

Jan. 28, 1947.

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2,414,906

SHEET FEEDING AND NOTCHING

Filed Sept. 15, 1944

3 Sheets-Sheet 1

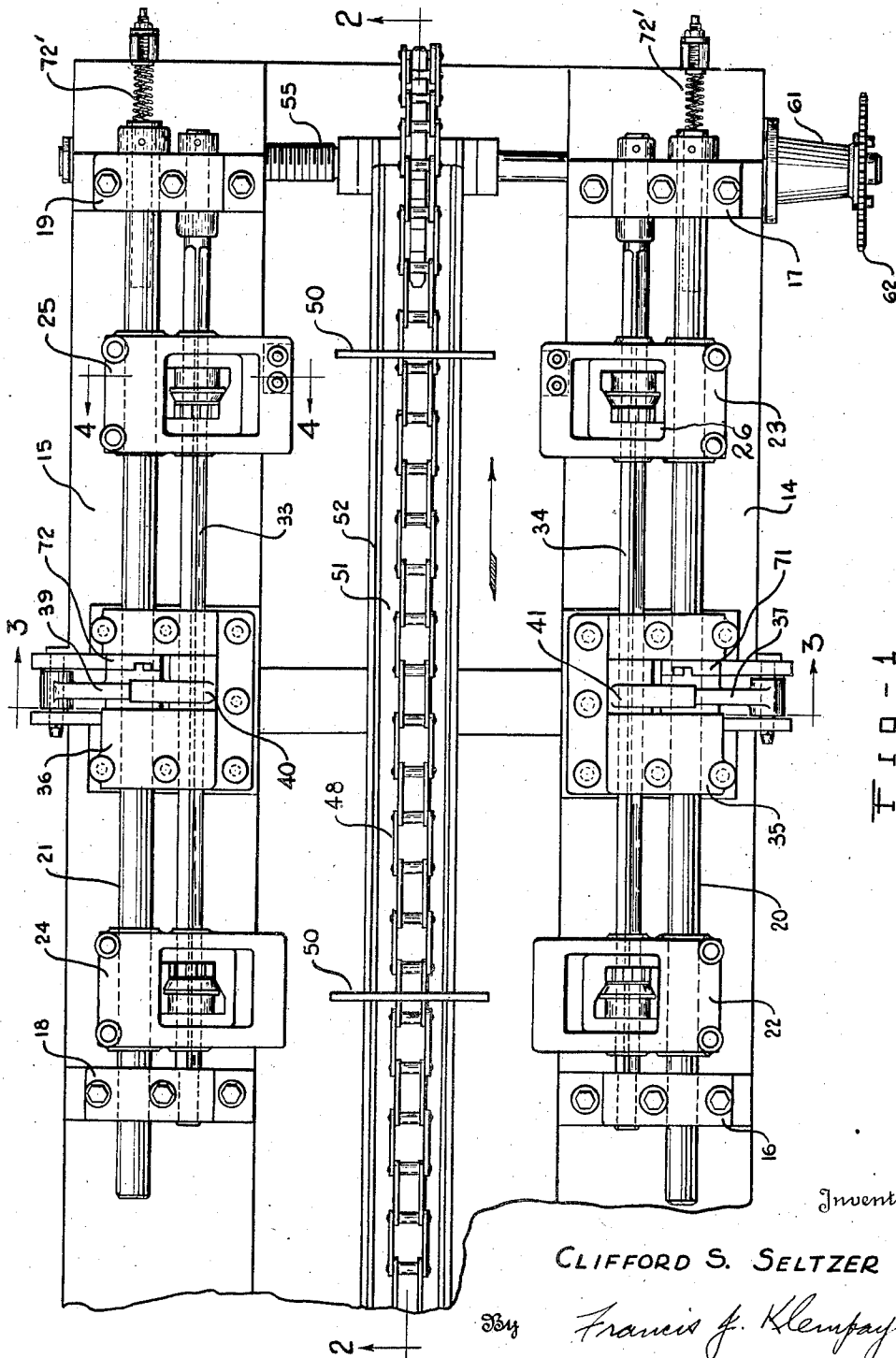


FIG - 1

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3 Sheets-Sheet 2

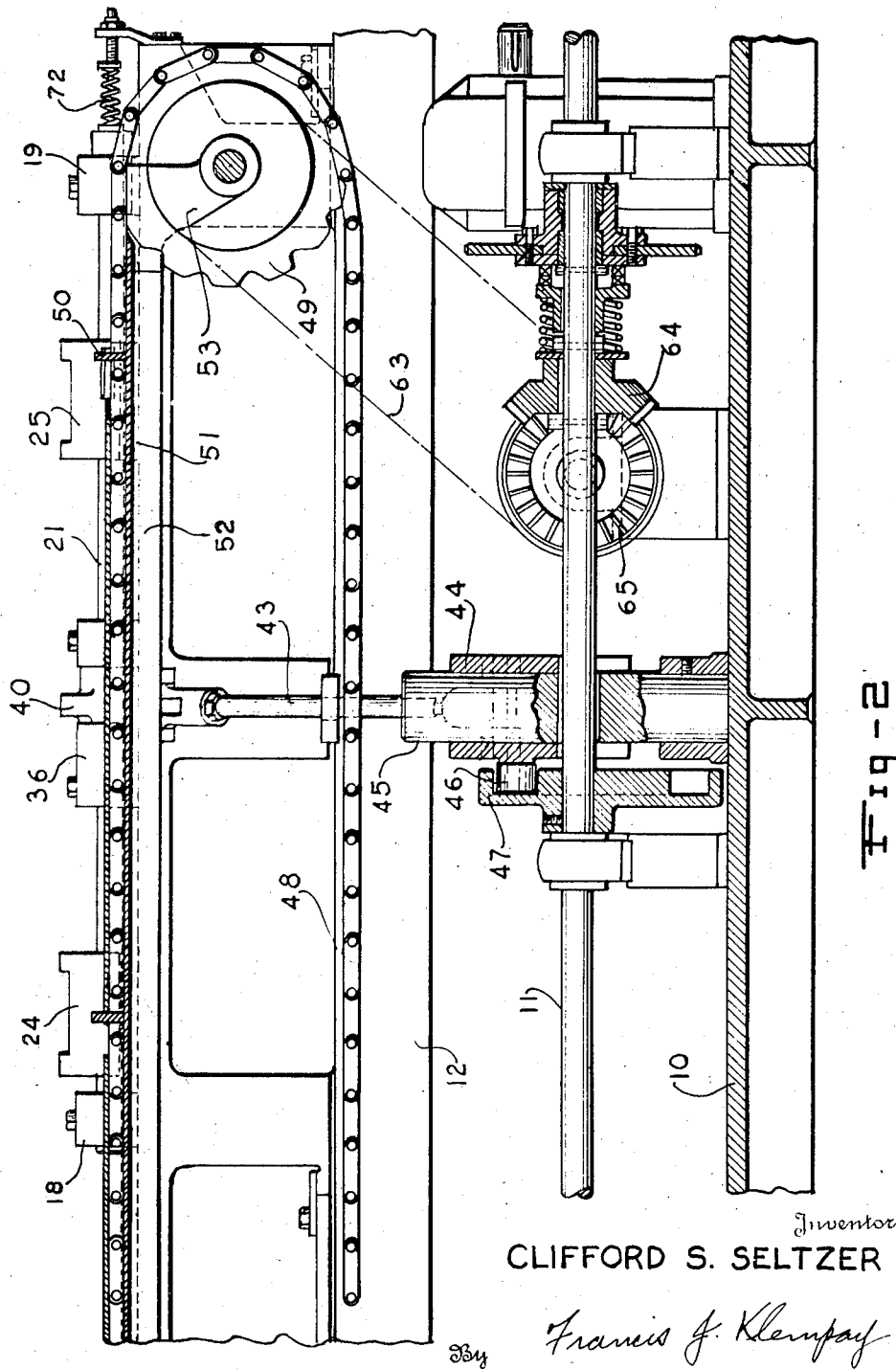


Fig. 2

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3 Sheets-Sheet 3

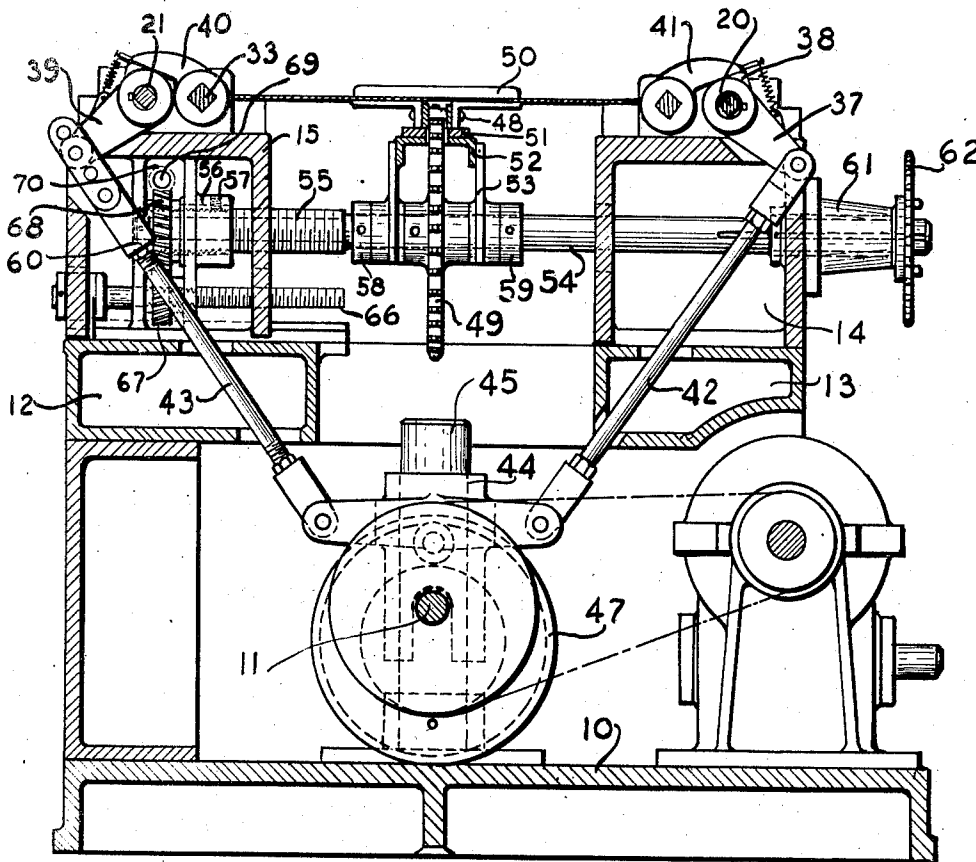


Fig - 3

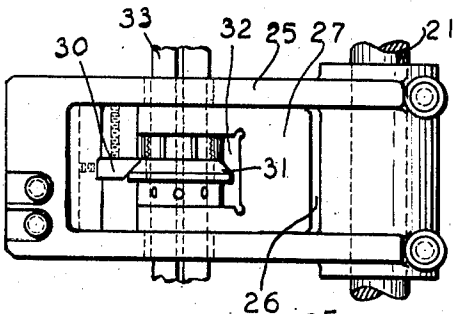


Fig - 5

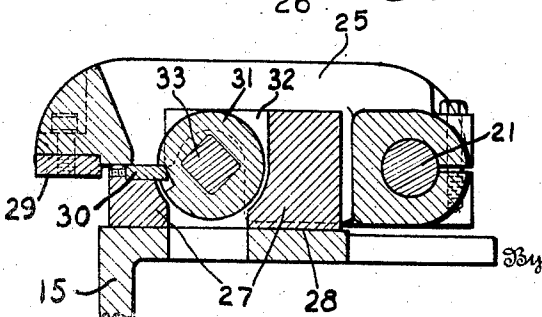


Fig-4

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UNITED STATES PATENT OFFICE

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SHEET FEEDING AND NOTCHING

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4 Claims. (Cl. 164—50)

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This invention relates to automatic sheet transporting and working apparatus and more particularly to apparatus operable automatically and at high speed to perform certain predetermined cutting operations on thin sheets as the same continuously progress along a fixed path. The invention is of special utility in connection with automatic high speed can making machinery in which it is desired, for example, that the corners of otherwise square or rectangular metal sheets be notched out before the sheets progress to the forming and seaming stations.

Apparatus of the general character herein involved has heretofore been constructed in such manner that either an intermittent motion is given to the successive sheets while the cutting operation takes place while the sheets are at rest or the sheets are moved continuously in which case the cutting or notching mechanism is mounted to travel along with the sheets for a sufficient interval of time to enable the cutting or notching operation to be effected. For various reasons the latter mode of operation is desirable and it is accordingly the principal object of the present invention to provide an improved sheet transferring and cutting or notching assembly in which the successive sheets are moved continuously along a predetermined path and while so in motion are engaged by suitable tools for effecting the required cutting or notching operations.

A further object of the invention is the provision of improved apparatus of the type mentioned which may be readily adjusted to perform cutting or notching operations on sheets of different dimensions. In the can making art, for example, it is often desired that the same machine be capable of producing the cylindrical bodies required for the making of cans of different sizes. The present invention provides an operative assembly whereby cutting or notching operations may be effected on each of the four sides or at each of the four corners of a rectangular sheet irrespective of the principal dimensions of the sheet, the apparatus being readily adjustable to accommodate sheets of varying transverse and longitudinal dimension.

Another object of the invention is the provision of improved apparatus of the character mentioned in which the successive sheets passing through the apparatus are automatically aligned and held in accurate alignment during the cutting or notching operations.

The above and other objects and advantages of the invention will become apparent upon consideration of the following detailed specification

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and the accompanying drawings wherein there is disclosed a preferred embodiment of the invention.

In the drawings:

Figure 1 is a plan view of a machine constructed in accordance with the principles of the invention and capable of simultaneously notching each of the four corners of a rectangular metal sheet as the same moves in continuous progression through the apparatus;

Figure 2 is a partial longitudinal section of the apparatus of Figure 1;

Figure 3 is a transverse section of the apparatus of Figure 1; and

Figures 4 and 5 are transverse sectional and plan views, respectively, of a part of the apparatus of Figure 1.

The apparatus illustrated herein is normally but a component part of a larger piece of equipment as, for example, a metal can body maker having a stack feeding assembly, the notching station herein, and forming and welding stations as will be understood. Thus, there is shown a longitudinally extending base 10 which is normally an integral part of the base of the complete machine assembly. Also, such assembly may include a common drive shaft 11 which is journaled for rotation in suitable bearing supports carried by the base 10. It will be understood that the common drive shaft 11 is provided primarily to achieve proper sequencing and synchronization of the various operative elements of the complete assembly.

Mounted on and extending longitudinally along opposite sides of the base 10 are the side frame members 12 and 13 and rigidly mounted on the frame member 13 is a longitudinally extending housing or support 14. A similar housing or support 15 is slideably mounted on the frame member 12 for lateral movement in directions toward and away from the housing 14, suitable guideways being formed in the frame member 12 and/or in the housing 15 to enable this to be accomplished. The reciprocating portion of the notching mechanism is slideably mounted on the housings 14 and 15, the former carrying a pair of longitudinally spaced guide blocks 16 and 17 and the latter carrying a similar pair of longitudinally spaced blocks 18 and 19. Blocks 16 and 17 are provided with longitudinally aligned bores for the slideable support of a rod 20 and a similar rod 21 is slideably mounted in the blocks 18 and 19.

Adjustably clamped to the rod 20 is a pair of arms 22 and 23 and a similar pair of arms 24 and

25 are adjustably clamped to the rod 21. These arms are substantially identical and therefore but one of them and its closely associated elements will be specifically described.

Referring to Figures 4 and 5, it will be observed that the arm 25 is provided with a vertically extending recess or opening 26 in which is mounted a block 27. Block 27 is slideably supported on an upper surface 28 of the housing 15 and it will be understood that the parallel longitudinally spaced side walls of the recess 26 of the arm 25 enables the arm to rock about the axis of the shaft 21 while the block 27 retains its position in contact with the surface 28. Secured to the bottom surface of the free end of the arm 25 is a gauge block 29 against the side edge of which the advancing end of the sheet impinges as the sheet progresses through the apparatus. Recessed in the block 27 is a cutting die 30 adapted to coact with a notched rotary die 31 in the manner more fully described in a co-pending application Serial No. 414,624 filed Oct. 11, 1941. As shown, block 27 is recessed as at 32 to receive the rotary die 31 and the die member 31 is, in turn, slideably mounted on a squared shaft 33 which is rotatably journaled in the blocks 18 and 19 carried by the housing 15. A similar squared shaft 34 is journaled in the blocks 16 and 17 for driving the rotary dies associated with the arms 22 and 23 as will be understood.

Rod 20 is longitudinally slideable in a block 35 mounted on the housing 14 and a similar block 36 on the housing 15 slideably supports the rod 21. Rotatably mounted on the rod 20 is a lever 37 having an integral cam portion 38 and a similar lever 39 is mounted on the rod 21. Slideably mounted on the shafts 33 and 34 are the levers 40 and 41, respectively, adapted to be engaged by the cam surfaces on the levers 39 and 37. By referring to Figure 1 it will be observed that these various levers are mounted in slots provided in the blocks 35 and 36 whereby they are constrained against endwise movement. Levers 37 and 39 are connected through clevises and rods 42 and 43, respectively, with the transversely opposite arms of a vertically reciprocable crosshead 44 which is slideably mounted on a post 45 which extends upwardly from the base 10. Rotatably mounted on the crosshead 44 is a cam following roll 46 which is engaged by a cam 47 keyed to the drive shaft 11. Thus, upon rotation of the drive shaft 11 the levers 37 and 39 are rocked upwardly and downwardly according to a predetermined timed-position pattern as governed by the shape of the cam 47.

To propel the successive sheets through the apparatus I provide an endless chain 48 which is entrained over a pair of longitudinally spaced sprockets, only one of which is shown in the drawings at 49. Sprocket 49 is the driving sprocket of the assembly, it being understood that the sprocket supporting the opposite end of the chain loop is of the idling type provided with the usual movable mounting whereby the tension on the chain may be adjusted, if desired. Chain 48 has rigidly attached thereto at definitely spaced intervals cleats 50 for engaging the trailing edges of the sheets being worked on and the upper reach of the chain is slideably supported on a longitudinally extending wear plate 51 carried by a channel member 52. Member 52 is, in turn, supported at its ends on the shafts which mount and drive the chain carrying sprocket. Thus, as shown in Figures 2 and 3, apertured ears 53, on opposite sides of the sprocket 49, mounts the head

end of the channel 52 on the drive shaft 54 which mounts and drives the sprocket 49.

Shaft 54 is rotatably supported at one end in an externally threaded sleeve 55 which is slideably mounted in a boss 56 formed integral with the housing 15. A slot in sleeve 55 cooperating with a screw 57 set in the boss 56 restrains sleeve 55 against rotation while allowing it to be moved axially. As shown in Figure 3, the sprocket 49 is pinned to the shaft 54 intermediate the lower ends of the ears 53 and collars 58 and 59 are pinned to the shaft 54 on the outside of the ears 53. Thus, upon axial movement of the shaft 54 the sprocket and chain assembly is moved transversely a corresponding amount. To the end of the shaft 54 which extends through the sleeve 55 there is pinned a collar 60 whereby, in cooperation with the collar 58, the shaft 54 is constrained against axial movement with respect to the sleeve 55. The opposite end of the shaft 54 is feathered in a hub 61 which is rotatably mounted in a bore formed in the outer wall of the housing 14. Secured to hub 61 is a sprocket 62 arranged to be driven by a chain 63 from shaft 11 through bevel gears 64 and 65, it being observed that bevel gear 64 is rigidly keyed to the shaft 11.

In adjusting the lateral position of the housing 15 to accommodate sheets of different dimension it is essential that the parallelism of the housings 14 and 15 be maintained and that the line of drive of the chain 48 be maintained substantially midway between the cutters on opposite sides of the assembly. For the first mentioned purpose I associate a screw 66 (threaded oppositely with respect to sleeve 55) with each of the sprocket shafts and, as indicated in Figure 3, the screws 66 are held against axial movement and rotation with respect to the side frame 12 of the assembly. Screw 66 passes through spaced webs in the housing 15 and positioned between these webs is a helical gear 67 which is screw-threaded onto the screws 66. Also positioned between these webs is a second helical gear 68 having screw-threaded connection with the sleeve 55. Extending longitudinally through the housing 15 is a shaft 69 on which is keyed a worm 70 having operative driving connection with the gear 68. It should be understood that an assembly identical with the assembly just described, including sleeve 55, screw 66, and gears 67, 68 and 70, is associated with the shaft supporting the idler sprocket at the opposite end of the housing 15 so that upon rotation of the common shaft 69 both ends of the housing 15 will be moved inwardly or outwardly in parallelism with the housing 14. It should be observed that the worm 70 drives the gear 68 which in turn drives the gear 67 so that upon rotation of these parts the housing 15 will be moved laterally by virtue of the interconnection between screws 66 and gears 67 while the shaft 54 is moved axially by virtue of the interconnection between gear 68 and sleeve 55. The driving ratio between gears 68 and 67 is such that the housing 15 moves twice as fast and far as does the sleeve 55 so that for any given rotation of the shaft 69 the center line of chain 48 will always remain midway between the cutters on opposite sides of the assembly. The shaft 69 is connected with a readily accessible crank or other operating device, not shown.

By referring to Figure 1 it should be noted that the recesses in collars 71 and 72 are feathered on rods 20 and 21, respectively, are of greater circumferential extent than are the teeth on the cam levers 37 and 39 so that after rods 20 and 21

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have been rotated sufficiently to close the arms 22—25 the levers 37 and 39 may continue to rotate sufficiently to effect completion of the cutting movement of the rotary dies 31 as will be understood. The carriage comprising the rods 20 and 21 and the guiding and cutting elements mounted thereon is biased to its retracted or initial starting position by compression springs 72' which extend into axial bores formed in the ends of the rods 20 and 21.

In operation, the conveyor chain 48 is normally in continuous motion and upon a sheet being propelled along this conveyor by engagement of its trailing edge by one of the cleats 50 the sheet will be guided into proper position between the cutters by the vertical guiding surfaces provided by the blocks 16, 18 and on the blocks 35 and 36. As the sheet advances the action of the cam 47 is such as to relieve the rods 20 and 21 allowing the arms 22—25 to rotate to downward position. Such position is indicated in Figure 4 and is such that the leading edge of the sheet engages the gauge blocks 29 carried by the arms 23 and 25. It should be noted that the arms 22 and 24 do not carry such gauge blocks.

Upon engagement of the leading edge of the sheet with the gauge blocks 29 the reciprocating carriage of the assembly including the rods 20 and 21 and the arms 22—25 is moved forwardly along with the sheet and, of course, the blocks 27 and the rotary dies 31 slide along with the sheet, these parts being constrained within the windows of the arms 22—25. As the sheet and cutters advance the driven cam 47 operates to move the crosshead 44 vertically upward thereby rocking the levers 37 and 39 upwardly to rotate the shafts 33 and 34 inwardly. This brings the cutting edges of the rotary dies 31 into cutting engagement with the sheet in cooperative relation with the die members 30. This motion of the levers 37 and 39 is accomplished without further inward rotation of the rods 20 and 21 by reason of the circumferentially elongated recesses formed in the driving collars 71 and 72. Upon completion of the cutting operation cam 47 begins to move the crosshead 44 downwardly allowing shafts 33 and 34 to rotate outwardly thereby positioning the notches in the rotary dies 31 in the plane of the path of movement of the sheet through the apparatus. By this time the slack is taken up in the recesses in the driving collars 71 and 72 and the rods 20 and 21 are subsequently rotated outwardly a slight amount to raise the gauge blocks 29 of the arms 23 and 25 sufficiently to allow the sheet to pass therebeneath. As soon as the blocks 29 are raised clear of the sheet the forward motion of the carriage ceases and the same is then returned to its initial starting position by the compression springs 72. Upon the trailing end of the sheet passing below the gauge blocks 29 the arms 23 and 25 will drop down in preparation for the next succeeding cycle of operation.

From the above description it will be apparent that in passing through the apparatus generally and the reciprocating carriage in particular the side edge portions of the successive sheets slide through the notches formed in the rotary dies 31. These dies are bevelled or otherwise suitably contoured in relation to the anvils 30 to effect the desired angular notching of the four corners of the successive sheets. Suitable means, shown more in detail in the above mentioned co-pending application, is provided to adjust the longitudinal positions of the cutting faces of the rotary dies 31 to compensate for wear.

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While I have shown the cutters as operating on the four corners of the successive sheets it should be apparent that by suitable disposition of the cutters and the making of the rotary dies as well as the fixed anvils of proper shape and contour any cuts desired may be made anywhere along the side edges of the sheets or stock. Means for accomplishing this mode of operation is known in the art.

In the machine illustrated, adjustments are made for differences in the transverse dimension of the sheets or strip by rotation of the shaft 69 in the manner described above. During such adjustments the clevis interconnecting rod 43 and lever 39 is disconnected and to allow for the change in interval rod 43 is adjustable as to effective length and the clevis mentioned divided with a series of spaced apertures for selective engagement by the pin interconnecting the clevis and lever. The location of the cuts taken along the side edge or edges of the sheets of strip is determined by the longitudinal adjustment of the arms 22—25 along the rods 20 and 21 as will be understood. Thus, for corner notching, such longitudinal adjustment of the arms 22—25 compensate for differences in the longitudinal dimension of the successive sheets fed to the machine.

It should now be apparent that I have provided an improved combined sheet or strip transferring and notching mechanism which accomplishes the objects initially set out. First, the mechanism is operative in its wholly automatic manner to effect the desired notching while the stock progresses through the apparatus in a continuous and uninterrupted manner. Further, the apparatus is readily adjustable to accommodate sheets of strip of different dimension and to vary the character and location of the notches desired. However, the apparatus specifically described herein should be considered as only illustrative of the principles of the invention as many changes may be made therein without departing from the spirit or scope of the invention and reference should therefore be had to the appended claims in determining the scope of the invention.

What I claim is:

1. Sheet notching apparatus comprising in combination a conveyor for continuously advancing successive sheets along a fixed path, a carriage mounted for slideable movement in forward and reverse directions parallel with said path, movable means on said carriage adapted to be engaged by the leading edges of said successive sheets whereby said carriage may be moved along with each successive sheet, means on said carriage to effect predetermined cutting operations on said sheets as the same move along with said carriage, means to move said movable means to retracted position upon completion of the cutting operations on each successive sheet whereby said carriage may be released from said sheets, and means operable upon said retractive movement of said movable means to return said carriage to its initial starting position.

2. Sheet notching mechanism comprising in combination a conveyor for continuously advancing successive sheets along a fixed path, a rod mounted for rotational and longitudinally slideable movement to one side of said path and extending substantially parallel with said path, an arm rigidly secured to said rod and carrying a gauge block adapted to be engaged by the leading edges of the successive sheets whereby said arm and rod may be moved along with the sheets,

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said arm having a window providing longitudinally spaced vertical parallel guide surfaces, a normally fixed horizontally disposed guide surface below said window, a die block slideably mounted on said horizontal surface and constrained between said spaced guiding surfaces, a notched rotary cutting die mounted in said window in operative relation with said die block, a shaft extending parallel with said rod and feathering said rotary die, means operable synchronously with said conveyor to first rotate said shaft in forward and then reverse directions to effect a predetermined cutting operation on the sheets and to thereafter rotate said rod thereby retracting said gauge block allowing the sheets to be released from said apparatus, and means to return said rod and arm to their initial starting positions.

3. Sheet notching apparatus comprising in combination a conveyor for continuously advancing successive sheets along a fixed path, a notching mechanism slideably mounted for movement along one side of said path in forward and reverse directions parallel with said path and comprising an arm mounted for pivotal movement about an axis spaced outwardly from but substantially parallel with said path, said arm having a surface adapted to be engaged by the leading edges of the successive sheets whereby said mechanism may be moved forwardly along with said sheets, said arm having a window providing

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longitudinally spaced vertical parallel guide surfaces, a notching device slideably mounted in said window, means operable synchronously with said conveyor to actuate and retract said notching device upon forward movement of said mechanism along with a sheet, means operable synchronously with said conveyor to rock said arm upon completion of the notching operation to thereby withdraw said first mentioned surface from the leading edge of the sheet to release the latter from the mechanism, and means to return said mechanism back to its initial starting position.

4. Sheet notching apparatus comprising in combination a conveyor for continuously advancing successive sheets along a fixed path, a sheet notching mechanism, movable means connected with said mechanism and operable to be engaged by the leading edges of the successive sheets to move said mechanism along with the sheets, means operable synchronously with said conveyor to actuate and retract said mechanism during forward movement of the same along with each sheet, means operable synchronously with said conveyor to move said movable means out of the path of movement of said sheets upon completion of the respective notching operations to release said sheets from said mechanism, and means to return said mechanism to its initial starting position.

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