E. W. BONFIELD & J. E. FELLOWS.

CARDBOARD CREASING MACHINE.

APPLICATION FILED JUNE 4, 1906.

944,536.

Patented Dec. 28, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

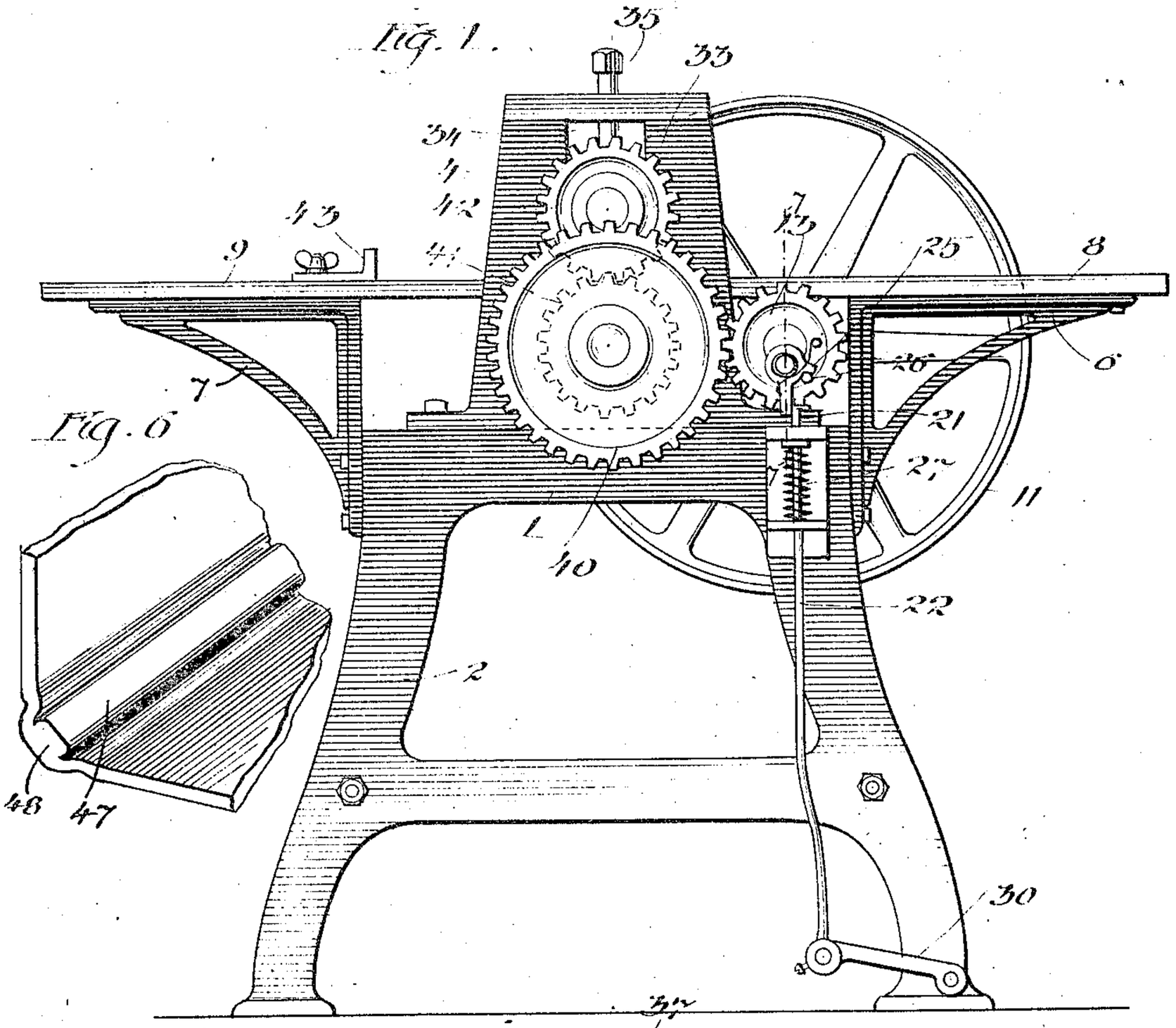


Fig. 6

Fig. 5.

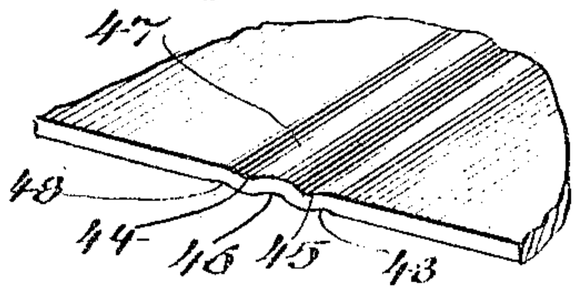


Fig. 3.

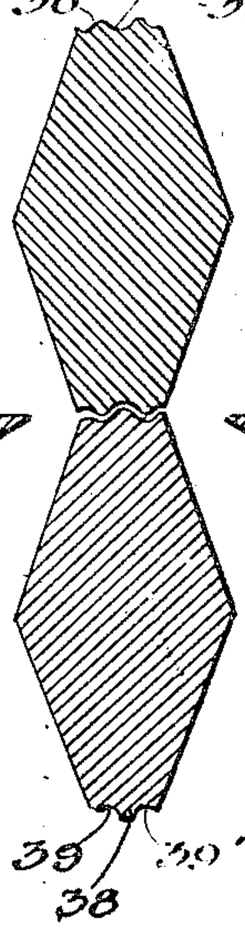
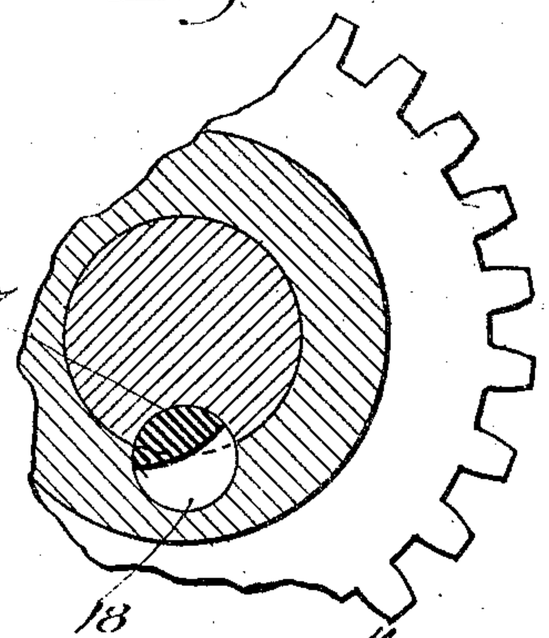


Fig. 4.



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2 SHEETS—SHEET 2.

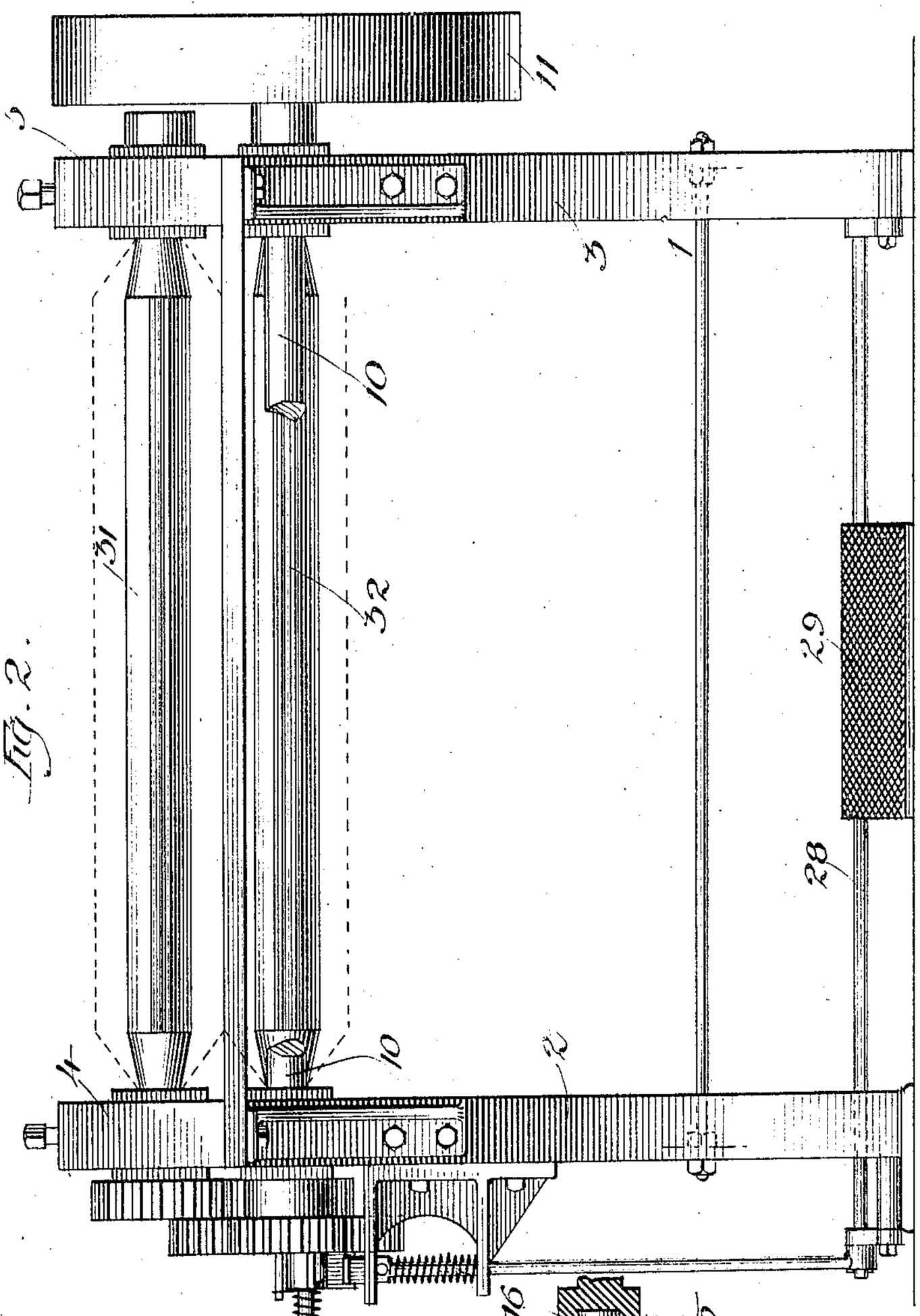

Fig. 2.

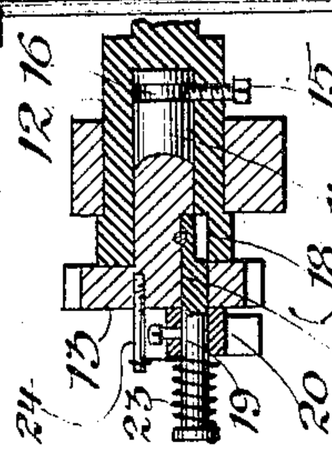

Fig. 1.

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UNITED STATES PATENT OFFICE.

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CARDBOARD-CREASING MACHINE.

944,536. Specification of Letters Patent. **Patented Dec. 28, 1909.**

Application filed June 4, 1906. Serial No. 320,032.

To all whom it may concern:

Be it known that we, EMMONS W. BONFIELD and JAMES E. FELLOWS, both citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Cardboard-Creasing Machines, of which the following is a specification.

This invention relates to improvements in cardboard creasing machines, and refers more specifically to a machine adapted to crease or score the cardboard in a peculiar manner, particularly useful in conjunction with cardboard of extra weight or thickness.

Among the salient objects of the invention are to provide a machine which will so score or crease the material that it may subsequently be bent at right angles along the line of creasing without materially tending to tear or break the cardboard along the line of flexure; to provide a machine which scores or creases the cardboard in such peculiar manner that a reinforcing fillet is formed at the inner angle of the subsequently bent cardboard; to provide a machine which imparts to the cardboard the peculiar creasing effect desired without seriously torturing or impairing the strength of the cardboard; to provide a machine which is extremely convenient in use particularly with reference to adjusting the blanks to position to be scored and which automatically ejects or partially ejects each blank by the very act of scoring or creasing it; to provide a machine which upon being thrown into gear makes a single effective stroke and automatically throws itself out of gear and arrests the creasing members; to provide a machine, the parts of which are of simple and strong construction, adapted for being manufactured at a very moderate cost; and in general to provide a simple and improved machine of the character referred to.

To the above ends the invention consists in the matters hereinafter described, and more particularly pointed out in the appended claims.

The invention will be readily understood from the following description, reference being had to the accompanying drawings, in which—

Figure 1 is an end elevation of a machine embodying the invention; Fig. 2 is a front elevation of the machine looking at the front or feeding side thereof; Fig. 3 is a fragmentary sectional view taken vertically through the creasing bars and adjacent parts of the feed table; Fig. 4 is a sectional view through the drive shaft adjacent to the primary driving gear and showing the construction of a part of the clutch mechanism; Figs. 5 and 6 are views of fragmentary portions of the cardboard as scored by the machine. Fig. 7 is a vertical sectional view taken through line 7—7 of Fig. 1.

Referring to the drawings, 1 designates as a whole a suitable frame, comprising in the present instance a pair of skeleton end frame standards 2, 3, upon which are respectively mounted bearing blocks 4, 5, a pair of laterally projecting front brackets 6 and a somewhat similar pair of laterally projecting rear brackets 7. Upon the pairs of brackets 6 and 7 are mounted front and rear table members 8 and 9, the edges of which approach each other but are separated far enough to permit the creasing bars to operate therethrough, as seen clearly in Fig. 3.

Mounted in the bearing brackets 4 and 5 to extend transversely across the front side of the machine just below the table member 8 is a main shaft 10, one end of which carries a belt pulley 11 whereby it is actuated and the opposite end of which terminates in a sleeve extension 12 rigid with the drive shaft, as best seen in detail Fig. 7.

13 designates a spur-gear rigid with a stub-shaft 14 which extends and is journaled within the sleeve extension 12 and is retained in position therein by means of a set-screw 15 threaded through the sleeve extension and engaging an annular groove 16 in the shaft.

In the bearing surface of the shaft 14 and in the inner meeting surface of the sleeve extension 12 are formed semi-circular spline grooves 17 and 18, respectively, adapted to be brought into register with each other; the spline groove of the shaft being continued as a round aperture out through the body of the gear 13, as shown clearly in said Fig. 7. Within the seat thus formed in the gear and stub shaft is rotatably seated an oscillatory feather 19, circular as to its outer end and that portion which extends through the gear and semi-circular, or approximately so, as to that portion which extends into the stub-shaft, so that when in one position it lies fully within the groove of the

shaft and when oscillated about its own axis it projects into the corresponding groove 18 of the sleeve. Upon the feather member is keyed or otherwise rigidly secured an arm 20 projecting radially therefrom and adapted to coöperate with a trip stop 21 formed as the upper end of an actuating rod 22 which is mounted in suitable bearings to reciprocate vertically upon one of the end frames, as best seen in Fig. 1. A spiral spring 23, attached to the feather member at one end, coiled around the latter and at its opposite end attached to a stud 24 upon the gear 13, tends normally to rock the feather member in a direction to throw the acting part of the feather member into interlocking engagement with both spline grooves so as to lock the gear positively to the driving shaft. A stop projection 25, rigid with the feather member, coöperates with a stud 26 upon the gear 13 to positively arrest the forward rotation of the gear member after the feather member has been oscillated in a position to disengage it from the sleeve extension. The actuating rod 22 is normally held upward in the path of the arm 20 by means of a coiled spring 27 acting thereon; and said actuating rod is depressed by means of a rock bar 28 provided with a treadle step 29 and carrying at one end a rigid crank arm 30 which connects with the lower end of the actuating rod 22. The mechanism described constitutes an automatic clutch mechanism which whenever the actuating rod is depressed or retracted throws into gear as the spline groove of the sleeve comes into register with the feather and automatically throws itself out of gear when the arm 20 again encounters the trip stop on the actuating rod.

31 and 32 designate a pair of creasing bars mounted respectively above and below the plane of the feed table; each creasing bar terminating at each end in a trunnion or bearing extension, which extensions are journaled in suitable bearings in the supports 4 and 5 vertically above each other. One of the creasing bars, the upper one in the present instance, is made bodily adjustable toward and from its companion, and to this end the trunnions of said upper bar are mounted in movable bearing blocks 33 which are shiftable in vertical ways 34 in the supports 4 and 5, and are adjustably held by adjusting screws 35.

The creasing bars are of such cross sectional form that when their longer diameters are in alinement their acting edges closely approach each other, but when rotated out of this position a considerable space is left between the proximate sides of the bars to admit the cardboard freely therebetween. In the preferred embodiment shown said bars are of approximately diamond shape in cross section; this form combining great strength and rigidity against separating thrust and being a form which is susceptible of cheap manufacture. The scoring or creasing edges of these creasing bars are of peculiar configuration and constitute one of the most important features of the invention. Considering either pair of coöperating edges of the two bars, one is provided with a pair of parallel projecting ribs or beads, as 36, 36′, and an intervening groove 37, while the coöperating edge of the other member is provided with a single rib or bead 38 and a groove, as 39, 39′, at each side thereof; the ribs and groove of one member being adapted to intermesh with the rib and grooves of the other member as the creasing bars are synchronously rotated upon their respective axes. These ribs and grooves are of rounded configuration in cross section so as to score and crease the cardboard without cutting it, and the creasing bars will be adjusted a suitable distance apart to accomplish this end. In the particular instance shown the lower bar is provided at each of its acting edges with a single rib and pair of grooves while the upper bar is provided with the double ribs or beads and single groove, but obviously this arrangement can be varied.

Upon the trunnion of the lower creasing bar is secured a spur-gear 40 twice the diameter of the driving gear 13 and arranged to intermesh with the latter, so that each rotation of gear 13 imparts a half revolution to the creasing bar. The two creasing bars are intergeared to rotate together by gears 41 and 42 of equal size mounted upon their respective trunnions.

A gage or stop 43 is adjustably mounted upon the rear table member 9 in position to arrest the rear edge of the cardboard as the operator passes the blank into position between the rolls.

The operation of the machine is obvious but may be briefly described as follows: the machine being rotated in such direction that the acting edges of the creasing bars turn outwardly and forwardly toward the operator, the operator thrusts the blank inwardly over the table between the bars until its edge is arrested by the gage, then depresses the treadle thus throwing the creasing mechanism into gear with the constantly rotating drive shaft, whereupon the creasing bars make a half revolution, and in so doing crease or score the blank and partly eject it toward the operator, the creasing mechanism being automatically thrown out of gear as the arm 20 encounters the trip-stop 21. These operations are repeated for each time the blank is to be scored.

The peculiar manner in which the blanks are scored is of importance. Referring to Fig. 5, it will be seen that one side of the blank is provided with two parallel grooves

or scores 44 and 45, while its opposite side is provided with a single groove 46; the groove 46 being interposed midway between the grooves 44 and 45 but upon the opposite side of the blank. If, now, the blank be bent upon itself along these scored lines so that the rib 47 between the grooves 44 and 45 be at the inner angle, as shown in Fig. 6, this rib forms in effect a fillet which occupies said angle and, to the extent of its rigidity, holds the portions of the blank at either side thereof from being bent toward each other beyond a position at right angles to each other. At the same time the groove 46 at the opposite side of the blank is stretched out so that the bottom of said groove becomes a facet at the exterior angle of the blank. In forming the scores in the blank, light score lines 48 are formed parallel with and at each side of the groove 46; these score lines 48 being made when the cardboard is bent down over the beads 36, 36' of the opposing creasing bar, and when the blank is folded into right angle relation in the manner described these score lines 48 impart to the finished side of the box a panel effect, the margins of which panel are defined by score lines. This paneled effect combined with the facet angle described imparts to the finished box an unusually neat and ornamental appearance. The presence of the groove 46 is of the utmost importance in thus bending the blank because in forming it the cardboard is stretched at this point the requisite amount to permit the blank to be bent into the right angled shape shown without overstretching the cardboard at any point, thus obviating all tendency to break the cardboard along the lines of scoring. The result, therefore, is, when the blank is used to form a box or other right angled structure, that the blank takes the right angle form with perfect freedom and at the same time the rib 47 forms the fillet which greatly reinforces the rigidity of the structure at the angle. While the blank thus possesses special rigidity when bent at right angles along the score line, as above explained, nevertheless it is to be understood that the blank is susceptible of being folded over so that one member rests flatly against the other, and in this instance the fillet or bead formed upon the interior of the angle is also of importance. In such case the fillet is compressed and flattened considerably but nevertheless its presence causes the blank to fold less sharply, and in this manner the tendency to break along the fold is very materially lessened. In other words, the necessary stretching of the cardboard around the outer portion of the fold is distributed both sides of the folding line and a more rounded bend results with a greatly decreased tendency to break or rupture the cardboard.

The blank scored in the peculiar manner described is not claimed herein, the same being made the subject matter of a separate application.

It will be obvious that the construction of the machine may be modified without departing from the spirit of the invention.

We claim as our invention:

1. In a creasing machine, a pair of creasing dies mounted to coöperate with a rolling movement, both having gear-tooth-like creasing ribs which in operation intermesh gear fashion, the peripheral surfaces of said dies immediately contiguous to the area occupied by the creasing and scoring parts, being formed to extend well inside of arcs struck from the axes of rotation of the respective die members and tangent at a point in a direct line between said axes.

2. In a creasing machine, a pair of creasing dies mounted to coöperate with a rolling movement, one die member having one central creasing rib and auxiliary scoring ribs along each side thereof, the other having two principal creasing ribs separated by a groove and arranged to mesh gear fashion with the first, the peripheral surface of said dies immediately contiguous to the areas occupied by the creasing and scoring parts being formed to extend well inside of arcs, struck from the axes of rotation of the respective die members and tangent at a point in a direct line between said axes.

3. In a creasing machine, a pair of creasing dies journaled upon parallel axes, one or both being of non-circular form in cross section throughout its acting length, and provided at both its opposite edges with creasing faces, the coöperative pairs of creasing faces comprising, the one, a creasing face or edge having salient creasing angles extending along and forming the side boundaries of, its creasing face at one or more intermediate creasing ribs, and the other provided with one or more creasing ribs arranged to intermesh with those of the opposed member, and provided also with creasing surfaces opposed to and adapted to cooperate with salient angles of the companion member.

4. In a creasing machine, a pair of creasing bars or members mounted side by side so that the creasing face of the one has rolling intermeshing movement with the creasing face of the other, one of said members being rotatably mounted, non-circular in cross section throughout its acting length, and provided with a creasing face forming a part of the periphery of maximum radius from its axis of rotation, and having another part of its periphery of substantially less radius and extending throughout the full acting length of the member, whereby at a time when the creasing portions are out of opposed register, an unobstructed passage is formed between said members of ample

width to permit free feed adjustment of the stock.

5. In a creasing machine, a pair of creasing bars, one provided with a creasing face or edge comprising salient creasing ribs extending along, and forming the side boundaries of, said creasing face, and a single intermediate creasing rib, and the other bar provided with a coöperating creasing face portion comprising a pair of salient creasing ribs spaced to intermesh between the central and outer ribs of the opposed member, the lateral marginal boundaries of the creasing portions of both bars being formed abruptly divergent, so that the stock being acted upon is free from restraint against the corrugating action of the creasing members.

6. In a creasing machine, the combination with a suitable main frame, of a pair of creasing bars journaled therein parallel with and adjacent to each other, each creasing member having the form of a flattened bar having journals at each end located midwidth of the bar, both of said bars being provided upon their diametrically opposite edges with sets of parallel creasing ribs and intervening grooves, closely intermeshing gears uniting said creasing bars to rotate in positively timed relation, whereby their opposed creasing ribs and grooves are successively brought into interspaced and intermeshing relation, the creasing face portions of said bars forming the parts of maximum radius from the axis of rotation of the bars, a feeding table having its supporting plane arranged in alinement with the feed passage between the meeting edges of said bars, and stop mechanism arranged to limit the insertion of a blank between said creasing bars.

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