April 9, 1929. F. E. LAWRENCE 1,708,274

STAPLING MACHINE

Filed Aug. 10, 1926 3 Sheets-Sheet 1

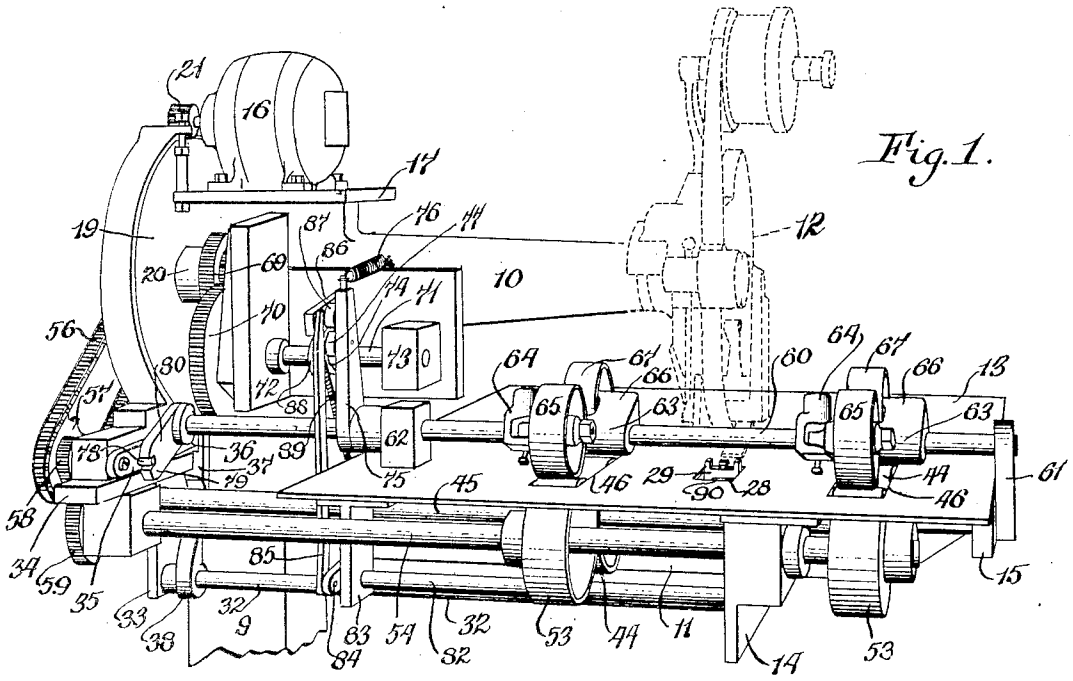


Fig. 1.

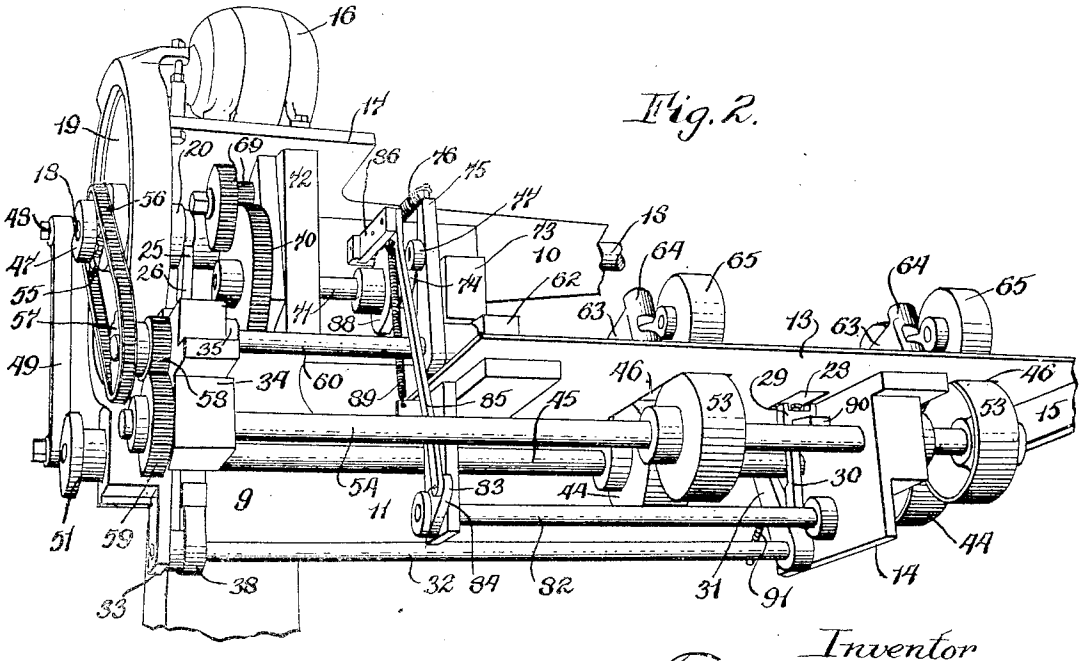


Fig. 2.

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April 9, 1929. F. E. LAWRENCE 1,708,274

STAPLING MACHINE

Filed Aug. 10, 1926 3 Sheets-Sheet 2

Fig. 4.

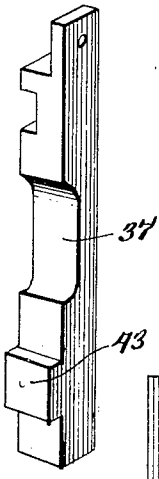


Fig. 3.

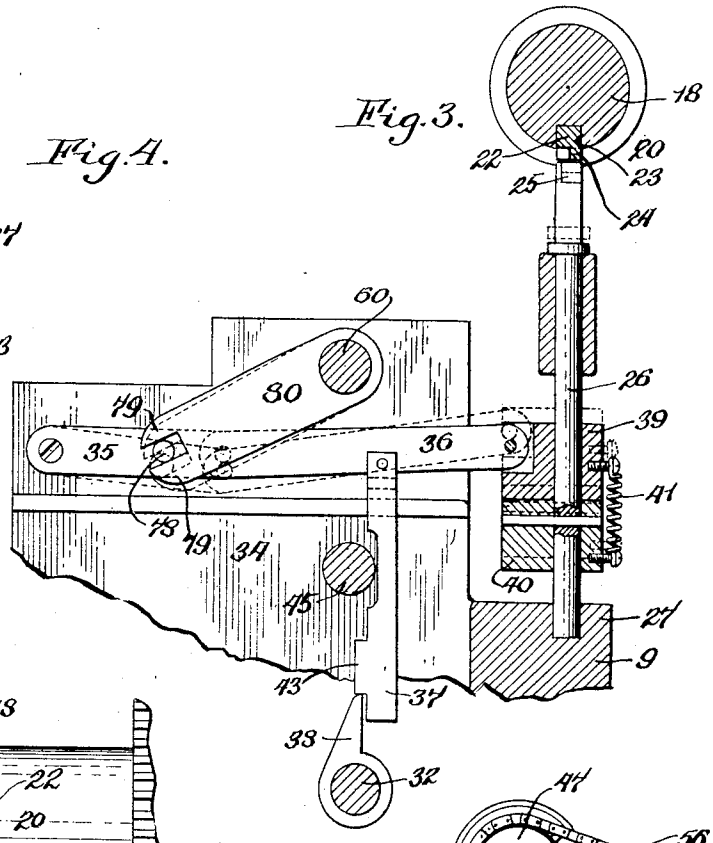


Fig. 5.

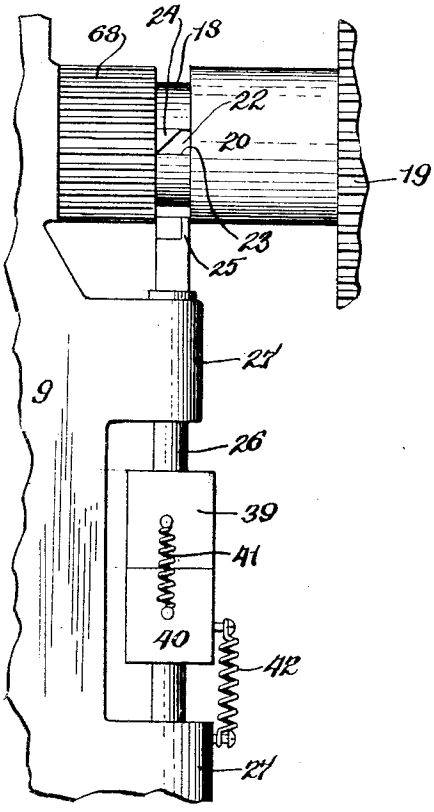
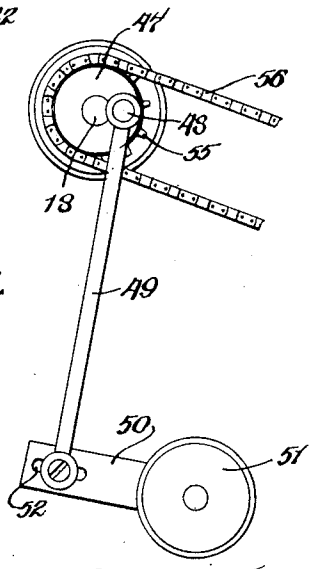


Fig. 6.



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April 9, 1929. F. E. LAWRENCE 1,708,274

STAPLING MACHINE

Filed Aug. 10, 1926 3 Sheets-Sheet 3

Fig. 7.

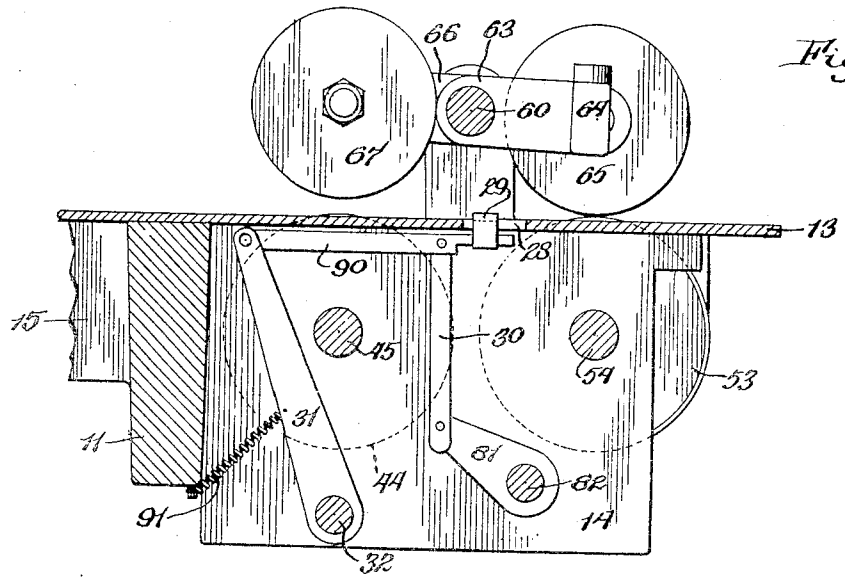
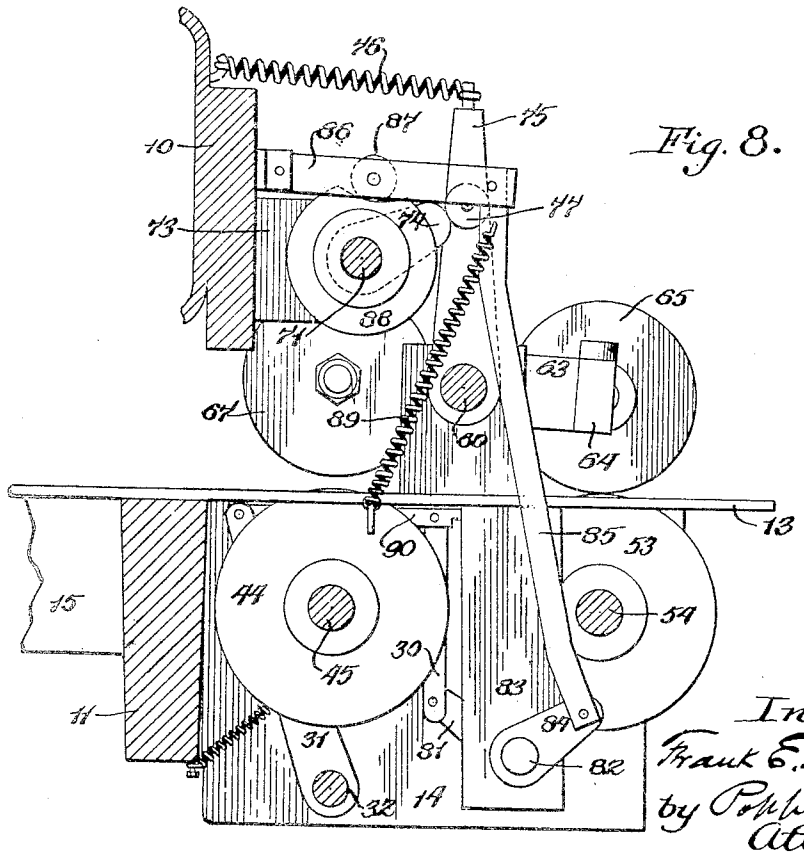


Fig. 8.



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Patented Apr. 9, 1929. 1,708,274

UNITED STATES PATENT OFFICE.

FRANK E. LAWRENCE, OF NIAGARA FALLS, NEW YORK, ASSIGNOR TO MORRISON STITCHER CORPORATION, OF NIAGARA FALLS, NEW YORK, A CORPORATION OF NEW YORK.

STAPLING MACHINE.

Application filed August 10, 1926. Serial No. 128,371.

This invention relates to stapling machines and more particularly to a driving mechanism to be used in connection with a stitching or stapling machine.

One of the objects of the present invention is to provide a driving mechanism for stitching machine which will advance the article to be stitched until a predetermined number of staples are driven into the same, and will then render the stitching machine inoperative, discharge the finished article, and prepare the machine to receive the next article.

Further objects are to provide a mechanism of this character which is reliable in operation and not liable to get out of order or adjustment, which can be readily adapted to suit different kinds of work, and which has relatively few parts.

In the accompanying drawings:

Figure 1 is a rear perspective view of the driving mechanism and associated parts viewed from above.

Figure 2 is a rear perspective view similar to Fig. 1, viewing the driving mechanism from below. Figure 3 is a fragmentary vertical section showing a part of the mechanism for rendering the stitching and advancing mechanism, operative and inoperative. Figure 4 is a perspective view of the locking bar forming part of the mechanism shown in Fig. 3. Figure 5 is a fragmentary rear elevation of the clutch for rendering the stitcher and advancing mechanism, operative and inoperative. Figure 6 is an end elevation of the ratchet mechanism forming part of the article advancing mechanism. Figure 7 is a fragmentary transverse section taken through the table and showing a portion of the trip mechanism. Figure 8 is a fragmentary transverse vertical section showing the cam mechanism which controls the operation of the mechanism.

Similar reference numerals refer to like parts in each of the several views.

In its general organization this invention comprises a supporting table, on which the article to be stitched is placed, a mechanism for advancing the article step by step under said stitching mechanism, a trip or gage adapted to be engaged by said article, a mechanism controlled by said trip for rendering the stitcher and advancing mechanism operative, article discharging mechanism, and a cam controlled mechanism for simultaneously rendering said stitcher and advancing mechanism inoperative and said discharging mechanism operative. Another cam controlled mechanism is provided which withdraws the trip or gage during the stitching operation of the machine.

The driving mechanism forming the subject of the present invention is mounted on a standard 9 which at its upper end has two laterally projecting arms 10 and 11, the upper arm 10 supporting the stapling mechanism 12 and the lower arm 11 supporting the work table 13 upon which the work is placed. The stitching machine and driving mechanism shown is particularly designed to stitch fiber boxes and the like, although the invention may be used in other installations. A branch arm 14 projects rearwardly from the table supporting arm 11 and supports the rear side of the table 13 and also part of the driving mechanism. Additional branch arms 15 may also be provided to further support the front and rear sides of the table.

The stitching mechanism 12 shown by dotted lines in Fig. 1 may be of any usual and well known type, the same operating on an anvil (not shown) on the table, and being driven from an electric motor 16 mounted on a bed 17 at the upper end of the standard 9. The driving connection between the stitcher and the motor comprises a shaft 18 extending through the arm 10 and operatively connected at the outer end of the arm with the stitcher, a large gear wheel 19 mounted on the other end of said stitcher shaft 18 operatively connected thereto by a clutch indicated at 20, and a pinion 21 mounted on the motor shaft and meshing with said large driving gear wheel 19.

This clutch operates to couple and uncouple the hub of the driving gear wheel 19 and the shaft 18 on which it is mounted, and may be of any well known and approved type, but is preferably actuated by a slide 22 which is received in a groove 23 in the shaft as shown in Fig. 3, and adjacent the inner side of the hub of the driving gear wheel this slide is provided with a beveled finger or lug 24, which projects outwardly from the shaft and is adapted to be engaged by the beveled upper end 25 of a vertically movable rod 26.

This rod is suitably guided in lugs 27 provided on the standard and when raised engages the beveled finger 24 and moves the

slide inwardly, thereby disengaging the hub of the driving wheel and the shaft and permitting the same to rotate freely thereon. The downward movement of the rod 26 releases the finger which moves outwardly under the action of a return spring (not shown) and operates to couple the clutch.

The dropping of the rod to couple the motor and stitching mechanism is effected by a mechanism which is tripped by the leading edge of the article to be stitched and is preferably constructed as follows:

Immediately in rear of the point where the stitching mechanism operates, the table 13 is provided with a square opening 28 through which a stop or gage block 29 is adapted to project above the upper side of the table and in the path of the article to be stitched. This gage block 29 is mounted on the rear end of a horizontal bar 90, which is pivotally supported adjacent its rear end on a link 30 for a purpose which will presently appear, and at its front end is pivotally connected to the upwardly projecting arm 31 of a trip shaft 32. This trip shaft is journaled at its opposite ends in the arm 14 and a depending bracket 33, which bracket is hung on an arm 34 projecting rearwardly from the standard 9.

The operative connection between the trip shaft 32 and the clutch is best shown in Fig. 3 and comprises a jointed lever composed of two links 35 and 36, which at its front end is connected to the clutch operating rod and is supported adjacent its front end by a depending locking bar 37 which rests on a dog or pawl 38, which pawl is secured to the trip shaft 32. The rear link 35 of the jointed lever is relatively short and at its rear end is pivotally secured to the supporting arm 34, and at its front end to the relatively long front link 36. The front end of the front link 36 is pivotally secured to a block 39 which is slidingly mounted on the clutch operating rod 26. Below this sliding block 39, a similar block 40 is pinned to the rod 26, and the two blocks are connected by a spring 41, thereby yieldingly connecting the front link 36 and the clutch operating rod 26 so that upon raising the front end of the link 36, the clutch is uncoupled. The reverse or coupling movement of the rod is effected by a spring 42 connecting the lower pinned block 40 with the standard.

Intermediate the ends of the front link is pivotally mounted the depending locking bar 37 having a rearwardly extending lug 43 which is engaged by the dog or pawl 38 on the trip shaft so that upon rotating the dog rearwardly, the locking bar is released.

Assuming the parts to be in position shown by dotted lines in Fig. 3, it is apparent that the article upon striking the gage 28 will move the same rearwardly and rock the arm 31, trip shaft 32 and dog 38 rearwardly, thereby releasing the locking bar 37 and permitting the front link 36 of the jointed lever, and the clutch rod 26 to drop under the action of the spring 42. This permits the clutch to engage and connect the stitcher and advancing mechanism with the prime mover.

While the stapler is operating upon the article to be stitched the article is advanced step by step by a pair of advancing rolls 44 which are mounted on an advancing shaft 45, which shaft is arranged below the table 13, the rolls projecting above the upper side of the table through openings 46 and engaging the under side of the article. This shaft is journaled in and extends through the supporting arms 34 and 14, and is advanced step by step by an advancing mechanism driven from the stitcher shaft 18. This mechanism includes a small crank wheel 47 mounted on the outer end of the stitcher shaft 18 and having a crank pin 48, on which a connecting rod 49 is mounted. This rod extends downwardly and engages the arm 50 of the ratchet mechanism 51, which is mounted on the outer end of the advancing shaft 45. A ratchet mechanism suitable for this purpose is shown in the patent issued to Howard G. Allen on October 28, 1924, No. 1,513,021, to which reference is made. It is apparent that each rotation of the stitcher shaft 18 moves the ratchet arm 50 up and down, which motion is transmitted to the advancing shaft through ratchet mechanism 51 so as to advance the same step by step. Inasmuch as the length of the distance between the staples is determined by the length of the throw of the ratchet arm 50, the throw of the arm is preferably made adjustable by providing a longitudinal slot 52 in the same manner in which the lower end of the connecting rod 49 is adjustably mounted so as to permit the connecting rod to be connected at the outer or inner end of the slot, and thereby give the ratchet arm a smaller or greater throw.

After the article is stitched, the same is discharged rearwardly from the table by a pair of discharging rolls 53 which are arranged immediately in rear of the advancing rolls 44 and are similarly mounted on a discharging shaft 54, which shaft is mounted in the same manner as the advancing shaft 45 and is continuously rotated by the prime mover 16. The driving connection between the motor and the discharging shaft comprises a driving sprocket wheel 55 mounted on the large driving gear wheel 19 and connected by a roller chain 56 with a driven sprocket wheel 57, which latter is mounted on the supporting arm 34 and carries a pinion 58 meshing with and driving a gear wheel 59 mounted on the outer end of the discharging shaft 54.

The article is held in engagement with the advancing rolls during the stitching operation, and upon completion of the stitching operation is pressed against the discharging

rolls by a mechanism which preferably is constructed as follows:

A longitudinal rock shaft 60 is arranged above the table between the advancing and discharging rolls 44 and 53 and is mounted in suitable brackets 61 and 62 arranged at the opposite sides of the table and the arm 34. This rock shaft carries a pair of cross arms 63, each of which is arranged above one of the sets of advancing and discharging rolls, and comprises a rearwardly projecting arm 64 carrying a loosely mounted roll 65 at its rear end and a front arm 66 carrying a loosely mounted roll 67 at its front end. When the rock shaft is rocked, the pair of rear and front rolls carried thereby are alternately moved toward the discharging and advancing rolls, and the article arranged between the rolls is caused to be either discharged from the machine or advanced step by step while the stitcher is operating the same.

The means for holding the rock shaft so that the front rolls thereof bear against the advancing rolls during the stitching operation of the machine, and rocking the same so that the rear rolls thereof bear against the discharging rolls after the stitching operation is completed are preferably constructed as follows:

On the stitcher shaft 18 between the large driving gear wheel 19 and the standard 9 is mounted a pinion 68 which is connected by a chain of gears 69 with a gear wheel 70, which gear wheel is mounted on the end of a cam shaft 71. This cam shaft is suitably mounted in brackets 72 and 73 and carries a cam 74. On the inner end of the rock shaft 60 is mounted an upwardly extending rock arm 75, which carries a small roller 77 which is held in engagement with the cam 74 by a spring 76. When the stitcher is inoperative the salient portion of the cam 74 is in engagement with the roller 77, thereby holding the rock arm 75 rearwardly and the rear rollers 65 carried by the rock shaft against the discharging rolls. When the stitcher starts to operate the cam 74 is rotated so that the small roller engages the receding portion thereof, and the rock arm and shaft, under the action of the spring 76 moves forwardly and forces the front rollers 67 carried by the cross arms 63 against the step by step advancing rolls, which position is held until the cam 74 again forces the rock arm rearwardly. The train of gears 69 are preferably so mounted and arranged that different combinations may be used and hence vary the number of stitches that are placed in the article since this is controlled by the length of time which the advancing mechanism continues to function.

As soon as the rock shaft 60 is moved to its discharging position, the clutch between the large driving wheel 19 and stitcher shaft 18 is thrown out, and the stitcher, advancing rolls, and cam shaft driven from the stitcher shaft are therefore rendered inoperative. The means for accomplishing this are preferably constructed as follows:

The rear link 35 of the joint lever which controls the clutch is provided with a pin 78. This pin is engaged by the jaws 79 of an arm 80 which is mounted on the end of the rock shaft 60 and projects forwardly therefrom. When the cam 74 moves into its discharging position in which its salient face engages the small wheel 77, the arm 80 is moved downwardly, which forces the rear link 35 of the jointed lever down. The locking bar 37 at this time is in the position shown by full lines in Fig. 3, and the same acts as a fulcrum, the front end of the front link 36 being moved upwardly by the downward movement of the lever 80, thereby moving the clutch rod 26 up and into engagement with the beveled finger 24 of the clutch, the clutch being thereby uncoupled, and the driven shaft 18 stopped.

During the stitching operation the gage or trip 29 is preferably withdrawn below the upper surface of the table so as not to interfere with the article passing thereover. This is accomplished by a mechanism constructed as follows:

As previously described, the rear end of the bar 90 which supports the trip or gage 29 is pivotally supported by a vertical link 30. This link at its lower end is connected to a forwardly extending arm 81, which arm is mounted on a shaft 82. This shaft is journaled at its opposite ends in the supporting arm 14 and a bracket 83 depending from the table 13, and this shaft at its inner end carries a rearwardly projecting arm 84, which arm is pivotally connected by an upwardly extending link 85 with the rear end of a vertically movable lever 86. This lever is pivotally connected at its front end to the frame of the mechanism above the cam shaft 71 and carries a small roller 87 which engages with a cam 88 mounted on the cam shaft. This cam has a relatively large salient face and a relatively small recessed portion, which latter is so arranged that it engages the small roller 87 at the same time that the salient part of the cam wheel 74 engages its roller 77. The small roller 87 is held down upon the cam 88 by a spring 89.

When the gage is moved so as to trip the lock and start the stitcher, the cam shaft starts to rotate. The roller 87, lever 86, link 85 and arm 84 are therefore raised by the salient portion of the cam 88 and the shaft is therefore turned so as to lower the arm 81 and link 30 and withdraw the gage 29 through the opening 28, in which position it is held until the completion of the stitching operation when the roller 87 again engages the receding portion of the cam 88 and causes a reverse operation of the parts.

The operation of the machine may be summarized as follows:

The article upon being brought against the gage 29, moves the arm 31 and trip shaft 32 rearwardly, thereby moving the dog out of engagement with the locking bar and permitting the front end of the jointed lever to drop and actuate the clutch to connect the stitcher shaft 18 to the prime mover. The rotation of the stitcher shaft operates the sitcher, the step by step advancing rolls 44 through the ratchet mechanism 51, and the cam shaft 71. The rotation of the cam shaft 71 simultaneously actuates the cam withdrawing mechanism controlled through the shaft 81 and the rock shaft 60, the latter rock shaft being moved so that its front rolls 67 engage the advancing rolls 44, thereby causing the article to be positively advanced past the stitcher mechanism. The rocking of the cam shaft 60 also moves the lever 80 upwardly to the position shown by full lines in Fig. 3, thereby raising the locking bar 37 and causing it to immediately engage with the dog 38, this dog being immediately returned to its upright or locking position after it is tripped by the spring 91. The machine then continues to operate until the cam shaft 71 returns to its original position. The salient portion of the cam 74 then rocks the arm 75 rearwardly, which throws the rear rolls 65 carried by the rock shaft 60, against the continuously rotating discharging rolls 53 and causes the stitched article to be ejected from the machine. The arm 80 mounted on the rock shaft is also forced down, which movement forces the front end of the jointed lever down, and the rear end up, the locking bar 37 acting as a fulcrum. This movement of the jointed lever throws the clutch out of engagement with the large driving wheel and the stitcher, cam shaft 71, and advancing rolls are rendered inoperative. At the same time the other cam 88 on the cam shaft 71 engages its low portion with the roller 87, and the shaft 82 is therefore rocked so as to raise the gage 29 up through the opening 28, in which position the same is held until the next article trips the same and again causes the machine to go through its cycle of operations as just described.

As a whole this machine is very simple, considering the function it performs. It opeartes reliably and is not liable to get out of order and the parts are accessible and readily replaced when necessary. It is also readily adjusted to provide a greater number of stitches in the article, and also a greater or less spacing between the same, which permits the machine to be used on a large variety of work.

I claim as my invention:

1. In a machine of the character described a prime mover, a driven shaft, a clutch intermediate said prime mover and driven shaft, an article advancing mechanism, an article discharging mechanism, a stitching mechanism operated by said driven shaft, means for controlling the operation of said advancing and discharging mechanisms, the operation of said controlling means being started through motion derived from the insertion of the article being operated on and being continued through motion derived from said driven shaft, and means controlled by said driven shaft for uncoupling said clutch.

2. In a machine of the character described, a prime mover, a driven shaft, a clutch intermediate said prime mover and said driven shaft, a stitching mechanism, and an article advancing mechanism actuated by said driven shaft, means actuated by the article to be stitched for coupling said clutch, and means actuated through motion derived from said driven shaft for uncoupling said clutch.

3. In a machine of the character described, a prime mover, a stitching mechanism, an article advancing mechanism, a discharging mechanism, means controlled by the movement of the article to be stitched for simultaneously rendering said stitching mechanism and said advancing mechanism operative and inoperative, and means for rendering said discharging mechanism operative when said stitching mechanism is rendered inoperative and vice versa.

4. In a machine of the character described, a table, a prime mover, a stitching mechanism arranged above said table, an article advancing roll extending up through said table, a discharging roll extending up through said table behind said advancing roll, means controlled by the article to be stitched for simultaneously rendering said advancing rolls and stitcher operative, and means for simultaneously rendering said advancing roll inoperative and said discharging roll operative.

5. In a machine of the character described, a table, a prime mover, a stitching mechanism arranged above said table, an article advancing roll extending up through said table, a discharging roll extending up through said table behind said advancing roll, means controlled by the article to be stitched for simultaneously rendering said advancing rolls and stitcher operative, and cam controlled means for simultaneously rendering said stitching mechanism and advancing roll inoperative and said discharging roll operative.

6. In a machine of the character described, a table, a prime mover, a stitching mechanism arranged above said table, an article advancing roll extending up through said table, a continuously operated discharging roll extending up through said table behind said advancing roll, a rock shaft arranged above said table between said rolls, a cross arm carried by said rock shaft, rolls mounted on the outer ends of said cross arm and adapted to alternately bear against said advancing roll and said discharging roll, and means for rocking

said rock shaft to engage one of its rolls with the advancing rolls when the stitching mechanism is in operation, and the other roll when said stitching mechanism is inoperative, comprising a cam shaft, means for driving said cam shaft and stitching mechanism simultaneously, a cam mounted on said cam shaft, and an arm mounted on said rock shaft and actuated by said cam.

7. In a machine of the character described, a prime mover, a stitching mechanism, a clutch between said prime mover and stitching mechanism, a lever controlling said clutch, and means for operating said lever to couple said clutch, including a trip shaft, a trip operatively connected with said trip shaft and adapted to be engaged by the article to be stitched, a locking member mounted on said lever, and a dog mounted on said trip shaft and adapted to engage said locking member, and hold said lever and clutch in one position.

8. In a machine of the character described, a prime mover, a stitching mechanism, a clutch between said prime mover and stitching mechanism, a jointed lever connected with and actuating said clutch, locking means engaging said jointed lever adjacent said clutch, means for releasing said locking means and coupling said clutch, and means operatively connected with said stitcher and engaging the other end of said lever for disengaging said clutch.

9. In a machine of the character described, a prime mover, a stitching mechanism, a clutch between said prime mover and stitching mechanism, a jointed lever pivotally secured at one end, means for connecting the other end of said lever with said clutch, a locking bar depending from the free end of said jointed lever, a trip shaft arranged below said locking member, a dog mounted on said trip shaft and adapted to engage said locking member, means for actuating said trip shaft to release said locking member, and lever whereby said clutch is coupled, and means for uncoupling said clutch and returning said lever to its normal position comprising a cam shaft driven by said stitching mechanism, a cam on said cam shaft, a rock shaft, an arm secured to said rock shaft and actuated by said cam, a second arm arranged on said rock shaft adjacent said jointed lever, and a pivotal connection between said arm and said jointed lever at the fastened end thereof, said rock shaft being adapted to be rocked by said cam, whereby said jointed lever is moved by said last named arm, said locking bar forming a fulcrum and causing the end of said jointed lever adjacent said clutch to be raised whereby said clutch is uncoupled.

10. In a machine of the character described, a stitching mechanism, a prime mover, a clutch connecting said stitching mechanism with said prime mover, means actuated by the article to be stitched to couple said clutch, a cam shaft actuated through motion derived from said stitcher mechanism, a cam on said cam shaft, a rock shaft, means for actuating said rock shaft through motion derived from said cam, an article advancing mechanism, an article discharging mechanism, means arranged on said rock shaft for rendering said article advancing mechanism, and article discharging mechanism alternately operative and inoperative, means for uncoupling said clutch, and means arranged on said rock shaft and actuating said clutch uncoupling means.

11. In a machine of the character described, a table, a prime mover, a stitching mechanism arranged above said table, a clutch between said stitching mechanism and prime mover, a gage block extending upwardly through said table into the path of the articles to be stitched, a horizontal bar supporting said block, a trip shaft arranged below said bar, a rock shaft aranged below said bar, an arm secured to said trip shaft and pivotally secured to said bar, means associated with said trip shaft for coupling said clutch whereby the forward movement of the gage block renders the stitching mechanism operative, an arm on said rock shaft, a link connecting said last mentioned arm with said bar, and means associated with said rock shaft for withdrawing the gage block during the stitching operation of the machine.

In testimony whereof I hereby affix my signature.

FRANK E. LAWRENCE.