W. A. WEIGHTMAN AND C. H. NITSCH.

CORNER CUTTING AND BENDING MACHINE.

APPLICATION FILED SEPT. 26, 1919.

1,386,292.

Patented Aug. 2, 1921.

4 SHEETS—SHEET 1.

Fig. 6,

Fig. 7,

Fig. 8,

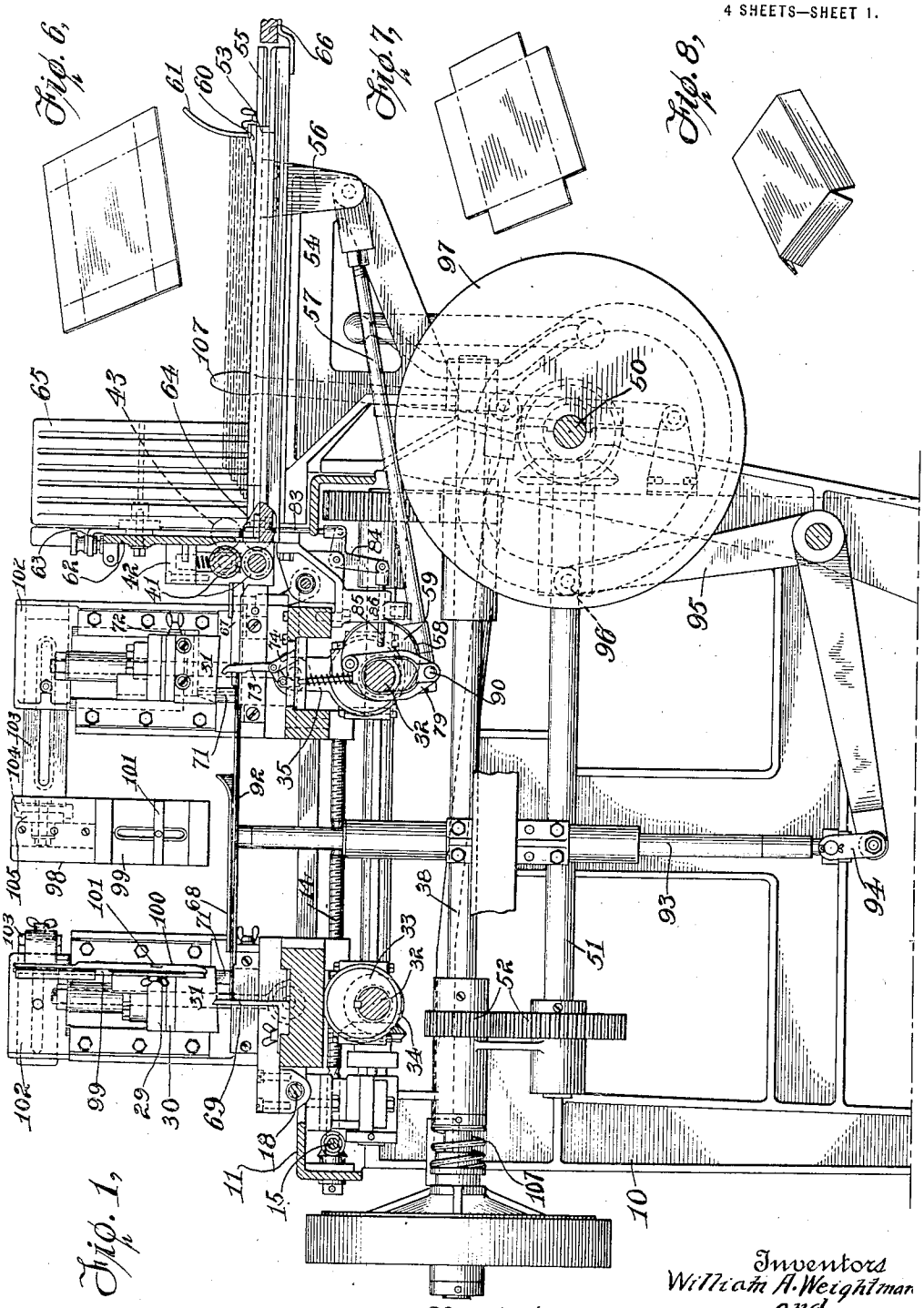


Fig. 1,

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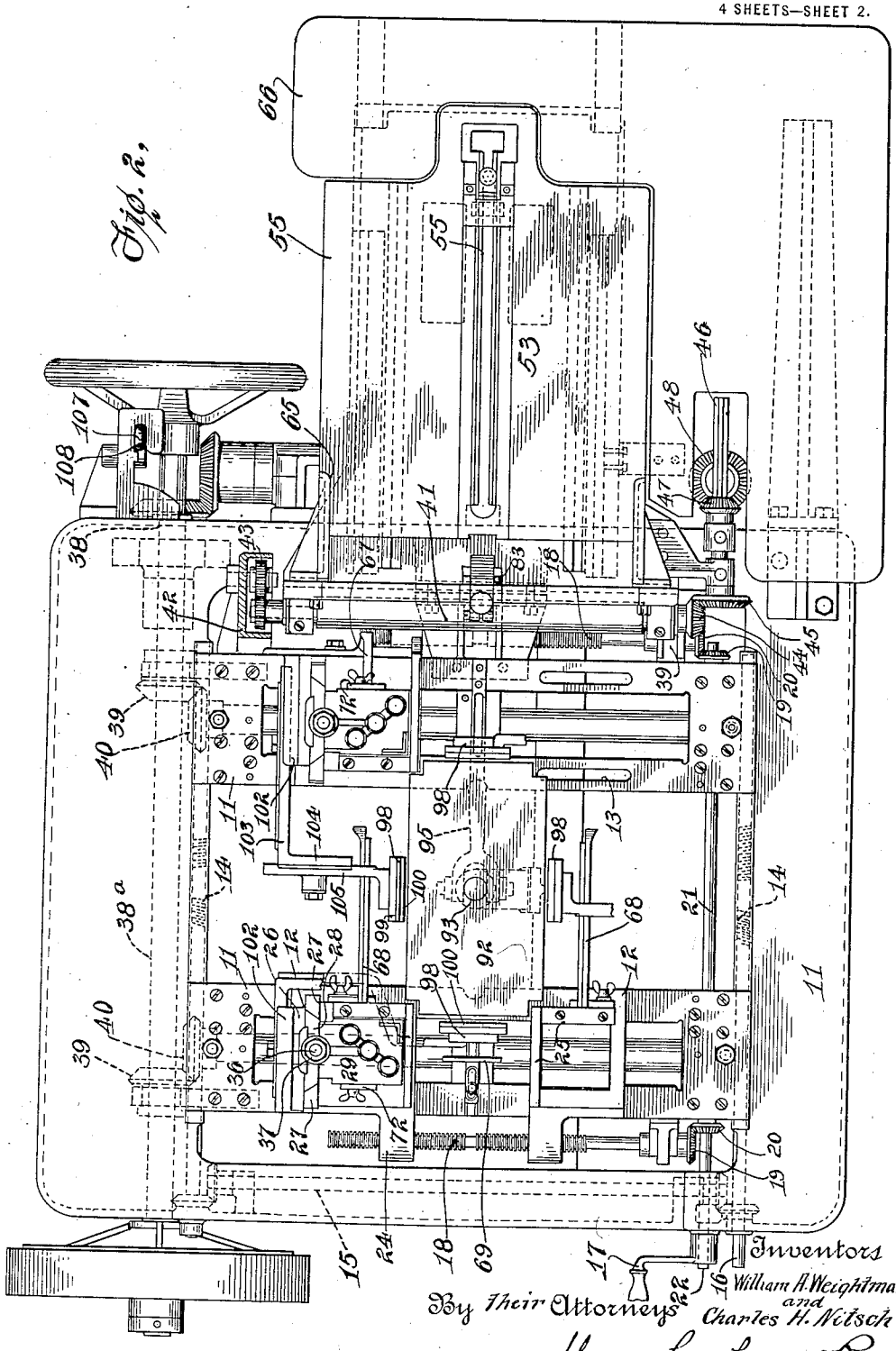
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4 SHEETS—SHEET 2.

Fig. 2.



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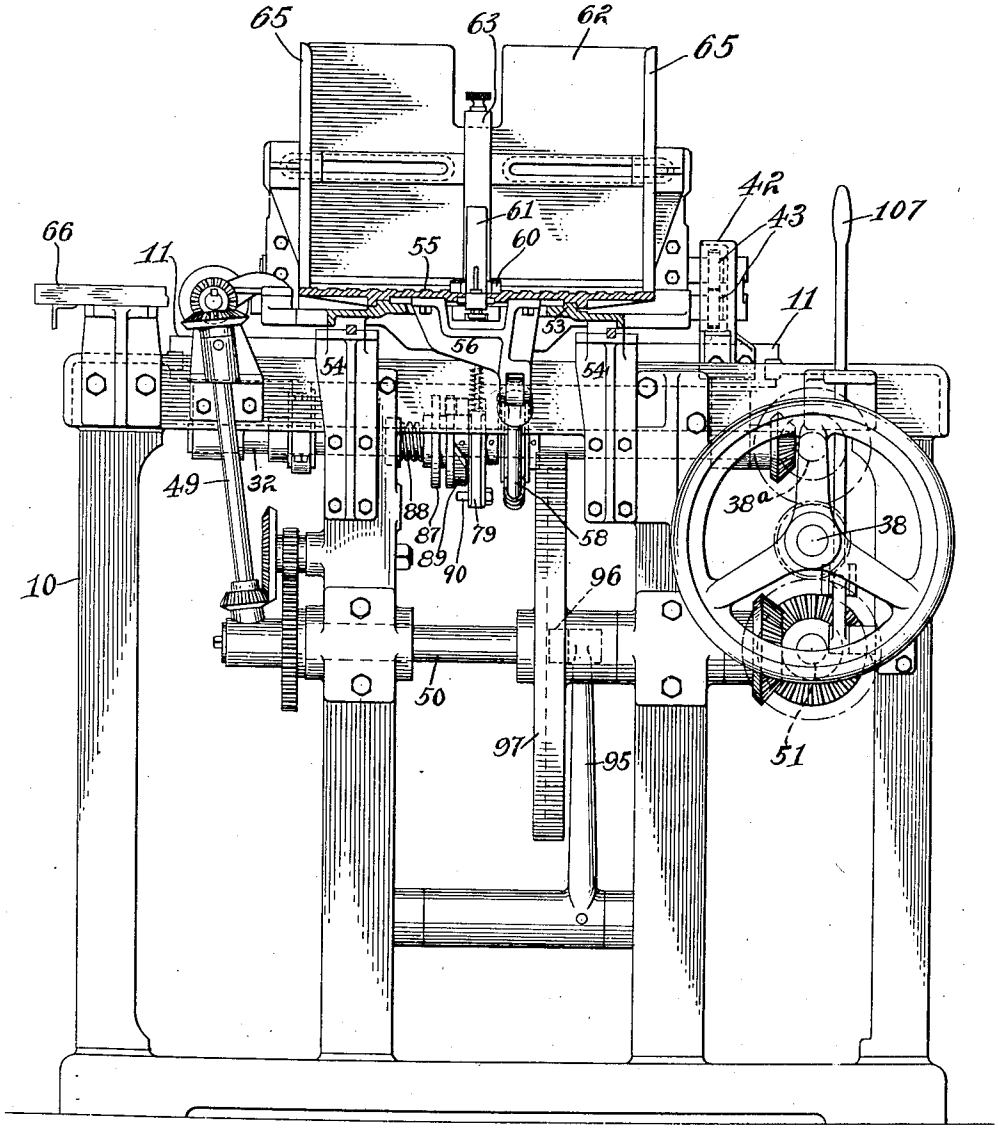
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4 SHEETS—SHEET 3.

Fig. 3,



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4 SHEETS—SHEET 4.

Fig. 4,

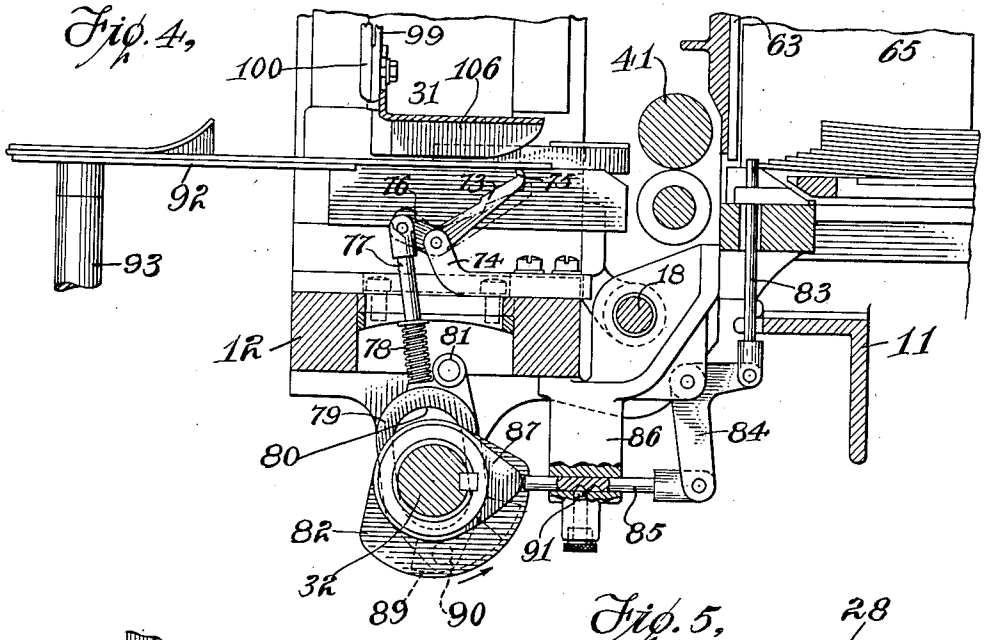
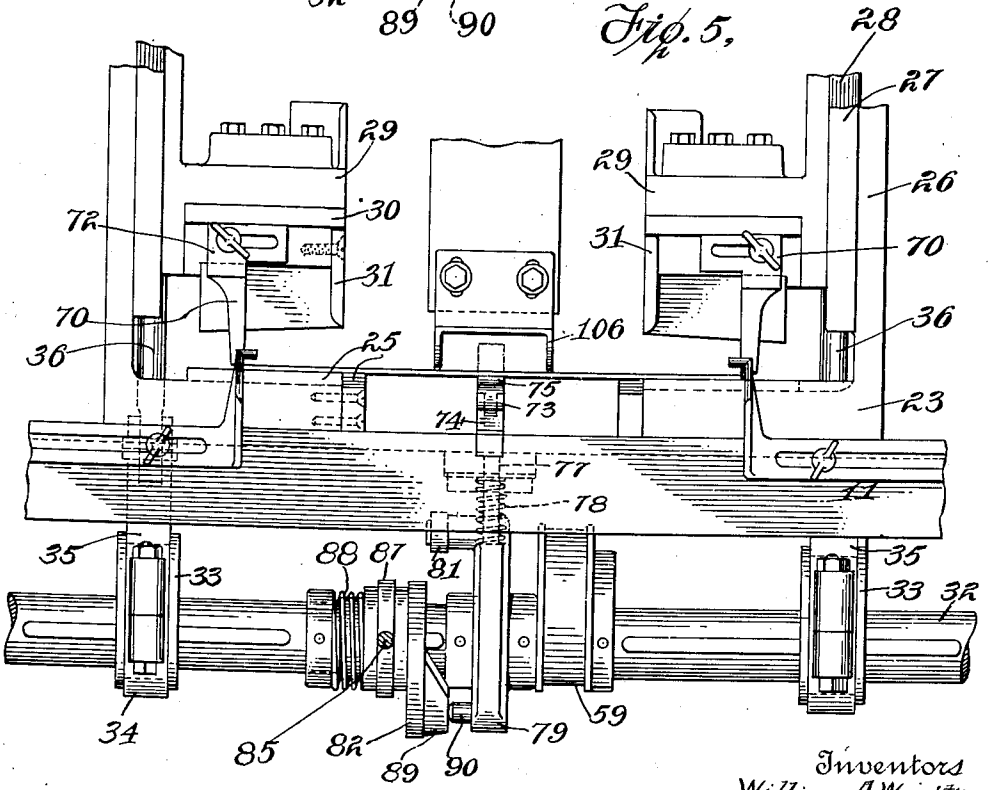


Fig. 5,



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UNITED STATES PATENT OFFICE.

WILLIAM A. WEIGHTMAN AND CHARLES H. NITSCH, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNORS TO STOKES AND SMITH COMPANY, OF SUMMERDALE, PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

CORNER CUTTING AND BENDING MACHINE.

1,386,292. Specification of Letters Patent. Patented Aug. 2, 1921.

Application filed September 26, 1919. Serial No. 326,496.

To all whom it may concern:

Be it known that we, WILLIAM A. WEIGHTMAN and CHARLES H. NITSCH, citizens of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented new and useful Improvements in Corner Cutting and Bending Machines, of which the following is a specification.

This invention relates to machines for excising the corners of rectangular blanks, and especially to machines adapted to operate on paper or cardboard to produce a blank having a rectangular central portion and side portions which, when folded at right angles to the central portion, produce a box-shaped structure.

Blanks of this formation are used for various purposes, but primarily to produce a pasteboard box body or shell, or a wrapper for a rectangular box or package.

It has been the practice to place a pile of rectangular blanks under a cutter and excise the corresponding corner portions of the entire pile simultaneously, cutting machines being ordinarily adapted to operate on one corner of the pile at a time. This method not only entailed considerable labor in placing the successive corners in position beneath the cutter, and the resulting relatively slow speed of operation and inaccuracy in registration; but it was also found that with blanks of certain materials, particularly the heavier grades of cardboard, the usual sharp inner corner of the excised portion was not cleanly cut, the cutter tending to tear it out, leaving an unsightly, ragged notch in the blank.

This invention is designed to avoid the difficulties above outlined. All four corners of the blank are simultaneously excised, greatly accelerating the cutting operation itself; and this feature of the invention is applicable to the usual method of cutting blanks in piles.

To avoid the roughness and tearing at the inner corner of the excised portion, it has been found necessary to cut the blanks in relatively small numbers, preferably one or two at a time, depending on the thickness and texture of the stock; and the cutting mechanism is provided with means for feeding blanks thereto in small quantities, which can be regulated at the will of the operator. Hand labor in feeding is thus entirely eliminated except for the piling of the blanks on the feed table, which can be done by an unskilled workman. Moreover, auxiliary means is provided for accurately registering the blank fed to the cutters so that perfectly cut blanks are practically assured.

In feeding the blanks to the cutters there is a possibility that a blank may stick and not to be fed into even approximate registration where the auxiliary devices, if used, become operative. Under such conditions the feed of the subsequent blanks would be prevented, and the machine would be jammed. Means is provided, operative when a blank is improperly fed, to prevent the feeding of subsequent blanks until the obstructing blank is removed. This means, it will be understood, is applicable to a great variety of other types of machines where similar conditions may arise in connection with the feeding of successive units of any kind.

Machines of this type are generally used in factories where blanks of varying dimensions are used; and it is highly desirable to provide a single machine having a wide range of adjustment, both in the direction of the width of the blank and of the length of the blank, to meet all ordinary conditions.

Means is provided for adjusting the cutters, whereby the machine may be rapidly and easily set for a predetermined blank by a comparatively unskilled workman, and without deranging the operating parts or requiring any change therein whatever.

It has been customary, in machines adjustable to accommodate blanks varying in size, to provide feed mechanism fixed to the frame of the machine; and as the distance of the operating parts from the feed mechanism varies according to the size of the blank operated on, it being greatest when the smallest blank is used, the distance through which the blank must be projected from the feed mechanism to its final position, ready for cutting, varies so greatly that means for projecting it across the intervening space must be very flexible in operation. It has been extremely difficult to provide such means; and the results have been often very unsatisfactory where the blank has had to travel across a substantial interval between the feed and the cutters. This difficulty has been avoided by connect-

ing the feed mechanism directly to the parts which are adjusted, such mechanism moving during adjustment, and consequently having a fixed relation to the cutting position of the blank regardless of the adjustment of the machine. This enables the use of feeding and registering mechanism of a much simpler sort, as it is only required to provide propulsion over a certain fixed interval.

After the blanks have been excised, various means of ejecting them from the machine may be used. When this invention is utilized in connection with blanks of cardboard or similar material used to form box shells or bodies, it is desirable, for convenience in performing later operations in the manufacture of boxes, to crease the blank along the edges of its central portion, defined by lines connecting the inner corners of the excised portions usually marked previously in the blank by scored lines.

Means is provided for discharging the cut blanks from the machine, and at the same time bending them sharply along the scored lines, so that the final product, when the invention is applied to box-making blanks is not only cut, but folded, ready for staying or wrapping. It will be apparent that this portion of the invention is not necessarily combined with the cutting mechanism, but may be used separately with blanks cut by any method to the required shape.

Other objects and advantages of this invention will be apparent from the following description taken in connection with the accompanying drawings, in which:

Figure 1 is a longitudinal sectional view through the machine, showing a blank in position ready to be operated on,

Fig. 2 is a plan view, certain parts being omitted to expose the underlying mechanism,

Fig. 3 is an end view from the right of Fig. 1, part of the feed table being shown in section,

Fig. 4 is a detail fragmentary view taken on the same plane as Fig. 1, showing part of the blank registering mechanism and the mechanism for preventing feed of succeeding blanks when a fed blank fails to register properly with the cutting mechanism,

Fig. 5 is a fragmentary front view taken from the right of Fig. 4, the feed mechanism and stop being omitted,

Fig. 6 is a perspective view of the blank in its original form.

Fig. 7 is a similar view showing the corners excised, and

Fig. 8 is a similar view showing the lateral extensions bent down to form a box shell.

The invention is mounted on a frame 10, which preferably is in the general form of a table having a top with the central portion cut away. A pair of carriages 11 is mounted transversely across the aperture in the top of the frame, and slidably mounted at opposite ends on ways or tracks on the frame. Each carriage 11 carries a pair of cutter heads, indicated generally by the numeral 12, mounted to slide longitudinally on the carriage in any desired way, as by providing tracks on the carriage engaged by a portion of each cutter head, the heads being preferably held into engagement with the carriages, as by slots 13 therein, engaged by bolts or studs on the lower face of each carriage.

Means is provided for moving the carriages simultaneously toward or away from a central point, to adjust the machine to various lengths of blanks. Various mechanisms may be used, but a pair of screw rods 14, mounted in the frame of the machine and threaded in opposite directions outwardly from the center of each rod and through extensions in the ends of the carriages 11, is preferably utilized. Preferably, the carriage adjusting rods 14 are operatively connected for simultaneous rotation in any way, such as by providing a connecting shaft 15 engaging rods 14 by means of bevel gears; and one of the rods 14 is provided with a driving connection, such as crank engaging extension 16. With this construction the application of crank 17 to extension 16 and the rotation thereof will rapidly and accurately adjust the distance between the carriages and the pairs of cutter heads 12 carried thereby.

Likewise provision is made for means for simultaneously adjusting the distance of each pair of cutter heads from the central point of each carriage carrying one of said pairs. One form of mechanism for this purpose consists of a pair of cutter adjusting screw rods 18, oppositely threaded from their centers, through extensions connected with cutter heads 12. Adjusting rods 18 are preferably rotated simultaneously, one method being the provision of a bevel gear 19 on the end of each adjusting rod 18, meshing with a bevel gear 20 rotatably mounted on a carriage 11, both bevel gears 20 being splined to shaft 21 carried by the frame of the machine, and having means for rotating it at will, such as extension 22 adapted to engage crank 17. The rotation of shaft 21 will simultaneously adjust the cutters for various widths of blanks rapidly and accurately, both pairs of cutters being equally and symmetrically spaced apart, the adjustment of the carriages 11 through adjusting rod 14 having no effect on the transverse adjustment of the individual cutters, as bevel gears 20 merely slide longitudinally on shaft 21.

Cutter heads 12 may be constructed in various ways, depending upon the thickness of the work and the shape of the recess, and while a plain, right-angled cutter will be

described, it will be apparent that various forms of cutters adapted to simultaneously recess the blank and cut slots therein may be mounted on the cutter head, without affecting the operation of other parts of this invention. In the preferred form shown, each head consists of a base portion 23, shown in plan view in connection with the lower left hand cutter head 12 in Fig. 1. Base 23 preferably carries an extension lug 24 through which is threaded cutter adjusting rod 18. Directly mounted on the base is the lower cutter member, which in the form shown, consists of a pair of detachable cutter bars 25 forming a right angle. Mounted on the base 23, preferably at the side opposite the center of the carriage, is a vertical standard 26 provided with ways, such as those formed by gibs 27, in which there is mounted for vertical reciprocation a slide 28 carrying the upper cutter element.

As is shown best in Fig. 5, an outstanding flange 29 is disclosed, preferably integral with slide 28, to which is bolted or otherwise attached a detachable cutter comprising a cutter plate 30 carrying a knife 31 which, in the form shown, slopes downwardly from the point of intersection of its sides, this construction having been found to be the best for procuring a clean, accurate cut. It will be apparent, however, that many other methods of constructing the cutter knives 31 and bars 25 may be used, to accommodate various types of work and shapes of corner recesses.

Means is provided for vertically reciprocating slides 28 and the upper cutter elements carried thereby, one method consisting in the provision of a cutter drive shaft 32 running longitudinally below each carriage, and preferably mounted in hangers thereon, each shaft 32 carrying a pair of eccentrics 33, each of which is connected by eccentric strap 34 and link 35 mounted on the strap to a slide 28, as by providing a bolt 36 running vertically through the slide, having a pivotal connection with link 35 at its lower end, and held in place at its upper end by a nut 37, this construction being advantageous because the removal of nut 37 will permit the operator to lift out slide 28 and the upper cutter mechanism for repair, replacement, or adjustment thereof, without disturbing the rest of the machine.

For preserving the proper relation between each cam 33 and its corresponding cutter slide, each cam is slidably mounted on its shaft 32, as by splining it thereto; and means is provided, such as lugs or collars mounted on cutter head 12, for sliding each cam in its shaft when the distance between adjacent cutter heads is adjusted.

Means is also provided for rotating cutter shafts 32, one form being disclosed, consisting of a drive shaft 38[a] to which are splined bevel gears 39 rotatable in collars mounted on carriages 11, gears 39 meshing with bevel gears 40 on the ends of cutter shafts 32, it being apparent that the adjustment of carriages 11 will not affect the operation of the drive connections of shafts 32.

A preferred form of simultaneous symmetrical adjustment of carriages and cutters, and of simultaneous drive of shafts operating the cutters in pairs is disclosed; but the invention is much broader than this specific form of drive, and includes the general arrangement of carriages and cutter heads 12, which may be separately and independently adjusted by hand or any other desired way, by means well-known to those skilled in the art.

Feed mechanism is provided adapted to receive a pile of uncut blanks and to feed the same in small units, preferably from the bottom of the pack, into position under the cutters. Various forms of feed mechanism are well-known and may be utilized. An important feature of this invention, however, is the direct connection of the feed mechanism to the adjacent carriage 11, so that its relation thereto is fixed; and the adjustment of carriages 11 toward or from the center will simultaneously move the entire feed mechanism, the advantage of which has been set forth above and would appear to be obvious when compared with the type of machine in which the feed mechanism is mounted in fixed position on the frame. The form of feed mechanism disclosed includes a pair of rapidly revolving, continuously mounted and operated rollers 41 in bearings carried by brackets 42 mounted on the adjacent carriage 11.

The upper roller 41 is preferably journaled in blocks slidable vertically in brackets 42, said blocks being pressed downwardly by springs, so that the rollers 41 are in resilient contact, permitting the rollers to separate during the passage therebetween of the blanks.

Means is provided for directly driving the lower roller 41, the drive being preferably transmitted to upper roller 41 in any desired way, such as by a lateral gear train 43, the advantage of this construction being that the rollers are free to separate to any desired extent without disturbing the meshing of the drive connections between said rollers. It will be apparent, however, that this form of drive is merely illustrative, forming no part of the invention.

One form of drive for the lower roller 41 is shown, consisting of a bevel gear 44 mounted on the gudgeon of said roller and meshing with a bevel gear 45 carried by shaft 46 journaled in a bracket connected with carriage 11. A bevel gear 47 rotating in a collar carried by the frame of the machine is splined to shaft 46 and drives rollers 41

through said shaft 46, by connection with meshing bevel gear 48 on countershaft 49, which is connected by suitable gear or other means to be driven from shaft 50, operatively connected to the main drive shaft 38 in any desired way, as by bevel gear connection with shaft 51, lying parallel to and below drive shaft 38 and driven therefrom, as by intermeshing pinions 52, shown best in Fig. 1.

It has been found of advantage, under normal working conditions, to reduce the driving speed of shaft 50 through pinions 52 and to increase the speed of the feed roller driving countershaft 49, by properly proportioning the gear connections thereof with shaft 50; but this is a matter of choice and forms no part of the invention.

Various forms of feed mechanism may be used to supply the blanks to the feed rollers 41. Preferably, the blanks are fed from the bottom of a pile supported on a fixed table 53 rigidly connected, as by brackets, to the adjacent carriage 11 and slidably mounted on supporting brackets 54 on the frame of the machine.

In the form of feed mechanism disclosed, the blanks rest directly upon a reciprocating table 55, slidably mounted on the fixed table 53. Any method of reciprocating the table 55 may be employed, such as the provision of a bracket 56 on the lower face thereof, passing through a longitudinal slot in fixed table 53 and connected by link 57 carrying eccentric strap 58 with an eccentric 59 on the adjacent cutter shaft 32. A bottom blank or blanks are fed to the rolls by engagement of the reciprocating table 55 therewith, either by friction or by engagement with a sloping abutment 60 adjacent the rear edge of the blank, a rear guide finger 61 being preferably mounted on abutment 60, which in turn is adjustable longitudinally of table 55 to accommodate varying sizes of blanks. A front plate 62 is mounted adjacent the forward end of the pile of blanks and is provided with a vertically adjustable gate 63 controlling the number of blanks passing from beneath the pile into engagement with feed rollers 41. As the forward edge of reciprocating table 55 may be somewhat spaced from front plate 62 of the feed table, an inclined guide plate 64 is mounted on the fixed table 53 and serves to direct the forward edges of the fed blanks to the space below gate 63 and into engagement with the feed rolls. Lateral guide plates 65 may be provided to maintain the pile in proper position, and are preferably adjustable transversely on front plate 62. A platform 66 may be mounted on the frame of the machine adjacent to the feed tables to support blanks ready for piling in feeding position.

Means has been provided for accurately registering the fed blanks in position beneath the cutters. Various forms of mechanism may be used but preferably primary registering means is provided consisting of guides or other elements for rapidly conveying the blanks from the feeding mechanism into position beneath the cutters, and secondary means suitably operated registers the blank accurately before the cutter is put into operation. It will be evident, however, that such secondary registering means may be omitted if desired. The primary means may include a pair of lateral guides 67 channeled to receive opposite side edges of the blank, and preferably adjustably mounted on the cutter head, such as by screw and slot connections on the side of each base 23, as shown best in Fig. 5. One end of each guide 67 is in close proximity to feed rollers 41 and may be suitably flared to insure the accurate feed of the blank from the moment it leaves the rolls. Guides 67 project into the space beneath cutter knives 31, which do not descend sufficiently low to bring the guides into contact with carrying plate 30 and interfere with the operation thereof.

A second set of guides 68 forming practically a continuation of guides 67 is mounted on the farther cutter heads by similar adjustable connections, and is provided with slots forming guideways for the edges of the blank, said slots having a relatively shallow upper lip, so that the blank may be pushed upwardly out of the slots with the minimum of bending of the blank. An end stop 69 is mounted on the farther carriage 11 at approximately the center thereof, and preferably is adjustable transversely thereto. It will be apparent that the momentum given to the blank by the rapidly revolving feed rolls 41 will tend to project it against stop 69, its lateral edges being guided by the side guides 67 and 68 which are sufficiently spaced to prevent wedging or jamming of the blank in its passing. Moreover, side guides and end stop are adjustable independently of the adjustment of the cutter heads to accommodate blanks having side and end flanges of different depths.

The secondary or final blank adjusting mechanism may be of any desired form preferably including means for positively shifting the blank prior to the contact of the cutters therewith so that its registry will be perfect. The means disclosed includes elements for adjusting the blanks laterally and an element for forcing them positively into engagement with stop 69. The lateral adjusting elements disclosed comprise fingers 70, one of which is mounted beneath each upper cutter head. The lower end of each finger is beveled or curved outwardly at 71 so that the lower ends of opposite fingers

are spaced by a distance greater than the distance between adjusted side guides 67 and 68 so that the fingers are certain to engage opposite sides of a blank located approximately in position to be cut. Guides 67 are terminated short of the inner flange of the upper cutter knives to provide room for the adjacent adjusting fingers 70. The vertical upper portions of the inner faces of said guide elements or fingers 70 are accurately positioned in exactly the vertical plane of the side edges of the blank when in perfect register, and it will be apparent that when cutter heads 12 descend, fingers 70 will operate to shift the blank laterally into exact register before cutter knives 31 come into contact therewith. Each finger 70 may be mounted on an arm 72 extending outwardly and upwardly around plate 30, preferably having an adjustable connection therewith, permitting the finger to be laterally adjusted with guides 67 and 68 to accommodate variously proportioned blanks.

Means for forcing the fed blank into close contact with the end stop 69 is shown best in Fig. 4. This may consist of an element normally located out of the path of the fed blank but movable against the rear end of the blank after it is in approximately correct position to force it against end stop 69. Various forms of movable elements may be employed. The form shown includes a finger 73 pivoted adjacent its lower end to a bracket 74, which preferably is adjustably mounted adjacent the center of the carriage 11 located next the feed rolls, the adjustment permitting the finger to be located suitably for blanks of varying proportions.

Means is provided for maintaining fingers 73 in lowermost position, indicated in dotted lines in Fig. 4, while a blank is being fed, and for raising it to its upper position, shown in Fig. 1, to force the blank positively against end stop 69 after said blank has passed over the finger and reached its approximate final position. The face of the finger 73 adjacent the edge of the blank may be suitably contoured for engagement thereof, as by providing a lip 75 adjacent its upper end.

Any desired means of oscillating the movable blank engaging element, shown in the form disclosed as finger 73, may be employed. In the preferred form there is provided an extension 76 on the lower end of finger 73 and beyond its pivot, said extension carrying a link 77 suitably reciprocated by a cam eccentric connection with shaft 32 to properly actuate finger 73. As the pressure of the finger against the edge of the blank is liable to produce an indentation, a spring element is preferably inserted in the actuating mechanism, said element in the form disclosed consisting of a helical spring 78, normally holding link 77 in contact with the actuating mechanism connected to the shaft 32.

Various means may be utilized for reciprocating link 78. A guide plate or yoke 79 is disclosed, having a guide slot 80, the sides of which are parallel and adapted to engage slidably a circular guide shoulder or sleeve concentric with shaft 32, the ends of slot 80 being preferably semicircular. Mounted on an extension of the upper end of plate 79 is a laterally extending roller 81 engaging a cam 82 mounted on shaft 32. It will be apparent that link 77 will be reciprocated in the absence of an obstruction to the movement of finger 73, but that the presence of such obstruction will merely serve to hold the link in a relatively elevated position, the further revolution of cam 82, causing it to drop away from roller 81 without forcing finger 73 upwardly as there is no positive downward drive of the link 77 except the weight of the parts. Consequently there will be no tendency to notch or tear the blank when finger 73 contacts therewith. Means is provided for preventing the feeding of the blanks from the pile when a fed blank fails to reach its position of approximate registration. This necessarily means that the blank will overlie the upper end of finger 73 in the position shown in Fig. 4, because a blank lying forward of said finger will be positively forced into registered position. When such a condition occurs, the feeding of successive blanks will obviously cause them to pile up adjacent the feed rolls, and the operation of the machine will be completely blocked. Consequently, means for preventing the feeding of the blanks has been arranged, so that the presence of a blank overlying the upper end of the finger 73 when the finger is shifted will bring said means into active position.

Preferably an element is provided which may be projected into the path of the lowermost blanks adjacent gate 63, so that the feeding mechanism, which is undisturbed, will merely project the lower blank against the gate instead of passing it into the aperture below the gate into engagement with the feed rolls, continued operation of the feeding means causing the sloping abutment 60 to frictionally slide beneath the bottom blank of the blank pile. This permits the continued operation of all of the parts of the machine until the operator voluntarily stops it, preventing undue strain and shock to the parts.

It will be apparent, however, that various forms of standard stop mechanism may be used in connection with different well-known forms of feed; and this invention

in its broad aspects is not limited to the method of preventing the feed herein disclosed, and especially is not confined to the particular mechanism which is shown for accomplishing the result.

An element for preventing the feeding of the blanks is disclosed, preferably consisting of a vertically slidable rod 83 mounted on the fixed table 53 so that the upper end of the rod may project into the path of the lowermost blank adjacent gate 63, but which normally is held in retracted position entirely out of the path of the blanks which are fed to the rollers 41. Means controlled by the position of finger 73 is provided for shifting the rod 83 into its upper position in the presence of an obstructing blank. I have disclosed for this purpose a bell crank lever 84 pivoted on an extension of carriage 11, one arm of the lever being pivotally connected to the lower end of rod 83, and the other arm to push rod 85, slidably mounted in bearing 86 carried by carriage 11. A cam 87 mounted on shaft 32 is adapted to contact with the end of push rod 85 and force rod 83 upwardly to stop the feed.

Means is provided for normally preventing the action of cam 87 on the connections of the stop 83, and for causing said cam to actuate rod 83 only in the presence of an obstruction to finger 73. This result is produced, in the construction disclosed, by mounting cam 87 slidably on shaft 32, as by splining it thereto, and maintaining it normally out of the plane of engagement with push rod 85, as by spring 88.

Various means for shifting cam 87 into the plane of engagement with push rod 85 may be employed. One form is disclosed, consisting of a lateral cam shoulder 89 connected to cam 87 and adapted to engage stud 90, which is mounted laterally at the lower end of guide plate 79. Slot 80 in said plate is so proportioned that when the finger 73 is in its upper position, at which time plate 79 will be in its lowermost position, stud 90 will lie below cam shoulder 89 and will not be engaged thereby. Consequently, in the normal action of the machine, cam 87 will not be laterally shifted, as the rise of finger 73 will drop stud 90 below cam 89 during the period when it is in juxtaposition to said stud. If, however an obstruction to the finger 73 should prevent its rise to its uppermost position and would consequently maintain the guide plate 79 and stud 90 in a more elevated position, as has been explained heretofore, the engagement between cam 89 and stud 90 would occur, cam 87 would be laterally shifted, and its engagement with push rod 85 would raise rod 83 into operative position to prevent the further feeding of blanks. In this connection it will be noted that means may be provided for maintaining rod 83 in raised position until positively released, such means being disclosed as a stud 91 engaging rod 85. This stud may either be spring pressed or positively screwed into position to maintain rod 83 normally in either raised or lowered position with accuracy.

It will be noted that while we have disclosed cams 82 and 87 as mounted upon the same sleeve, cam 89 being mounted laterally on cam 82, this construction is not necessary, although convenient, as it maintains cam 82 out of engagement with roller 81, when there is an obstruction in the machine, thus preventing the lowering and raising of finger 73 under such conditions. It will be apparent, however, that cam 82 may be independent of cam 87, and the laterally mounted shoulder cam 89 may be carried either by cam 87 or by cam 82 on which it is shown as mounted. Obviously, other means of establishing and interrupting the operative connection between cam 87 and push rod 85 may be provided.

When used for the cutting of cardboard blanks employed in the manufacture of box shells, means may be provided for bending the lateral extensions of a blank downwardly into box form as shown in Fig. 8, to facilitate later operations in manufacturing the boxes. This means preferably includes reciprocating plate 92 upon which the blank normally rests when in position for cutting the corners thereof, and which is adapted to rise with the blank after the corners have been excised, means being provided in the path of the lateral extensions of the blank operating to bend them downwardly over the edges of the plate to crease the blank accurately along the proper lines; and further means is operative to retain the folded blank and preferably to stack successive blanks, so that a plurality may be removed from the machine at one time ready for subsequent operations. Plate 92 may be reciprocated in any desired way, the construction disclosed including a vertically reciprocating plunger shaft 93 mounted in bearings on the framework of the machine and connected by link 94 to a bell crank 95, also pivoted on the framework and carrying roller 96 engaging a cam slot in the face of disk cam 97 carried by shaft 50. Many other methods of reciprocating plate 92 may, however, be used, the specific form shown herein being no part of my invention.

For the purpose of turning the lateral flaps of the blank downwardly over the edges of the plate 92, vertical walls 98 are preferably provided, shown best in Figs. 1 and 2, each having a lower edge located in the path of each lateral flap or extension. Each wall 98 is preferably mounted on a cutter head 12, the four walls being so arranged as to form a well; and when the

blank has been forced upwardly into the well its down-turned marginal flaps will press outwardly against the walls, maintaining the blank in its uppermost position within the well after the plate 92 has been withdrawn. Each blank forces those preceding it upwardly, until a substantial stack is produced which may be readily removed by hand.

Each wall 98 preferably consists of a rear plate 99 to which may be attached front plate 100 preferably formed of wood, and having a curved lower edge adapted to turn a marginal flap of the blank downwardly. The middle wall of Fig. 1 is shown without a wooden front plate 100, and includes a vertically adjustable bar 101, to which the front plate may be attached; but it will be apparent that this specific form of wall may be varied in a great many ways. For adjustably mounting each wall, each vertical standard 26 of a cutter head 12 is provided preferably adjacent its upper end with a transverse guideway 102 in which is adjustably and slidably mounted a lateral extension plate 103, the outer end of which is preferably provided with a guide plate 104. Each wall 98 is mounted on a transverse extension plate 105, slidably and adjustably mounted in guide plate 104. This construction permits of the ready location of each wall in intermediate position between adjacent cutter heads, and also spaced at the proper distance from the center of plate 92 to accommodate blanks varying in thickness, and also to vary the sharpness of the angle through which the blank is bent, it having been found desirable in certain instances not to bend the blank sharply at right angles about the edges of plate 92.

When a fed blank stops above finger 73 in the position shown in Fig. 4, the pressure of the finger may be sufficient to force the blank upwardly out of the side guides 67, permitting the finger to rise to a point where the stop mechanism would be inoperative. To obviate this possibility, a stop element is preferably located just above the path of the blank and adjacent the finger, against which the rising finger may force a blank and which will act as a stop to prevent further ascent of said blank, assuring the proper operation of the feed stop mechanism. While numerous devices may be used for this purpose, the preferred form comprises a pair of vertical plates, connected by a transverse web, the whole forming a sled-like structure 106, the vertical plates having upwardly curved portions on the end adjacent the feed rollers to serve as additional guides for directing the front edge of a fed blank downwardly into proper register with the side guide 67. The guiding element 106 is preferably mounted on adjacent wall 98, and may be vertically adjustable thereon.

It will be apparent that the walls 98 at the sides of the machine will be mounted at right angles to their respective extension plates 105, while the remaining two walls are mounted parallel to their extension plates, which preferably are slightly offset to position the walls properly adjacent the registering edges of plate 92, as shown in dotted lines to the left of Fig. 1.

While a specific mechanism for turning the side panels of the blank inwardly during the upward motion of the plunger carrying plate 29 has been set forth, it is to be understood that various devices may be used for this purpose, the primary requisite being a transverse element against which the rising blank will be forced so as to turn the side flaps downward.

Furthermore, various means of mounting and adjusting said element may be used without departing from the spirit of the invention.

For convenience in handling and removing the cut and bent blanks, the face plates 100 of the walls 98 are preferably curved outwardly at a point spaced from the bottom of said walls to increase the diameter of the well at that point. In the normal operation of the machine the box blank, after being forced into the wall and being left there by the descending plate 92, has its side flaps in practically vertical position, so that the bottom of the succeeding blank contacts with the lower edges of said side flaps and forces the blank bodily upward. Upon reaching the expanded portion of the wall, however, the side flaps are permitted to spread out somewhat so that the succeeding blank is nested therein, permitting the blanks to be in nested form not requiring the space necessary to accommodate a large number of blanks in set up condition.

The operation of the machine will be apparent from the foregoing description, and only a brief summary thereof will be given. In preparing the machine for a box of a given size, a blank supporting plate 92 of the proper dimensions is attached to the upper end of plunger 93. Carriages 11 and cutter heads 12 are then manipulated through turning the adjusting shafts 14 and 21, until the cutter heads are in proper position adjacent the corners of plate 92. During the adjustment of the carriage 11, it will be noted that the feed table 53 is simultaneously shifted, so that it maintains its proper relation to the cutter heads. The walls 98 of the well are next accurately located with their inner faces slightly outside the vertical plane of the sides of plate 92, the walls being approximately midway between the adjacent cutter heads. The feed table is adjusted to ac-

commodate the proper size of blank, and the stop mechanism is adjusted with rod 83 out of the path of the lowermost blanks of the feed table, the machine being set in motion, as by throwing in a clutch such as that shown at 107 in Fig. 1 and controlled by a hand lever 108. The feed rolls 41 are rapidly revolved and receive a blank passed beneath gate 63 by the forward motion of the reciprocating feed table 55. The speed of the rolls throws the blank rapidly forward between the pairs of side guides 67 and 68, its momentum carrying it over the finger 73, which is in retracted position, into contact with end stop 69. Finger 73 then rises, forcing the blank into contact with the end stop and the cutters descend, the lateral adjusting fingers 70 engaging the sides of the blank and registering it accurately before the cutters contact therewith. After the descent of the cutters and the excising of the corner portions, plate 92 rises, the lower ends of walls 90 wiping against the lateral extensions of the blank and folding them inwardly along the edges of the plate, the withdrawal of the plate leaving the blank in the well, successive blanks being nested therein in the manner above described. In case a blank projected forward by the rollers 41 should jam between the lateral guides and be checked in position above finger 73, thus preventing the rising motion of said finger, stud 90 would remain in the path of side cam 89, shifting cam 87 laterally so that the projection thereon forces push rod 85 outwardly, thrusting stop rod 83 upward and preventing the feed of further blanks, all the operative mechanism of the machine remaining in operation until stopped by the operator through manipulation of the clutch lever 107. After the machine is stopped and the obstructing blank removed by hand, rod 83 is forced downwardly into inactive position by the operator, and the machine is again started.

While a machine for excising the corners of blanks has been described, it will be apparent that the adjusting, feeding, registering and stop mechanism are applicable to any type of machine in which operations are performed at the corners or analogous portions of an article; and this invention is not considered, so far as it relates to these features, to be limited to the specific form of machine disclosed.

Various modifications and changes may obviously be made in the construction shown; and the invention is not confined to said construction, but includes such modifications thereof as fall within the scope of the invention as above disclosed and as limited by the claims.

We claim:

1. In a machine for operating on spaced portions of articles varying in size, a plurality of spaced operating elements, means for shifting said elements toward and from a central operating station to accommodate articles varying in size, means for feeding articles to said elements, and means for maintaining said feeding means in approximately fixed relation to the adjacent side of an article located in said operating station, regardless of the size of the article.

2. In a machine for operating on spaced portions of articles varying in size, a plurality of spaced operating elements, means for adjusting said elements toward and from a central operating station to accommodate articles of different sizes, means for feeding articles to said elements and means operated by the adjustment of said elements for shifting the position of said feeding means to maintain it in fixed relation to an article located in said operating station, regardless of the size of the article.

3. In a machine for operating on spaced portions of rectangular articles varying in size, spaced operating elements, each adapted to operate on one corner of an article, means for shifting said elements longitudinally and transversely to accommodate articles varying in size, means for feeding articles to said elements and means for maintaining said feeding means in approximately fixed relation to the adjacent side of an article located in position to be operated on, regardless of the size of the article.

4. In a machine for operating on spaced portions of articles varying in size, four spaced operating elements, means for shifting an adjacent pair of elements toward and from the other pair to adjust said elements to accommodate articles varying in size, means for feeding an article to said elements and means for shifting said feed mechanism simultaneously with the adjustment of said pair of operating elements so as to maintain an approximately fixed relation between the feed mechanism and an article in operating position.

5. In a machine for operating on spaced portions of articles varying in size, a plurality of operating elements including an element mounted on a movable support, feed mechanism located adjacent said support, means for shifting said support and the element carried thereby to adjust the relative position of said elements to varying sizes of articles, and means for shifting the feed mechanism simultaneously with the adjustment of said support to maintain said feed mechanism in approximately fixed relation to an article in position to be operated on, regardless of the size of the article.

6. In a machine for operating on spaced portions of articles varying in size, a plurality of operating elements including an element mounted on a movable support, feed mechanism located adjacent said support and connected thereto, and means for

shifting said support operating through said connection to shift the feed mechanism simultaneously so as to maintain it in fixed relation to said support and to an article in position to be operated on by said elements.

7. In a machine for operating on spaced portions of articles varying in size, a plurality of operating elements including an element mounted on a movable support, feed mechanism located adjacent said support and rigidly connected thereto, and means for shifting said support operating through said connection to shift the feed mechanism simultaneously so as to maintain it in fixed relation to said support and to an article in position to be operated on by said elements.

8. In a machine for excising marginal portions of blanks, a plurality of cutters, means for adjusting the cutters to operate on blanks varying in size, means for feeding blanks to the cutters, and means for adjusting said feeding means simultaneously with the adjustment of the cutters to maintain said feeding means in fixed relation to the blank when positioned beneath the cutters, regardless of the size of the blank.

9. In a machine for excising marginal portions of blanks, a plurality of cutters, means for shifting a cutter to accommodate varying sizes of blanks. means for feeding blanks to the cutters, and a connection between the shiftable cutter and the feeding means to maintain the latter in approximately fixed relation to a blank located beneath the cutters.

10. In a machine for excising the corners of rectangular blanks, a cutter for excising each corner, means for laterally shifting two of said cutters to accommodate varying sizes of blanks, means for feeding blanks to the cutters, and a connection between the shiftable cutters and the feeding means to shift the latter when the cutters are adjusted so as to maintain it in approximately fixed relation to a blank in position beneath the cutters.

11. In a machine for excising the corners of rectangular blanks, a cutter for excising each corner, a shiftable carriage carrying two of the cutters and adapted to be moved toward and from the other two cutters to accommodate varying sizes of blanks, and feeding mechanism for feeding blanks to said cutters, rigidly connected to the carriage and shiftable therewith during adjusting movement of said carriage, the construction being such that the feeding mechanism is maintained in fixed relation to a blank in position beneath the cutters.

12. In a machine for excising marginal portions of blanks, cutting means, a drive shaft for operating said cutting means, means for feeding a blank to said cutting means, and means for registering said blank in position for operation of the cutting means thereon, said registering means including means stationarily mounted with respect to and operated by said drive shaft and adapted to contact the blank for forcing the blank into registered position.

13. In a machine for excising marginal portions of blanks, cutting means, means for feeding a blank to said cutting means, means for registering said blank in position for operation of the cutting means thereon, said registering means including means for forcing the blank into registered position and a base therefor slidably adjustable to vary the location of said blank forcing means in accordance with the size of the blanks.

14. In a machine for excising marginal portions of blanks, cutting means, means for feeding a blank to said cutting means, and means for registering said blank in position for operation of the cutting means thereon, said registering means including an oscillating finger adapted to contact with an edge of the blank to force it into registered position, and a base carrying said finger and adjustable to accommodate said finger to blanks varying in size.

15. In a machine for excising marginal portions of blanks, cutting means, a drive shaft for operating said cutting means, means for feeding a blank to said cutting means and means for registering said blanks in position for operation of the cutting means thereon, said registering means including a finger oscillated by said drive shaft and adapted to contact with a blank to force it into registered position.

16. In a machine for excising marginal portions of blanks, cutting means, a drive shaft for operating said cutting means, means for feeding a blank to said cutting means, means for registering said blank in position for operation of the cutting means thereon, said registering means including a finger oscillated by said drive shaft and adapted to exert yielding pressure against a blank to force it into registered position.

17. In a machine having an operating station, means for feeding articles successively to said station, means for registering each article into position in the station, and means operated by said registering means for rendering the feeding means inoperative.

18. In a machine having an operating station, means for feeding articles successively to said station, means for registering each article into position in the station, and means, rendered operative by an article not properly positioned in said station, for rendering the feeding means inoperative.

19. In a machine having an operating station, means for feeding articles successively to said station, means for registering each article in position in the station, and an ele-

ment located adjacent the feed path operative in the presence of an article in said path prior to reaching its position in said station, to render the feeding means inoperative.

20. In a machine having an operating station, means for feeding articles successively to said station, means for registering each article in position in the station, said means including an element movable into contact with said article to shift it into accurately registered position, and means operated by said movable element in the presence of an improperly located article, to render the feeding means inoperative.

21. In a machine having an operating station, means for feeding articles successively to said station, means for registering each article in position in the station, said means including an element located adjacent the feed path normally outside of said path and movable into the path to contact with the rear of an article fed therethrough to shift it into operative position, and means, operative in the presence of an improperly located article obstructing the passage of said element into the feed path, to render the feeding means inoperative.

22. In a machine having an operating station, means for feeding articles successively to said station, means for registering each article in position in the station, including an oscillating finger pivoted adjacent the feed path, normally lying outside thereof and having a projecting end movable into said path into contact with the rear portion of an article to shift it into registered position, and means, operated in the presence of an improperly located article opposite said finger preventing the entrance of the end thereof into the feed path, to render the feeding means inoperative.

23. In a machine for operating upon a succession of articles, feeding means, and means operative in the presence of an improperly located article to prevent the feeding of succeeding articles independently of the continuing normal operation of said feeding means.

24. In a machine for operating upon a succession of articles, a feeding station, means for feeding a plurality of articles successively from said station, and means operative in the presence of an article fed from said station and improperly located, to engage articles in said station so as to prevent the feeding thereof independently of said feed mechanism.

25. In a machine for operating upon successive blanks, a support for a pile of blanks, means for feeding the bottom blank of the pile through an aperture, and means adapted to contact with the bottom blank to raise it above the aperture so as to prevent the feeding of blanks without interfering with the continued normal action of the feeding means.

26. In a machine for operating upon successive blanks, blank feeding mechanism, means for rendering the feed inoperative, mechanism for operating on successive blanks, a rotating shaft connected to said mechanism, and means carried by said shaft operatively engaging the means for rendering the feed inactive to actuate it in the presence of abnormal conditions in the operating mechanism.

27. In a machine for operating upon successive blanks, blank feeding mechanism, means for rendering the feed inoperative, mechanism for operating on successive blanks, a rotating shaft connected to said mechanism, and means carried by said shaft shiftable into operative engagement with the means for rendering the feed inactive to actuate it in the presence of abnormal conditions in the operating mechanism.

28. In a machine for operating upon successive blanks, blank feeding mechanism, means for rendering the feed inoperative, mechanism for operating on successive blanks, a rotating shaft connected to said mechanism, a rotating element mounted on said shaft, and means for laterally sliding said element along the shaft into position for operative engagement with the means for rendering the feed inactive to actuate it in the presence of abnormal conditions in the operating mechanism.

29. In a machine for excising marginal portions of blanks, a plurality of descending cutters located at opposite sides of a blank, and means mounted on said cutters and engaging opposite sides of the blank during the descent of said cutters to shift the blank into accurately registered position prior to the engagement of the cutters therewith.

30. In a machine for bending lateral flaps of blanks, means for shifting the blank in a direction at right angles to its major surfaces, a plurality of abutments each lying in the path of a lateral extension of said blank and adapted to bend said extension when the blank is shifted, means for adjusting each abutment toward and away from the center of the blank, and means for adjusting the abutment in a line parallel with the adjacent side of the blank.

In testimony whereof we have hereunto set our hands.

WILLIAM A. WEIGHTMAN.
CHARLES H. NITSCH.