May 6, 1924. 1,493,108

A. E. CRANSTON

BINDING MACHINE

Filed July 13, 1920 3 Sheets-Sheet 1

Fig. 2.

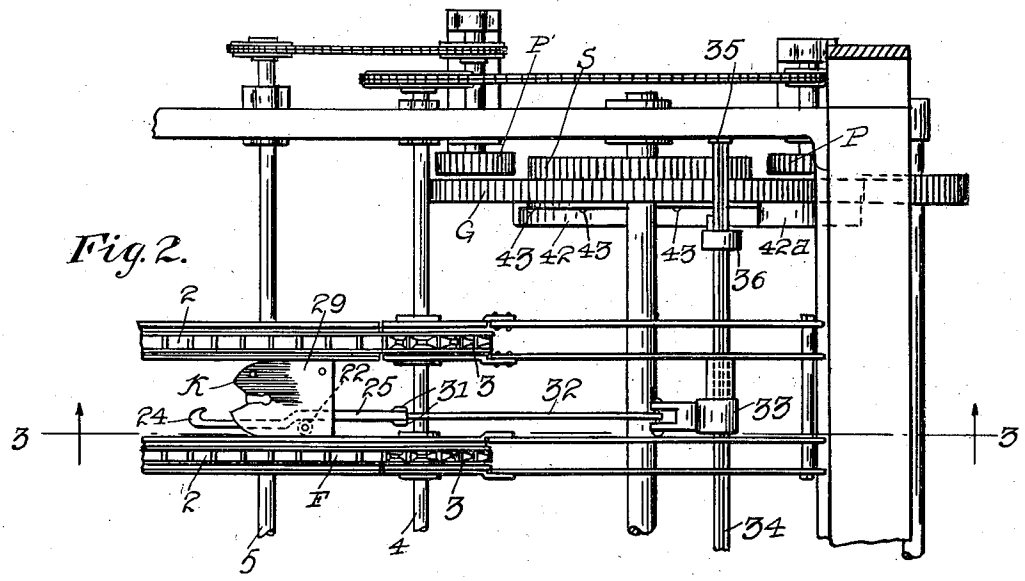
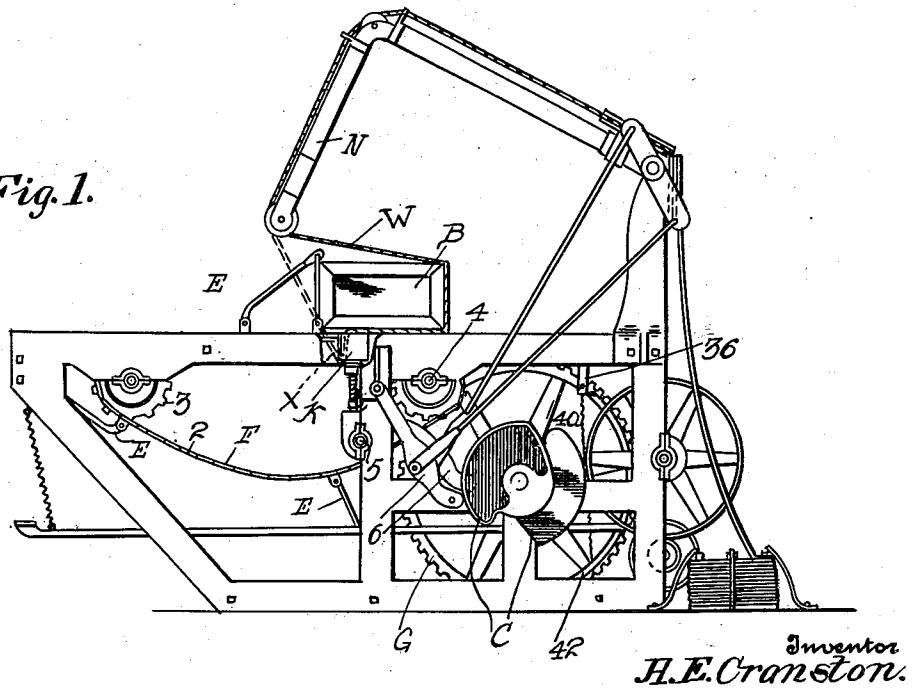


Fig. 1.



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BINDING MACHINE

Filed July 13, 1920 3 Sheets-Sheet 2

Fig. 3.

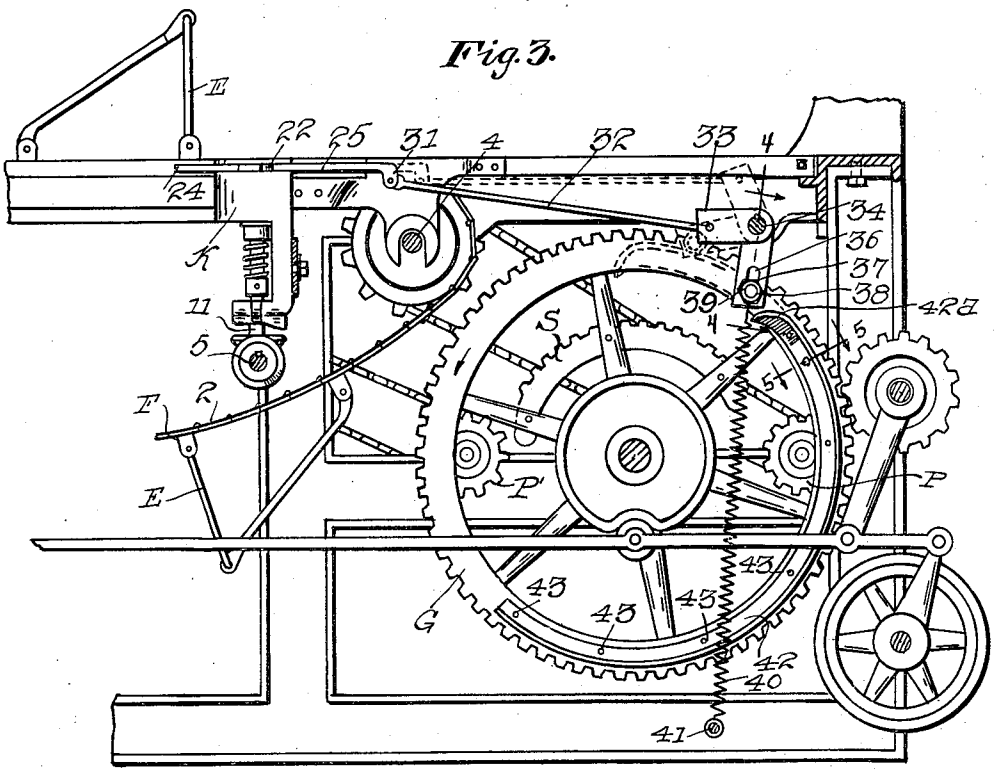
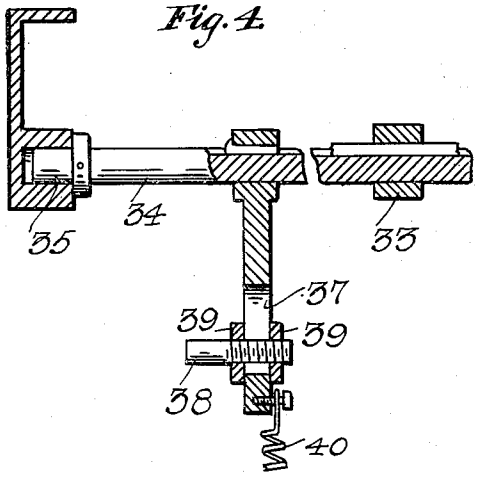


Fig. 4.



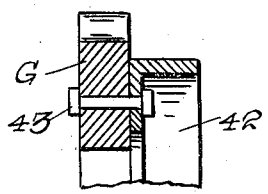


Fig. 5.

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BINDING MACHINE

Filed July 13, 1920 3 Sheets-Sheet 3

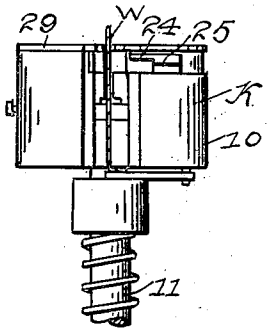


Fig. 7.

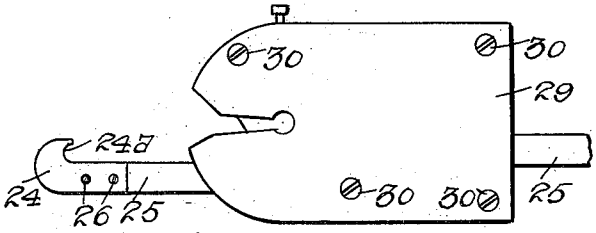


Fig. 6.

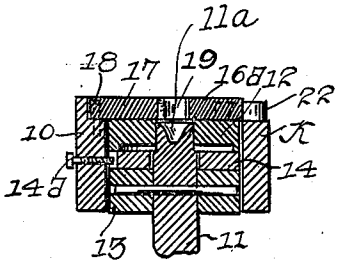


Fig. 9

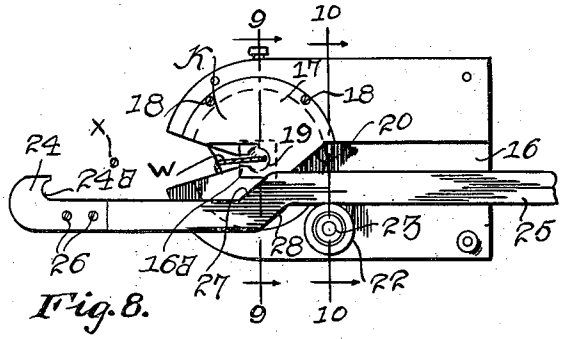


Fig. 8.

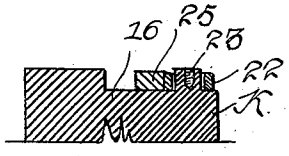


Fig. 10.

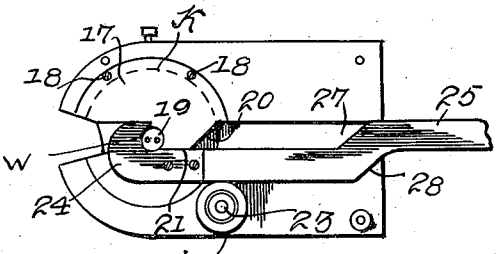


Fig. 11.

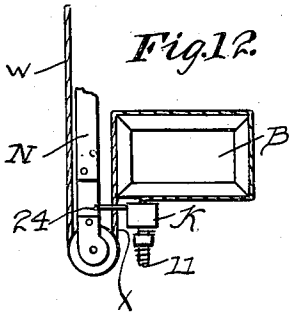


Fig. 12.

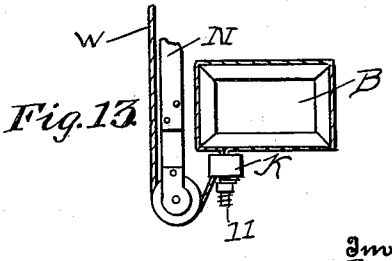


Fig. 13.

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Patented May 6, 1924. 1,493,108

UNITED STATES PATENT OFFICE.

ALBERT EARL CRANSTON, OF SPOKANE, WASHINGTON, ASSIGNOR TO ALEX J. GERRARD, OF CHICAGO, ILLINOIS.

BINDING MACHINE.

Application filed July 13, 1920. Serial No. 395,866.

To all whom it may concern:

Be it known that I, ALBERT EARL CRANSTON, a citizen of the United States, and a resident of Spokane, in the county of Spokane and State of Washington, have invented certain new and useful Improvements in Binding Machines, of which the following is a specification.

My invention relates to machines for binding boxes or the parts of boxes into bundles, and it contemplates certain improvements in the binding machine embodied in my pending application Serial No. 340,250, filed November 24, 1919, and the knotter embodied in my pending application Serial No. 322,086, filed September 6, 1919.

A purpose of my invention is the provision of a binding machine including mechanism for twisting the ends of a loop of wire into a knot at a distance from either corner of a box or bundle thereby eliminating inconvenience and possible damage as a result of disposing the knot at the corner of the box or bundle. Furthermore, my invention provides means for subsequently pressing the knot flat against the bottom of the box or bundle to permit the close packing of the boxes or bundles to conserve packing space.

I will describe one form of binding machine embodying my invention and will then point out the novel features thereof in claims.

In the accompanying drawings:

Figure 1 is a view showing in side elevation one form of binding machine embodying my invention.

Figure 2 is a fragmentary top plan view showing the knotter and operating mechanism of the machine shown in Figure 1.

Figure 3 is a vertical sectional view on the line 3—3 of Figure 2.

Figure 4 is an enlarged detail sectional view taken on the line 4—4 of Figure 3.

Figure 5 is an enlarged sectional view taken on the line 5—5 of Figure 3.

Figure 6 is a view showing in plan the knotter shown in Figures 1, 2 and 3, with the cover or guide plate in position.

Figure 7 is a front end elevation of the knotter shown in Figure 6.

Figure 8 is a view similar to Figure 6 with the cover or guide plate removed.

Figure 9 is a vertical sectional view taken on the line 9—9 of Figure 8.

Figure 10 is a view similar to Figure 9 taken on the line 10—10 of Figure 8.

Figure 11 is a view similar to Figure 8 showing the hook in retracted position.

Figure 12 is a fragmentary view showing in side elevation the threading arm and knotter, and the position of the wire after the threading arm has been lowered and before the knotter hook has been retracted.

Figure 13 is a view similar to Figure 12 showing the position of the wire after the knotter hook has been retracted.

Similar reference characters refer to similar parts in each of the several views.

In Figures 1, 2 and 3, I have shown a binding machine which is identical in construction to the binding machine shown and described in my pending application, Serial No. 340,250, with certain exceptions that will become apparent as the description proceeds. To simplify the description, I will describe only those parts of the binding machine necessary to a clear understanding of the present invention.

As shown in Figures 1, 2 and 3, F designates an introducing conveyor including a pair of endless chains 2 trained over sprockets 3 and carrying at intervals followers E. The introducing conveyor E is designed to effect the successive feeding of boxes or bundles along the bed of the machine to a knotter designated generally at K, and the conveyor and knotter are adjustable laterally across the machine for binding a box or bundle at a particular point. The conveyor F is driven by a shaft 4, and the knotter K is driven by a shaft 5. Both of the shafts 4 and 5 are adapted to be driven at predetermined intervals by a driving gear G carrying a segmental gear S which is adapted to successively engage gears P and P′ operatively connected to the shafts 4 and 5, respectively, by chains and sprockets as shown in Figures 2 and 3.

The binding machine as heretofore constructed also embodies a needle or threading arm N supported for rocking movement to occupy an elevated position as shown in Figure 1 and a lowered position as shown in Figures 12 and 13, the needle being moved

to either of these positions by means of cams C engaging arms 6, as shown in Figure 1. The needle N carries a tying wire W which under the feeding action of the conveyor F is caused to be threaded within the knotter K and to encompass a bundle or box B when the needle is in elevated position, as shown in Figure 1.

The knotter K is similar in construction to the knotter embodied in my pending application, Serial No. 322,086, in that it comprises a vertically disposed shaft 11 operatively connected to the shaft 5 for rotation thereby and having fixed to its upper end an upper twisting disc 12, a lower disc 13, and an intermediate disc 14 loosely embracing the shaft and locked against rotation therewith by a screw 14^a. The present knotter, however, differs from the old form in that it is provided with a housing 10, the upper face of which is milled down as indicated at 16. Instead of pinning the upper disc 12 to the shaft 11, as in the old form of knotter, it is non-rotatably held thereon by fitting it over the squared end 16^a of the shaft, and is retained in horizontal position by a retaining plate 17 which covers a portion of the upper disc and is secured to the housing by countersunk screws 18. As shown in Figures 9 and 8, the plate 17 is provided with a semicircular wire guide recess 19 which registers with the upper end of the slot or groove 11^a in the shaft 11. The plate 17 is also provided with a cam face 20 cut on the rear edge thereof, and a hook positioning shoulder 21, as shown in Figure 11. A roller 22 is loosely mounted on a hub 23 projecting upwardly from the milled down portion 16 of the housing 10, and engaging such roller is a hook rod 25 on the forward end of which is detachably secured by means of screws 26 a hook 24 made of hardened steel and formed with a bill indicated at 24^a. The rod 25 is offset intermediate its ends to provide a cam face 27 which is adapted to engage the cam face 20, and a cam face 28 which is adapted to engage the roller 22. As shown in Figure 6, a guide plate 29 covers the mechanism and is secured to the housing 10 by screws 30.

In the projected position of the hook 24, as shown in Figure 8, the roller 22 is out of engagement with the cam face 28, and the cam face 27 is out of contact with the cam face 20. However, when the hook 24 is moved to retracted position as shown in Figure 11, the rod 25 is moved to the right causing the cam face 28 to engage with the roller, thus causing a lateral shifting of the rod and hook so that in the final retracted position of the hook, the bill 24^a forms a complete inclosure for the recess 19. It will be understood that the shoulder 21 serves to properly position the hook with relation to the recess and to maintain such hook in this position as long as it is retracted.

Referring now to Figures 2 and 3, it will be seen that the rod 25 projects beyond the knotter housing 10 and terminates in depending lugs 31 to which latter is pivotally connected a connecting rod 32. The rod 32 is pivotally connected to a crank arm 33 which is non-rotatably keyed to, but laterally slidable on a shaft 34 for the purpose of maintaining its relative position with respect to the knotter K when the latter is adjusted laterally of the machine to change the location of the wire wrap. The shaft 34 is journaled in the frame of the machine as indicated at 35, and keyed to the shaft is a cam arm 36 which is slotted as at 37 to allow for the vertical adjustment of a cam pin 38 secured thereto by nuts 39. A spring 40 is connected at its upper end to the cam arm 36 and at its opposite end to a rod 41 secured to the frame. The spring 40 serves to bias the arm 36 into a depending position as shown in Figure 3, and as such arm is fixed to the shaft 34, it will be clear that the crank arm 33 is biased to a horizontal position to maintain the hook 24 in projected position. The shaft 34 is adapted to be partially rotated in a clockwise direction, as shown in Figure 3, to effect a retraction of the hook 24, by a cam 42 which is secured to the driving gear G by means of bolts 43. The major portion of the cam 42 is disposed concentrically with respect to the gear G, but the point of such cam is bent inwardly as indicated at 42^a to contact with and raise the cam pin 38 to the concentric portion of the cam 42 when the latter is revolved in a counter-clockwise direction.

The operation of the entire machine is as follows:

With rotation of the driving gear G an actuation of the introducing conveyor F is effected to cause one of the followers E to advance a box or bundle indicated at B in the direction of the knotter K. The segmental gear S in the present instance is so timed that it will halt the forward movement of the box or bundle B when the rear edge thereof is several inches from the center of the knotter K, as illustrated in Figure 1. As soon as the box or bundle has ceased advancing, the needle or threading arm N descends to the position shown in Figure 12, causing the wire W to be looped about the box or bundle except for that portion indicated at X in Figures 1 and 8 lying between the rear lower corner of the box and the center of the knotter. At this time, the portion of wire X will be in lateral relation to the knotter, the hook 24 being in projected position and disposed out of the downward path of the needle N and the wire W. Just before the segmental gear S engages the pinion P′ to start the knotter K, point 42^a of

the cam 42 strikes pin 38 thereby elevating the arm 36 to the position shown in dotted lines in Figure 3. This movement of the arm 36 revolves shaft 34 and crank arm 33 in a clockwise direction, moving rod 32 and rod 25 to the right thus moving the hook 24 to retracted position. As the rod 25 travels to the right, the cam face 28 engages the roller 22 and thus forces the hook 24 sidewise so as to bring it in line with the wire W. Further movement of the rod 25 draws the hook 24 directly towards the center of the knotter K, and in its travel, the hook embraces the wire W drawing it into the center of the knotter as shown in Figures 11 and 13. With the hook 24 in this position, the knotter K now revolves to perform its cutting and twisting operation so as to effect the knotting of the ends of the loop of wire embracing the box or bundle B. As the knotter is making its last revolution, in which position the wire is securely held within the knotter, the concentric portion of the cam 42 which his been holding the hook 24 in the retracted position, rides from underneath the pin 38 and thus allows the spring 40 to throw the entire hook actuating mechanism back to its normal position so that the hook 24 is moved back to the projected position. During this movement, the cam face 26 of the rod 25 engages the cam face 20 of the plate 17 and thus forces the hook sidewise and back into its normal position for a succeeding operation in manipulating the wire W for the tying of a succeeding bundle or box.

Because of the position of the box or bundle B and the ends of the loop of wire W embracing such box or bundle, when the knotter K is set into operation, the twisting of the loop ends into a knot will be effected a distance from the corner of the box so that as the box is pushed forward by a succeeding box, the knot is withdrawn from the knotter and the weight of the box itself resting as it does on the knot, will flatten the knot out so that it lies alongside the wire and does not project from the bottom of the box. With the knot displaced from any corner of the box, it will be clear that such disposition eliminates the inconvenience and possible damage resulting from the placing of the knot directly on the corner of the box or bundle, while the flattening of the knot into contiguous relation with respect to the bottom of the box permits the close packing of a plurality of boxes so wrapped, thereby conserving packing space to an appreciable degree.

It is to be particularly noted that in the operation of the hook 24 as above described, a most effective pulling is exerted on the wire W while drawing the portion X into the center of the knotter K thereby causing the wire to much more tightly embrace a box or bundle than would otherwise be possible.

My invention is particularly adapted, although not necessarily, for the binding or wrapping of boxes for shipment, the machine being effective for pulling the wire around the box with such tension that the wire bites into the corners of the box making it impossible to slip the wire off without severing the wire. This obviously prevents tampering with the contents of a box so wrapped without detection as it would be difficult to replace the ends of the wire or to substitute a new wire having the same kind of identifying knot.

Although I have herein shown and described only one form of binding machine embodying my invention, it is to be understood that various changes and modifications may be made herein without departing from the spirit of the invention and the spirit and scope of the appended claims.

What I claim is:

1. A binding machine comprising, a knotter for holding one end of a loop of wire and subsequently twisting both ends of the loop into a knot, a conveyor for feeding angular material to the knotter so as to overlie the same, a needle operable to effect a looping of the wire about the material, and means operable to move a portion of the wire to a position wherein the loop is tightened about the material and wherein said knotter is operated, and a knotting of the loop ends will be effected at a distance from any edge of the material.

2. A binding machine comprising, a needle arm operable to effect the looping of an angular bundle of material with a wire, a knotter for holding one end of the wire during the looping operation and for subsequently twisting the ends of the loop into a knot, a conveyor for feeding bundles of angular material to the knotter in a manner to cause each bundle to overlie the knotter and to thereby cause one end of the loop to be disposed below the bundle and at a distance from any edge thereof, and the opposite end of the loop at one side of the bundle, and means for drawing the said loop end at the side of the bundle beneath the bundle and into said knotter, whereby upon actuation of the knotter, a knotting of the loop ends is effected on the bottom of the bundle and at a distance from any edge thereof.

3. A binding machine comprising, a needle arm operable to effect the looping of an angular bundle of material with a wire, a knotter for holding one end of the wire during the looping operation and for subsequently twisting the ends of the loop into a knot, a conveyor for feeding bundles of angular material to the knotter in a manner to cause each bundle to overlie the knotter and to thereby cause one end of the loop to

be disposed below the bundle and at a distance from any edge thereof, and the opposite end of the loop at one side of the bundle, and a hook mounted for reciprocating movement to occupy a projected position with relation to said knotter and a retracted position wherein the looped end at the side of the bundle is engaged and moved into said knotter.

4. In a binding machine, a knotter including a retaining plate, a cam face formed on the retaining plate, a housing, a roller journaled on the housing, a rod interposed between said plate and roller and having cam faces formed thereon adapted to engage said roller and the cam face on said plate, a hook detachably secured to one end of the rod, and means for reciprocating said rod whereby said hook is caused to move in two vertical planes when said rod is moved in one direction.

5. In a binding machine, a knotter including a retaining plate having a wire receiving recess formed therein, a cam face formed on the plate, a housing, a roller journaled on the housing, a rod interposed between said plate and roller and having an offset intermediate portion to provide cam faces on the opposite edges thereof, a hook detachably secured to said rod, and means for reciprocating said rod to cause its cam faces to engage the cam face of said plate and said roller to effect a lateral shifting of said hook and to thereby cause said hook when in one extreme position to form a complete closure for the recess in said plate.

6. In combination, a knotter, a hook movable to draw a wire disposed at one side of the knotter into the knotter, a rod supporting said hook and mounted for reciprocating movement, and means for actuating said rod to operate said hook comprising a shaft, a crank arm secured to said shaft, a connecting rod connecting said rod with said crank arm, a cam arm secured to said shaft and disposed at an angle to said crank arm, a cam pin adjustably supported within said cam arm, a cam movable to engage said cam pin to actuated said shaft in a manner to move and retain said rod in a predetermined position for a predetermined period, and a spring for returning said shaft to its normal position when it is disengaged by said cam.

7. A binding machine comprising, a needle arm operable to effect looping of a bundle of material with wire, a knotter adapted to hold one end of the wire during the looping operation and subsequently twisting the ends of the loop into a knot, said knotter including a retaining plate having a wire guide recess formed therein, a cam face formed on the plate, a housing, a roller journaled on the housing, a rod mounted for reciprocating movement and having an offset portion to provide cam faces adapted to contact with the cam face of said plate and with said roller, a hook carried by said rod, a conveyor for feeding bundles of material to the knotter in a manner to cause each bundle to overlie the knotter, and mechanism for actuating said conveyor, said needle arm, said rod and said knotter for predetermined periods and in the sequence mentioned.

8. In a binding machine, a knotter including a wire receiving recess, a rod, means for reciprocating said rod, a hook on said rod, cam faces on said rod, cams on said knotter adapted to coact with said cam faces whereby the reciprocation of said rod effects a lateral shifting of said hook and thereby causes said hook when in one extreme position to form a closure for said wire receiving recess.

9. In a binding machine, a knotter, a hook movable to draw a wire disposed at one side of said knotter into the knotter, a rod supporting said hook and mounted for reciprocating movement, and means for actuating said rod to operate said hook comprising a cam pin operatively connected to said rod, a cam movable to engage said cam pin to actuate said rod in a manner to move and retain said rod in a predetermined position for a predetermined period, and means for returning said rod to its normal position when said cam and said cam pin are disengaged.

10. In a binding machine, a knotter including a retaining plate, a cam face formed on the retaining plate, a housing, a roller journaled on the housing, a rod interposed between said plate and roller and having cam faces formed thereon adapted to engage said roller and the cam face on said plate, a hook secured to one end of the rod, and means for reciprocating said rod whereby said hook is caused to move in two vertical planes when said rod is moved in one direction.

11. In a binding machine, a knotter including a retaining plate having a wire receiving recess formed therein, a cam face formed on the plate, a housing, a roller journaled on the housing, a rod interposed between said plate and roller and having an offset intermediate portion to provide cam faces on the opposite edges thereof, a hook secured to said rod, and means for reciprocating said rod to cause its cam faces to engage the cam face of said plate and said roller to effect a lateral shifting of said hook and to thereby cause said hook when in one extreme position to form a complete closure for the recess in said plate.

12. In combination, a knotter, a hook movable to draw a wire disposed at one side of the knotter into the knotter, a rod supporting said hook and mounted for reciprocating movement, and means for actuat-

ing said rod to operate said hook comprising a shaft, a crank arm secured to said shaft, a connecting rod connecting said rod with said crank arm, a cam arm secured to said shaft and disposed at an angle to said crank arm, a cam pin supported on said cam arm, a cam movable to engage said cam pin to actuate said shaft in a manner to move and retain said rod in a predetermined position for a predetermined period, and a spring for returning said shaft to its normal position when it is disengaged by said cam.

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