

G. F. CALLERY.
 MEANS FOR MAKING FIBER BOARD BOX BLANKS.
 APPLICATION FILED APR. 12, 1918.

1,361,564.

Patented Dec. 7, 1920.

3 SHEETS—SHEET 1.

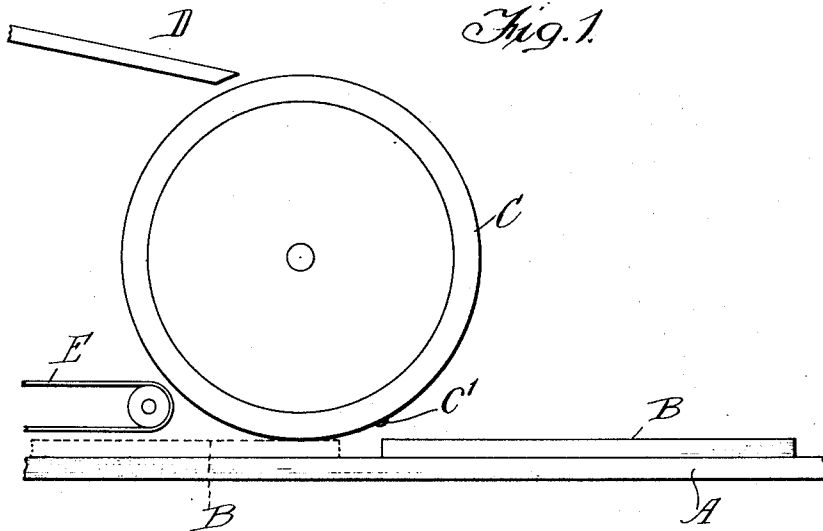
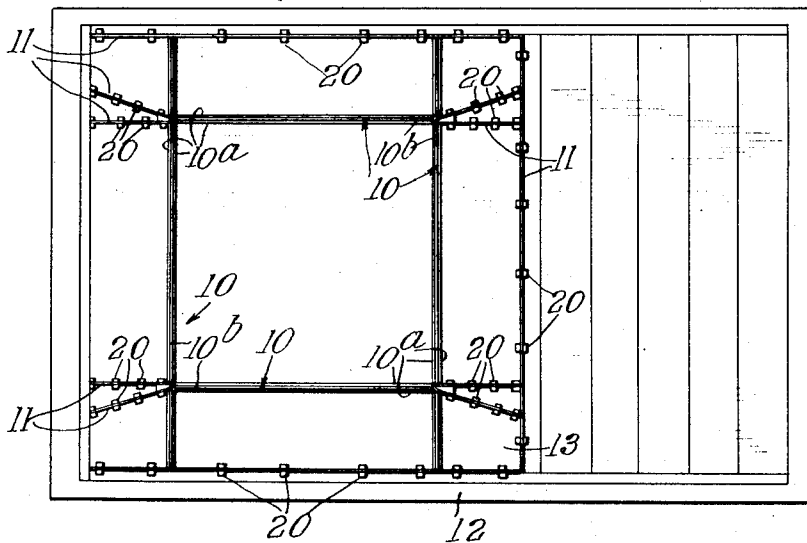


Fig. 2.



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Fig. 3.

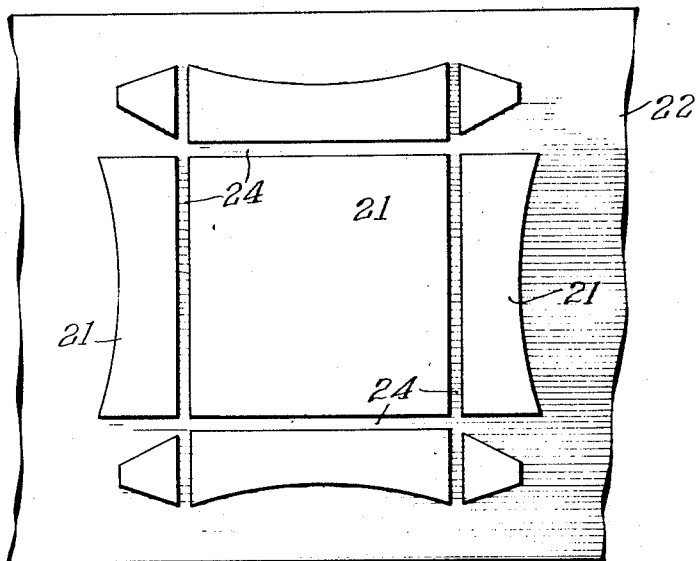


Fig. 4.

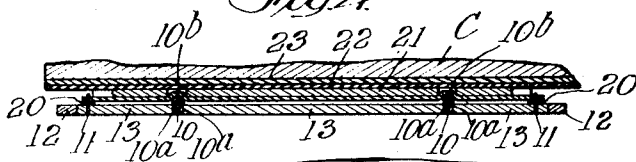
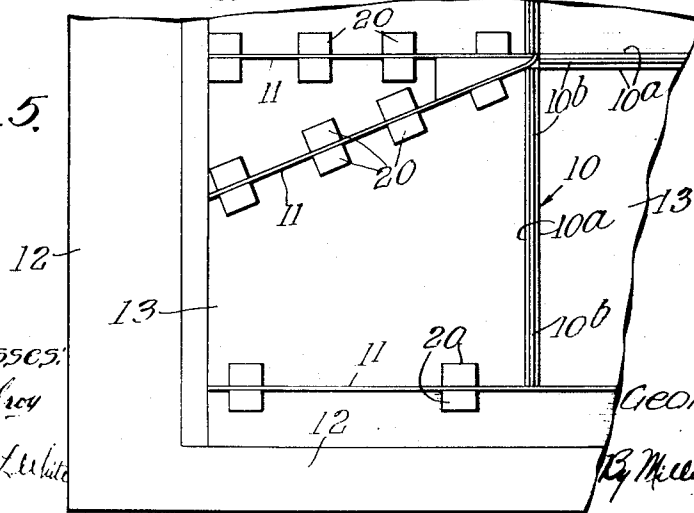


Fig. 5.



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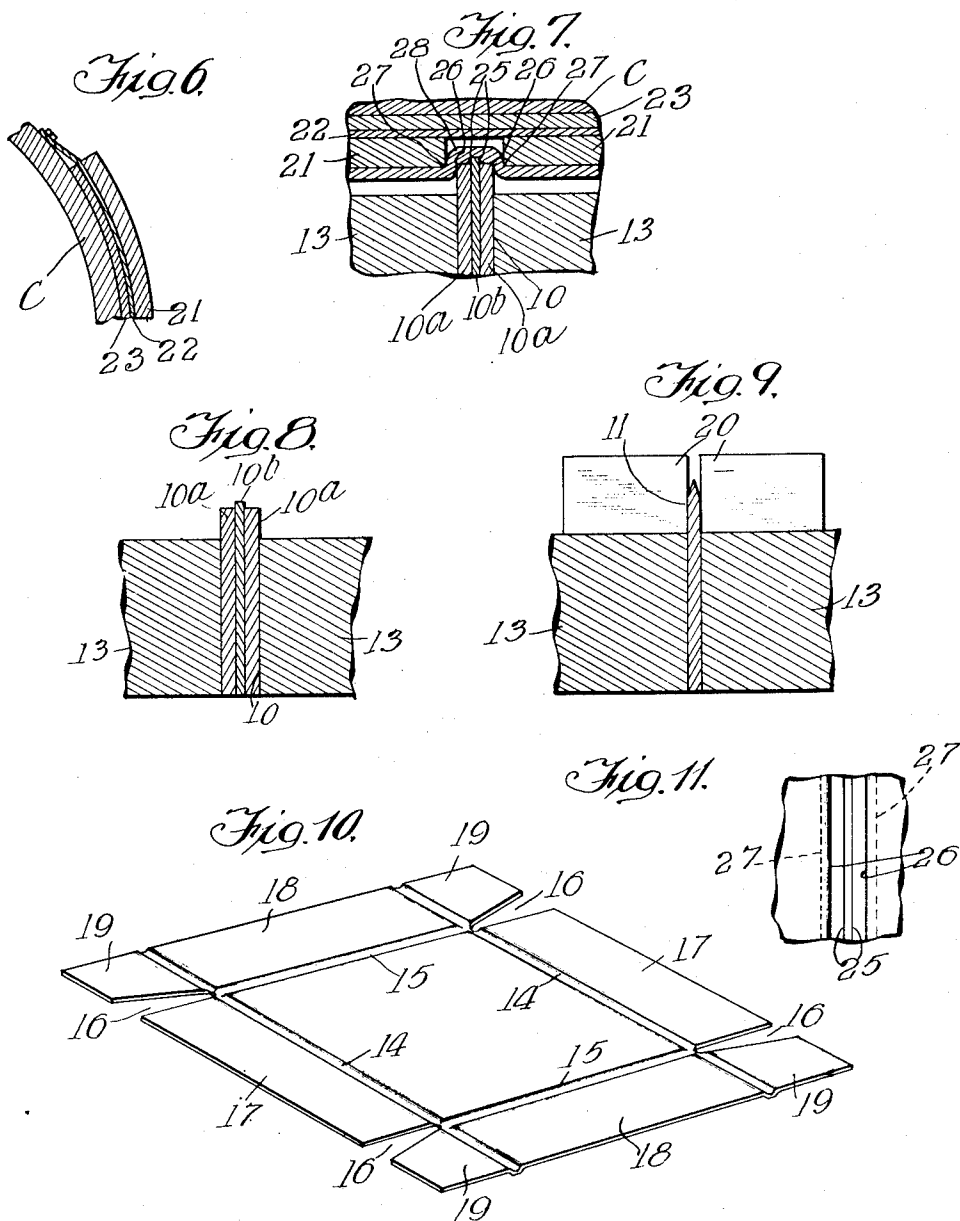
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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MEANS FOR MAKING FIBER-BOARD BOX-BLANKS.

1,361,564.

Specification of Letters Patent.

Patented Dec. 7, 1920.

Application filed April 12, 1918. Serial No. 228,149.

To all whom it may concern:

Be it known that I, GEORGE F. CALLERY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Means for Making Fiber-Board Box-Blanks, of which the following is a specification.

This invention relates to the art of manufacturing boxes and cartons from heavy laminated fiber-board to produce strong containers suitable for use in shipping merchandise by freight or express. Such containers are formed by cutting and creasing the stock and then folding the blank thus produced into the form of a carton or box. These heavy shipping containers take the place of wooden boxes and they receive the same rough treatment in use. It is, therefore, necessary that they be very strong and durable, and especially so at the corners and along the lines where the material is folded or bent in forming the containers. Any cracking or rupture of the fibers of the board, either in the operation of creasing the board or in the subsequent folding operation, seriously lessens the strength and durability of the container and may destroy its utility for shipping purposes.

My invention refers to means for forming the necessary grooves or creases in the fiber board stock and for cutting the stock into suitable shape to form a blank, and the invention has for its object to produce an improved means which is superior to any now known for making these blanks from very heavy and stiff laminated fiber-board.

The invention is embodied in a cylinder press which comprises a rotary cylinder, a reciprocatory bed, a depression die or templet mounted on and conforming to the periphery of the cylinder, and a projection die or dies comprising creasing bars and cutting knives mounted on the bed in the plane of reciprocation thereof. The stock is fed to the machine from a feed table above the cylinder, and the stock is engaged by suitable grippers on the cylinder and is carried therewith into engagement with the projection die, the sheet of stock being curved to conform to the periphery of the cylinder during such movement. The cutting knives trim the stock to define the perimeters of the blanks and the creasing bars form creases in the stock running at such different

angles to each other as is necessary, so that at each cycle of movement of the machine one or more complete blanks are formed out of the stock ready to be folded into the form of a box or carton.

Owing to the arcuate or curved condition of the stock while being acted upon, and further due to the fact that a plurality of the creasing bars are acting upon the stock along different parallel lines simultaneously, tremendous stress is placed upon the stock tending to tear the fibers apart along certain lines and more especially tending to cause a rupture of the fibers at or near the lines of engagement of the creasing bars and templet grooves with the stock.

Prior to my invention it has been considered not to be feasible or possible to successfully crease the heavier grades of laminated fiber-board and make box blanks therefrom on a cylinder machine. All prior attempts to form creased box-blanks of such heavier grades of fiber-board on a cylinder machine, so far as I am aware, have met with failure because one or more strata or laminae of the board would be cracked or broken either in the creasing operation or in the later operation of folding the stock along the creased lines to form the box. It is therefore an important object of my invention to produce a creasing and cutting means for cylinder presses by which the heavier grades of fiber-board may be successfully made into box blanks without any break or rupture in the fibers of the board either in the creasing operation or in the later folding operation. A specific object of the invention is to produce an improved form of creasing bar by which the results mentioned may be attained.

The preferred embodiment of my invention is illustrated in the accompanying drawings, in which Figure 1 is a fragmental side elevation somewhat diagrammatic in character illustrating the type of machine in which the invention is herein shown as embodied. Fig. 2 is a plan view of the reciprocatory chase containing the projection die. Fig. 3 is a development view of a portion of the cylinder illustrating the depression die carried thereby. Fig. 4 is a fragmental sectional view through the projection and depression dies, and a piece of cardboard being creased and cut thereby. Fig. 5 is a fragmental plan view on an enlarged scale illus-

trating a portion of the projection die. Fig. 6 is a fragmental transverse section through the cylinder and depression die elements. Fig. 7 is a fragmental sectional view on a still larger scale illustrating in greater detail the action of the dies on a piece of cardboard. Fig. 8 is a sectional detail view of one of the creasing bars. Fig. 9 is a similar view of a cutting knife and associated parts. Fig. 10 is a perspective view of the completed blank as formed by the machine. Fig. 11 is an enlarged view of a fragment of a box blank illustrating the character of crease formed therein. Fig. 12 is an edge view illustrating the crease with the blank folded ninety degrees.

Referring to Fig. 1, A indicates a portion of the main frame of the machine, B the bed which reciprocates horizontally on said frame, C the cylinder, C' the grippers, D the feeding table, and E a delivery conveyer for carrying the material away. Inasmuch as my invention does not relate to the details of construction and operation of the machine, as a whole, I have deemed it unnecessary to illustrate the machine further than as shown in Fig. 1. The machine may be of any well known or preferred type of cylinder press, for example, such as is manufactured by R. Hoe & Company of New York city.

The reciprocatory bed B contains the projection die, which is composed of suitably arranged creasing bars, indicated as a whole by reference numeral 10, and suitably arranged cutting knives 11, said bars and knives being locked in the chase 12 by furniture 13 as is usual with machines of this type. These creasing bars and cutting knives may be set in any desired relative arrangement to form a single carton blank of the shape and dimensions desired, or to simultaneously form a plurality of separate blanks of smaller size. In the present instance the die is arranged to form a single blank. Referring to the blank shown by way of example in Fig. 10, it will be noted that the creasing bars form two creases 14 running from end to end of the blank and two intermediate creases 15 which are perpendicular to and terminate at the transverse creases 14. The knives 11 trim the cardboard down to the external size of the blank to be formed and certain of said knives form suitable notches 16 in the edges of the blank in registry with the creases 15. When the blank is folded up the central area forms the bottom of the box, the flaps 17 form the sides, the flaps 18 form the ends, and the end portions 19 of the latter flaps are bent to lie alongside of the side flaps 17, and are secured to said side flaps in any suitable way.

The knives 11 project upwardly from the face of the furniture in the chase to a plane higher than the plane of the upper edges of the creasing bars, the distance between the

planes of the upper edges of the knives and the bars being slightly greater than the thickness of the stock being operated upon. Thus the knives cut the stock before the creasing bars start to act on the stock so that the knives do not interfere with the "taking up" of the stock in the creasing operation. At considerable intervals along the knives there are arranged pairs of compressible resilient blocks 20, usually of cork, which are adapted to be pressed downwardly by the stock being cut when the stock passes under the cylinder so that the knife edges then project beyond the blocks 20 and pass through the stock. When the pressure is removed from the blocks 20 they expand and strip the stock from the knives.

The form of the creasing bars 10 is a vital feature of the present invention. Each bar has a central rib, or raised part, running along its upper edge and preferably this rib is of materially less width than the space between the rib and either side of the bar, or in other words, the shoulders at opposite sides of the central rib are of materially greater width than the rib itself. The preferred way of forming these creasing bars is by utilizing three rules placed side by side in contact, the outer rules 10^a being of substantially equal thickness and the central rule 10^b being of materially less thickness than the outer rules. The central rule is also of slightly greater height than the outer rules so that it provides a raised rib running along the creasing bar as a whole. Preferably the corners of the rules 10^a and 10^b are rounded very slightly, but are still well defined corners, so that in their action on the cardboard stock they form well defined impressions therein.

The depression die is built up on the periphery of the cylinder C and comprises an outer grooved templet 21 having a contour conforming to the arrangement of the creasing bars 10 and knives 11. This outer templet, which is of fibrous material, is glued to the surface of a steel jacket 22, which is suitably mounted on the cylinder C as by means of bolts. Beneath this steel jacket is a plain inner templet or underlay 23 which is of fibrous material and is glued to the periphery of the cylinder C and forms a backing for the jacket and the outer templet. The grooves 24 in the outer templet 21, which are adapted to receive the creasing bars 10, are of materially greater width than the thickness of the creasing bars as a whole, that is to say, the aggregate thickness of the three rules, so that when the creasing bars and grooves 24 are associated, there is left a space between the sides of the bars and the sides of the grooves. The depth of the grooves is such that the fiber-board stock does not touch the bottom of the grooves.

The result of the action of the dies is

illustrated in Fig. 11, in which it will be noted that the creased area, as a whole, which is formed in the fiber-board stock, consists of a central narrow channel or depression defined by lines 25 which are formed by the central thin rule 10^b, said depression being in the middle of another shallower depression defined by lines 26 which are formed by the outer corners of rules 10^a. On the opposite side of the sheet of stock there are depressions, indicated by the lines 27, which are formed by the corners of the depression die defining the grooves 24. Between lines 27 on their face of the stock there is formed a bulged projection 28 (Fig. 7).

The stock may be folded in either direction. When folded toward the bulged portion 28, the inner laminae of the stock bend along the lines 27 and bow inwardly between said lines, as indicated in Fig. 12, resulting in a loosening or separation of the fibers and laminae of the board in this area, so that said inner fibers or laminae do not cause undue strain upon the fibers along the opposite side of the sheet. There is thus formed a pliable, flexible joint between the adjacent rigid portions of the board, which joint is in no wise damaged or injured by the bending of its fibers and will therefore withstand the rough treatment that the box will necessarily receive in shipping.

In the operation of the machine the individual pieces of fiber-board stock are fed off of the feed table D to the usual gripping devices C' on the platen C and the stock is then carried by the platen into engagement with the projection die, the reciprocatory bed B moving at the same surface speed as the platen so that the stock is subjected in a gradual way to the action of the creasing bars and cutting knives of the projection die.

In order to avoid cracking or rupture of the stock it is necessary that the engagement of the dies with the stock be as gradual as possible so that there will be no single line along the stock which is subjected to undue strain. With my form of creasing bar the engagement of the bar with the stock is first along the line of the rib formed by the thin central rule. This engagement pushes the board partially into the groove 24 in the depression die. The next engagement is that of the outer corners of the outer rules of the creasing bar with the board, and this causes the board to be moved farther into the groove, but with the pressure on the board at different points from the point of first pressure. In this way an arch is formed in the stock so that the stock is not bent at right angles around the corners of the outer rules and thus undue strain along these lines is avoided. Inasmuch as these outer corners of the side rules are spaced from the

corners of the groove in the depression die, by reason of the groove being wider than the creasing bar, as a whole, the board is not subjected to undue strain, or shearing stress along the corners of the grooves in the depression die. The result of the action is the gradual moving of the board into the groove without there being sufficient strain on the board at any point to cause a breaking or rupture of the fibers of the board. At the same time the result of this action on the board is to partially bend or score the fibers along a plurality of spaced parallel lines so that when the board is bent in the folding operation the flexing occurs along a plurality of lines and undue strain along any one line is thus avoided.

The gradual engagement of the dies with the stock has another important advantage in that the strain or shock on the machine is thereby much less than it would be if a plain creasing bar were used. Furthermore, on account of the reduced tendency of the dies to rupture the stock, less accuracy or precision is required in "making ready" so that a material amount of time is saved in setting up a new job on the machine.

With prior machines it has been impossible successfully to crease stock after it has aged or dried out beyond a certain degree or to fold the creased stock without breaking it if the stock has dried out materially after having been creased. I have found that my creasing means will successfully crease older or drier stock than prior machines would, and that the crease formed by my machine may be successfully folded with the stock in a much drier condition than is possible with other forms of creases.

I have found that with the means herein disclosed I can manufacture box or carton blanks of the heavier grades of laminated fiber board at a much greater rate of speed than can be done on any means now known with the same grade of board. With my means each blank is creased, trimmed and notched in a single brief passage through the machine and if desired, the creasing bars and cutting knives may be arranged to form a plurality of independent blanks simultaneously from the same piece of stock in a single passage through the machine.

I claim as my invention:

1. A machine for making fiber-board box blanks comprising, in combination, a horizontally disposed cylinder, a horizontally reciprocatory bed, a projection die disposed in a horizontal plane on said bed and comprising a plurality of creasing bars relatively arranged to form creases in the stock so as to define therein the different walls of a box or carton, said projection die further comprising cutting knives arranged to cut the stock to define the exterior perimeter of the blank, the cutting edges of the knives being

located above the upper edges of said bars a distance sufficient to effect a substantial completion of the cutting of the stock before the creasing thereof is begun, each of said
 5 creasing bars having a central longitudinal rib projecting from its upper or operating edge, the outer corners of the bars and the corners of said rib being arranged to make
 10 impressions in one face of the stock along a plurality of adjacent, but spaced, parallel lines, and a depression die carried by the cylinder and curved to conform to the surface thereof, said depression die having
 15 grooves of greater width than the creasing bars and adapted to receive said bars in creasing the stock.

2. A machine for making fiber-board box blanks comprising, in combination, a cylinder, a flat reciprocatory bed beneath said
 20 cylinder, a projection die disposed in the plane on said bed to reciprocate therewith and comprising a plurality of creasing bars relatively arranged to form creases in the stock so as to define therein the different
 25 walls of the box or carton, said projection die further comprising cutting knives arranged to cut the stock to define the exterior perimeter of the blank each of said creasing
 30 bars having a central longitudinal rib projecting from its upper or operating edge, the outer corners of the bars and the corners of said rib being arranged to make impressions in the face of the stock along a plu-
 35 rality of adjacent but spaced parallel lines, and a depression die carried by the cylinder and curved to conform to the surface thereof, said depression die having grooves of greater width than the creasing bars and
 40 adapted to receive said bars in creasing said stock.

3. Creasing means comprising, in combination, a projection die composed of three rules placed side by side in contact, each
 45 of said rules have substantially square corners at its operating edge, the two outer rules being of approximately the same thickness and being of materially greater thickness than the middle rule, and said middle rule being of greater height than the outer

rules and having its operating edge projecting beyond the operating edges of the outer rules to provide a central longitudinal rib, and a depression die having a groove to co-
 50 operate with said projection die.

4. Creasing means comprising, in combination, a projection die composed of three rules placed side by side in contact, each of
 55 said rules having substantially square corners at its operating edge, the two outer rules being of approximately the same thickness and being of materially greater thickness than the middle rule, and said middle rule being of greater height than the outer
 60 rules and having its operating edge projecting beyond the operating edges of the outer rules to provide a central longitudinal rib, and a depression die having a groove to co-
 65 operate with said projection die, the corners defining said groove being spaced apart farther than the combined thickness of the three rules of the projection die, whereby
 70 the sides of the projection die are spaced from the sides of the groove in the depression die.

5. A machine for making fiber-board box blanks comprising, in combination, a cylinder, a flat reciprocatory bed, a projection die
 75 disposed in a plane on said bed to reciprocate therewith and comprising a plurality of creasing bars angularly disposed with relation to each other and relatively arranged to form creases in the stock so as to define there-
 80 in the different walls of the box or carton, each of said creasing bars having a longitudinal rib projecting from its upper or operating edge, the outer corners of the bars and the corners of the rib being arranged to make
 85 impressions in one face of the stock along a plurality of adjacent but spaced parallel lines, and a depression die carried by the cylinder and curved to conform to the surface thereof, said depression die having grooves
 90 of greater width than the creasing bars and adapted to receive said bars in creasing the stock.

In testimony whereof, I have hereunto set
 95 my hand.

GEORGE F. CALLERY.