October, 1930.

SAM'L M. LANGSTON.
KARL SIEG.

CERTIFICATE OF CORRECTION.**Patent No. 1,850,800.****March 22, 1932.****SAMUEL M. LANGSTON ET AL.**

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 7, line 29, claim 2, strike out the word "second"; and line 30, after "said" insert the word "second"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 13th day of December, A. D. 1932.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.