June 28, 1938. E. SOUTHWORTH 2,122,186

ROUND-CORNERING MACHINE

Filed April 6, 1937 2 Sheets-Sheet 1

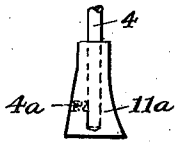


Fig. 2a

Fig. 1

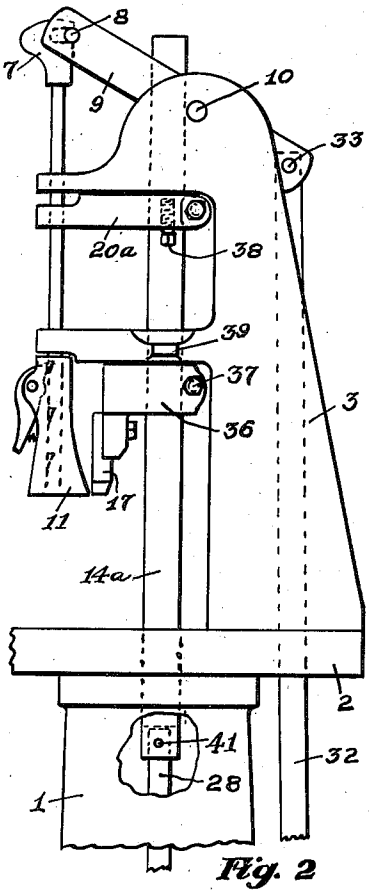


Fig. 2

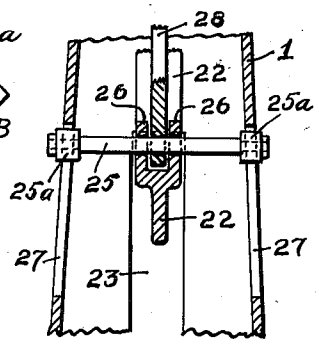


Fig. 3

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ROUND-CORNERING MACHINE

Filed April 6, 1937 2 Sheets-Sheet 2

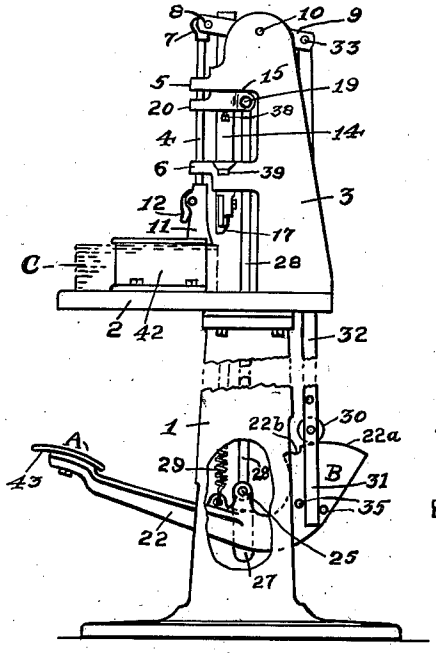


Fig. 4

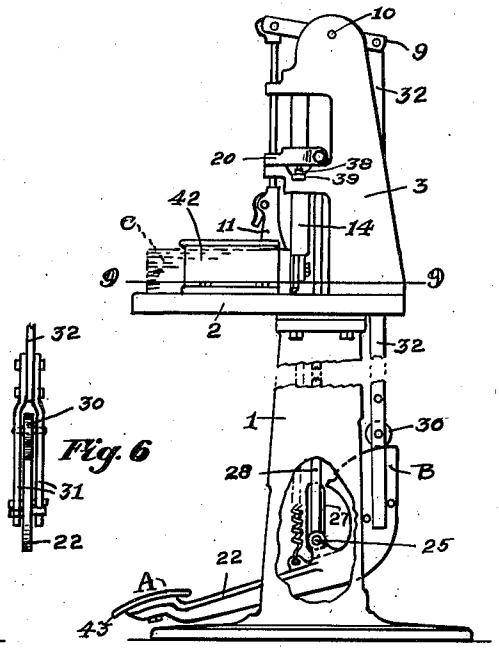


Fig. 5

Fig. 6

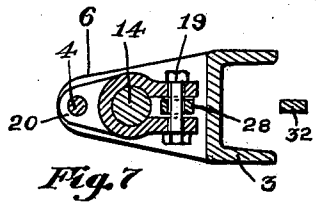


Fig. 7

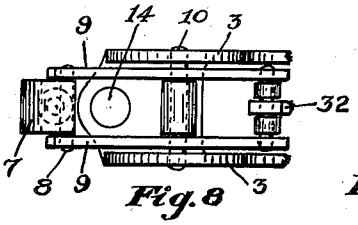


Fig. 8

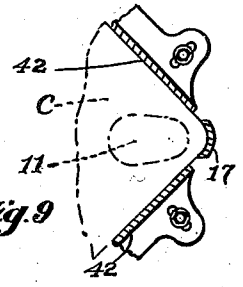


Fig. 9

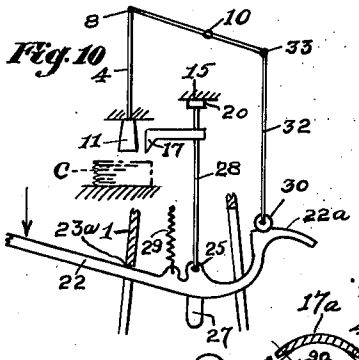


Fig. 10

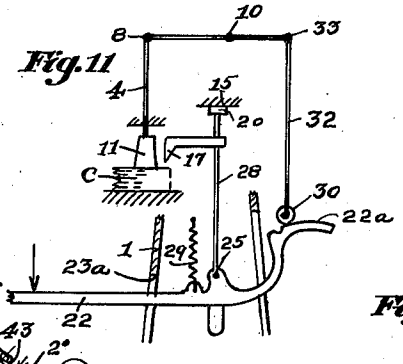


Fig. 11

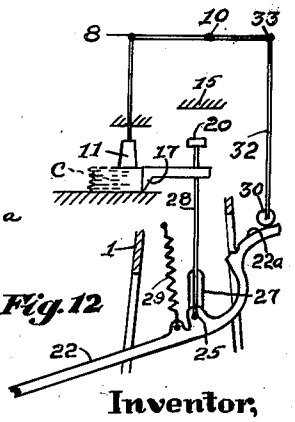


Fig. 12

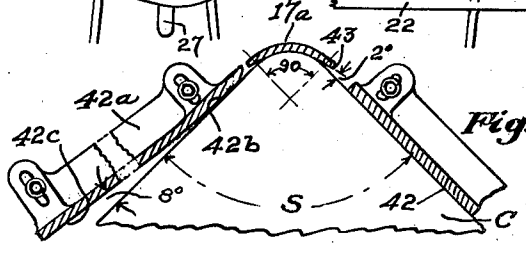


Fig. 13

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Patented June 28, 1938 2,122,186

UNITED STATES PATENT OFFICE

2,122,186

ROUND-CORNERING MACHINE

Edward Southworth, Portland, Maine

Application April 6, 1937, Serial No. 135,225

8 Claims. (Cl. 164—51)

The invention hereinafter to be described relates to so-called round-cornering machines such as are used by printers and book-binders in rounding the corners of cards and sheets of paper of various kinds.

The present invention deals more particularly with improvements which I have evolved in a machine employed for the foregoing purpose and for which United States Letters Patent No. 629,824 was granted me on August 1, 1899.

In certain other types of card and paper round-cornering devices the binding force on the stack of paper which is being operated on is exerted by a spring.

As some grades of paper are more difficult to cut than are others, and particularly as the cutting knife is apt to become quickly dulled, the pressure to operate the knife must be largely increased at times. But this increased pressure of the knife on the paper will often create a lateral thrust tending to move the sheets away from the aligning gages, resulting in unsymmetrical rounding of the corners.

The spring, in this instance, is seldom able to cope with the situation and for this reason is an objectionable method of binding the stack to the table.

In my former invention, as well also as in my present one, the method of operation does not contemplate relying on spring pressure for retaining the stack of paper on the cutting table, but is based on the principle of applying a positive, unyielding pressure on the stack of an amount comparable to and in accordance with that required to force the knife through the paper material.

This would imply that, to all intents and purposes, the knife-actuating member fulcrums on the stack of paper material being round-cornered, and the pressure on the stack is thus measured and controlled under all conditions by the amount of power expended in forcing the knife through the paper at any point throughout the whole round-corner-cutting operation.

With this arrangement the pressure on the stack of paper increases or decreases in accordance with the increase or decrease, respectively, in resistance to the passage of the cutting knife through the stack of paper.

One of the objects of my present invention is to equip my round-cornering machine with a foot-actuated treadle, thereby enabling the operator to use both hands exclusively for loading and unloading the paper material into and out of the machine, thus increasing its productive capacity.

Another object is to provide means to re-position the binder element on the binder rod, to compensate for varying thicknesses of the stack of paper, and also to eliminate lost motion in the preliminary movement of the treadle, just prior to the start of the round-cornering operation.

And a further object resides in the lever structure which provides greater stroke movement of the parts than can be conveniently procured by cam devices, with which my former invention was equipped.

I have illustrated my invention in the accompanying drawings in which like reference characters are employed to identify like parts throughout the various views.

In the drawings,—

Fig. 1 is a sectional elevation of my improved round-cornering machine;

Fig. 2 shows an alternative arrangement for the knife-actuating parts;

Fig. 2*a* shows an alternative form of binder;

Fig. 3 is a vertical section taken on line 3—3, Fig. 1;

Figs. 4 and 5 depict the machine with the treadle shown in two different positions;

Fig. 6 is a rear end view of the treadle and connecting parts;

Fig. 7 is a section taken on line 7—7, Fig. 1;

Fig. 8 is a plan view of the top portion of the machine;

Fig. 9 is a section taken on line 9—9, Fig. 5, and

Figs. 10, 11, and 12 show diagrams of the moving parts in three different positions.

Referring to the drawings, 1 is a pedestal which supports the table 2 upon which is mounted the frame 3.

On the front of the frame is mounted a vertically reciprocating rod 4, slidable in bearings 5 and 6 made integral with the frame 3. The upper end of the rod 4 is fixed in a hook member 7 which slidably engages a cross-pin 8 joining the forward ends of two rockers 9, 9. These rockers are pivotally mounted on the pin 10 secured in the upper end portion of the frame 3.

On the lower end of the rod 4 is adjustably secured a binder, or as sometimes designated, presser-foot 11 adapted to be positioned at various points on and vertically of the rod 4 through the agency of the pawl 12 pivotally secured on the binder member by the pin 12*a*. The pawl may engage, as desired, any one of the plurality of notches 13 made in the side of the rod 4.

By disengaging the pawl from one of the notches and moving the binder 11 bodily, either

upwardly or downwardly on the rod until the pawl engages another of the notches, it is possible to vary the distance from the bottom of the binder to the table, and in this manner eliminate much waste movement of the parts when the stack of paper to be cut is not full height.

A spring 12b holds the pawl in engagement with the rod 4.

The ability to make this adjustment in the positioning of the binder member is of great advantage when it is desired to change the height of the stack of cards or paper to be round cornered, as considerable leg work can be saved the operator of the machine by decreasing the distance the treadle is required to be depressed to bring the binder into contact with the stack of cards.

In Fig. 1 is illustrated one embodiment of the cutter-actuating parts as they are disposed in the frame 3. In this particular assembly I employ a cutter-bar 14 reciprocable vertically in bearings 15 and 16, and on the lower end of the shaft secure an arcuate shape cutting knife 17 by means of the screw 18.

Intermediate the ends of the cutter-bar and adjustably secured thereto by a clamp screw 19, is a stop and knife-aligning collar 20 having therein a hole 21 within which the rod 4 is slidably disposed.

By relaxing the screw 19, cutter-bar 14 may be slightly rotated, in either direction, to accurately bring the arcuate cutting edge of the knife into tangency with the two adjacent sides of the cards the intercepted corners of which are to be severed.

When the knife is properly adjusted, the clamp screw 19 is re-tightened and thereafter, except accidental disarrangement of the knife occurs, alignment and correct registration of the knife with the cards is maintained by the rod 4 which prevents rotation of the collar 20, this feature being clearly shown in the sectional elevation, Fig. 1, and the sectional plan view, Fig. 7.

Now in its essential features the structure just described, forming a portion of my card and paper rounding machine, is quite similar to that employed in my former invention, mention of which has hereinbefore been made. The structure having to do with the actuation of the binder and cutting-knife members, however, is very dissimilar, when comparing my former with my present invention, which latter I will now describe.

Installed in the pedestal 1 is a treadle 22 which operates in the front and rear slotted apertures, 23 and 24 respectively. Contrary to conventional practice, in which a treadle is usually swung on a fixed pivotal connection serving as the fulcrum, my present invention contemplates a dual fulcrum arrangement for the treadle, the latter member fulcruming on a cross-shaft 25 during the first portion of its downward swing, the member 25 being fixed in the two ears 26 of the treadle and having on each outer end a roller 25a vertically slidable in a slot 27 cut on each side of the pedestal 1. Pivotally mounted on the cross-shaft 25, between the ears 26 is a connecting-rod 28 extending upwardly to make connection with the screw 19.

An extensible spring 29 acts to normally hold the collar 20 against the bearing 15 and the top of the treadle, in advance or forward of the cross-shaft 25, in engagement with the top of the slot 23, as at 23a.

The rearward end or short arm of the treadle is bent upwardly, forming a fan shape structure with an eccentric, convex face 22a, on the inner end of which is a depression 22b.

When the treadle is disposed as shown in Fig. 1, the roll 30, positioned between the branches of the yoke 31, seats in the depression 22b, the roll being mounted over the pin 31a.

Rising from the yoke 31 is another connecting-rod 32 making connection with the rearward ends of the two rockers 9, over the cross-pin 33, the connecting-rod passing through an opening 34 in the table 2.

To prevent displacement of the yoke 31 from off the arcuate face 22a of the treadle, I provide two pins 35, one on each side of the yoke, loosely holding the latter in place.

In Fig. 2 I illustrate a slightly modified form of connection with the cutting knife. In this instance the cutting knife 17 is attached to a collar 36 which clamps on the cutter-bar or shaft 14a by means of a screw 37.

A knife-aligning and stop collar 20a is secured to the shaft 14a and serves in substantially the same capacity as does the collar 20 in the design just previously described. In each of these knife-aligning and stop collars, 20 and 20a, a stop-screw 38 limits the downward movement of the knife by abutting on a stop shelf 39. This prevents the knife from too deeply seating itself in the wooden cutting block 40 when at the end of its stroke, and makes fine adjustment of the knife possible.

The connecting-rod 28 in this alternative form of structure is secured to the shaft 14a by a pin or screw 41. In all other particulars the two designs may be quite similar.

It will be observed by reference to Figs. 10, 11 and 12, that the treadle, while moving from position shown in Fig. 10 to that shown in Fig. 11, swings on the cross-shaft 25 as a fulcruming point.

The upward pulling effort of the extensible spring 29 is yieldingly exerted on the treadle at a point intermediate two contacting points, serving as stops, namely, the pivotal connection at 25 and the upper end 23a of the slotted aperture 23.

For reasons hereinbefore given, I consider it preferred construction to make the binder or presser-foot member as it is shown in Fig. 1. I may, however, elect to construct it as illustrated in Fig. 2a in which is depicted a presser-foot 11a fixedly secured to the binder rod 4 by a set-screw 4a.

In operating my round-cornering machine a stack of cards or paper sheets C, the corners of which are to be rounded, is first placed on the table 2 and the gages 42 adjusted against adjacent sides of the stack to bring them into tangency with the sides of the cutting knife 17.

The operator then applies a pressure on the treadle, depressing the long arm A until, through the agency of the interconnecting elements, the presser-foot 11 is brought down firmly on to the top of the stack. This movement is what I call the primary or stack-binding movement of the treadle.

During this primary movement the treadle swings from its pivotal connection with the connecting-rod 28 on the cross-shaft 25, the spring 29 yielding but still acting to hold the cutting-knife actuating parts in their original positions.

It will be observed that at the beginning of the primary movement of the treadle, the portion "B" thereof, swinging inwardly, raises the roll 30 out of the depression 22b on to the eccentric part 22a. This results in giving the binder-actuating parts a sudden impetus and gain in

movement calculated to more expeditiously seat the binder on the stack of paper.

At the start of the depressing of the treadle in what I term the secondary or stack-cutting movement, which in reality is a continuation of the primary movement, the fulcrum point immediately and automatically shifts from the cross-shaft **25** to the roll **30**, which latter had at the termination of the primary movement reached its normal limit of upward travel.

Throughout the secondary movement the roll **30** serves as the fulcrum point of the treadle, the pivotal connection at **25** lowering with the treadle and bringing the knife and interconnecting parts downwardly until the cutting operation has been completed and the knife contacts the cutting block **40**.

There is one feature in carrying out the secondary movement of the treadle which I consider of more than ordinary importance. It concerns the action which occurs as the eccentric face **22***a* swings under the roll **30**, toward the pedestal, thereby transmitting to the pivotal connection at **25** a certain amount of added downward movement of this connection, independently of that procured by the treadle action in general.

Actually, of course, the fulcrum or rearward bearing point for the treadle throughout its whole secondary movement is the roll **30**, but relatively speaking, and insofar as the result attained is concerned, there is what amounts to a progressive lowering of the fulcrum point, although perhaps more strictly speaking, a gradually increasing rise in contour of the rearward top face of the treadle which when engaging the more or less fixed roll **30** tends to lower the intermediate portions of the treadle, including the pivotal connection **25** which has interconnection with the cutting knife.

In consequence of this dual action of the treadle in depressing the knife-interconnecting parts a shorter swinging arc in the secondary movement of the treadle and less leg action of the operator is required.

The round-cornering operation is most successfully performed when the knife is sharp and the corners of the sheets square. The cutting-knife, however, will after a period become dulled and an increased application of pressure required to force it through the stack of material to be round-cornered.

In some designs of round-cornering machines this extra pressure on the stack would disarrange the sheets, for the reason that no corresponding increase of pressure on the binder is present.

In my present invention this difficulty has been taken care of, as has hereinbefore been explained, by construction which transmits or communicates to the binder any excess pressure applied to the cutting-knife. In other words, the binder pressure is responsive to any change in the pressure required to operate the knife.

When the corners of the sheets to be rounded are square, a knife after the order of that shown in Fig. 9, which embraces just ninety degrees on the cutting edge, is theoretically all right. But in practice it will be found that it is quite difficult to hold the sheets to the gages so that a perfectly tangential cut is made. To overcome this, it is customary to extend the cutting edges of the knife slightly beyond the quarter of a circle, flaring them on each side two or three degrees, as at **43**, on the extended portions. This will compensate for slight variations in gaging, and is hardly noticeable in the finished job, the error is so slight. A knife of this type is shown at **17***a*.

A difficulty, however, frequently arising in round-cornering work, is where the sheets come quite considerably out of square on their corners. In this case it is possible to have three different kinds of angles, right, acute and obtuse, to deal with.

A full length gage on each side of the stack of paper will not work satisfactorily under the foregoing conditions, so in my improved construction I employ a gage as shown in Fig. 13, one side being quite similar to the gage shown in Fig. 9, but the other side constructed as shown at **42***a* in which there are two faces, one oblique to the other, a short facet **42***b* being disposed closely adjacent the cutting-knife and a long face **42***c* extending to the opposite end of the gage member, as say eight degrees more or less out of parallel with the short facet.

In placing the sheets on the table they are jogged hard against the regular gage **42**, then the gage **42***a* is brought up into contact with the other side of the stack, the portion of the gage used to contact the paper depending on whether the paper is cut true or is out of square at the corners. If out of square, the short facet **42***b* is presented to the side of the stack, which makes the gaging more accurate as contact on this side is close to the cutting knife **17***a*. Otherwise the long portion of gage **42***a* may be used, as is done in the conventional way of gaging.

It has been found that with a gage of the foregoing description better and more uniform work can be produced.

The character S in Fig. 13 would indicate that the gage was being used on paper stock having corners cut either more or less out of square, with the short facet being used in this instance.

A proper gage is absolutely essential in the operation of a round-cornering machine, otherwise there is no assurance that the corners of the sheets will be rounded symmetrically.

What I claim is:

1. In a machine for rounding the corners of paper cards and sheets the combination with a reciprocating binder-rod and a reciprocating cutting-knife non-synchronously co-acting therewith, of a binder element slidably mounted on said binder-rod, a pawl pivotally secured on said binder element, means on said binder-rod adapted to be engaged by said pawl to hold said binder in any one of various predetermined positions on and vertically of said binder-rod, a roll-equipped connecting-rod making inter-connection with said binder-rod, a treadle having intermediate its ends pivotal inter-connection with said cutting-knife, and an arcuate-face portion on the rearward end of said treadle slidably engaging said roll-equipped connecting-rod, said portion being eccentrically disposed with respect to the pivotal point of said treadle and adapted, when the forward end of the treadle is depressed, to swing inwardly and downwardly, lowering the rearward end of the treadle bodily.

2. In a round-cornering machine for paper sheets and cards the combination with a reciprocating, arcuate-shape cutting-knife and a binder-rod cooperatively connected but non-synchronously reciprocating therewith, of a binder element adjustably secured on the lower end of said binder-rod, a treadle swinging on and from a perpendicularly movable pivot having inter-connection with said cutting-knife, an arcuate-face portion, having a depression on one end, rising from the rearward end of said treadle, said portion being eccentric with said mov-

able pivot, and a roll-equipped connecting-rod, having inter-connection with said binder-rod, slidably engaging said arcuate-face portion, whereby, when the forward end of the treadle is depressed, the arcuate-face portion, fulcruming on the end of the roll-equipped connecting-rod, swings inwardly and bodily downwardly, assisting the forward end of the treadle in lowering said cutting-knife.

3. A machine for rounding the corners of cards and paper sheets comprising in combination with a reciprocating cutting-knife and a presser-foot adapted to be lowered on to the cards or sheets to secure them while being round-cornered, a connecting-rod having at its upper end interconnection with said cutting-knife, a treadle mounted in said machine and having intermediate its ends pivotal connection with the lower end of said connecting-rod, said pivotal connection being susceptible of vertical movement only, a second connecting-rod having interconnection with said presser-foot and having at its lower end a revoluble roll, and an arcuate face portion on the rearward end of said treadle constantly in engagement with said roll, adapted, after the roll has been raised to bring said presser-foot into engagement with the said paper sheets, to cause the intermediate and rear end portions of the treadle to descend, bodily, as the rearward end swings inwardly in sliding-fulcrum contact with said roll.

4. In a round-cornering machine for paper sheets and the like, the combination with a pedestal, a table, a cutting-knife and a paper binding element both reciprocably mounted on said table, of a connecting-rod having at its upper end interconnection with said cutting knife, a treadle pivotally connected to the lower end of said connecting-rod, a stop for limiting the upward movement of said connecting-rod, a stop on said pedestal for limiting the upward movement of the forward end of said treadle, and an extensible spring, the upper end of which is fixed on said machine and its lower end attached to said treadle at a point intermediate its pivotal point and the treadle stop on said pedestal, whereby said connecting-rod is held in its upwardly stopped position before and throughout the primary movement of said treadle.

5. In a round-cornering machine for rounding the corners of cards and paper sheets the combination with a pedestal, a table mounted on said pedestal, a cutting-knife and a paper binder each reciprocably mounted on said table, of a connecting-rod having at its upper end interconnection with said cutting-knife, a second connecting-rod having a roll on its lower end portion and having connection at its upper end with said paper binder, a treadle pivotally joined intermediate its ends to the lower end of said first mentioned connecting-rod, a fan-shape, upwardly extending portion on the rearward end of said treadle, the upper face thereof being arcuate and in continuous engagement with said roll, a seat in said arcuate face in which said roll is disposed when the actuating parts are in their normal, at rest positions, a yoke depending from said second connecting-rod, straddling said fan-shape portion, and means to guide said yoke whereby said roll may be held against displacement from off said arcuate face.

6. A round-cornering machine comprising in combination with a pedestal, a table, a reciprocably mounted cutting-knife and a reciprocably mounted paper-binder, a connecting-rod having interconnection with said cutting-knife, a connecting-rod, having a roll on its lower end, interconnecting with said paper-binder, a treadle mounted to swing from a pivotal connection with said first mentioned connecting-rod, a spring yieldingly holding said first mentioned connecting-rod in an upwardly stopped position, and means on the rearward end of said treadle, engaging said roll, adapted to respond to the depressing of the forward end of the treadle to simultaneously depress the rearward portion thereof.

7. A round-cornering machine adapted for use in rounding the corners of a stack of sheets comprising in combination with a vertically reciprocating cutter-bar having a cutting-knife thereon, and a vertically reciprocating presser-foot, a connecting rod the upper end of which interconnects with said cutter-bar, a second connecting-rod having a roll on its lower end and having interconnection with said presser-foot, a treadle pivotally mounted on the lower end of said first mentioned connecting-rod, and means on the rearward end of said treadle slidably engaging said roll, adapted when said presser-foot is disposed on the top of said stack of sheets, to provide a portion of the cutting-knife lowering capacity of the treadle in cooperation with the downward swinging movement of its forward end.

8. A round-cornering machine for rounding the corners of a stack of paper sheets comprising in combination with a reciprocating knife-carrying member and a presser-foot, a treadle pivotally mounted to swing from the lower end of said knife-carrying member, an eccentric portion on the rearward end of said treadle, means interconnecting said eccentric portion and said presser-foot, and gaging means for said stack of sheets, said means embodying a straight faced member adapted to be positioned on one side of said stack, a second member disposed on the adjacent side of the stack and having a long face portion merging into a short oblique one having a rounded end, said oblique portion being adjacent the cutting knife, and means for positioning said second member whereby either face, singly, may be brought into engagement with the adjacent side of the stack.

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