Nov. 9, 1937. H. DINGLE 2,098,573

STAPLING MACHINE

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FIG. 1

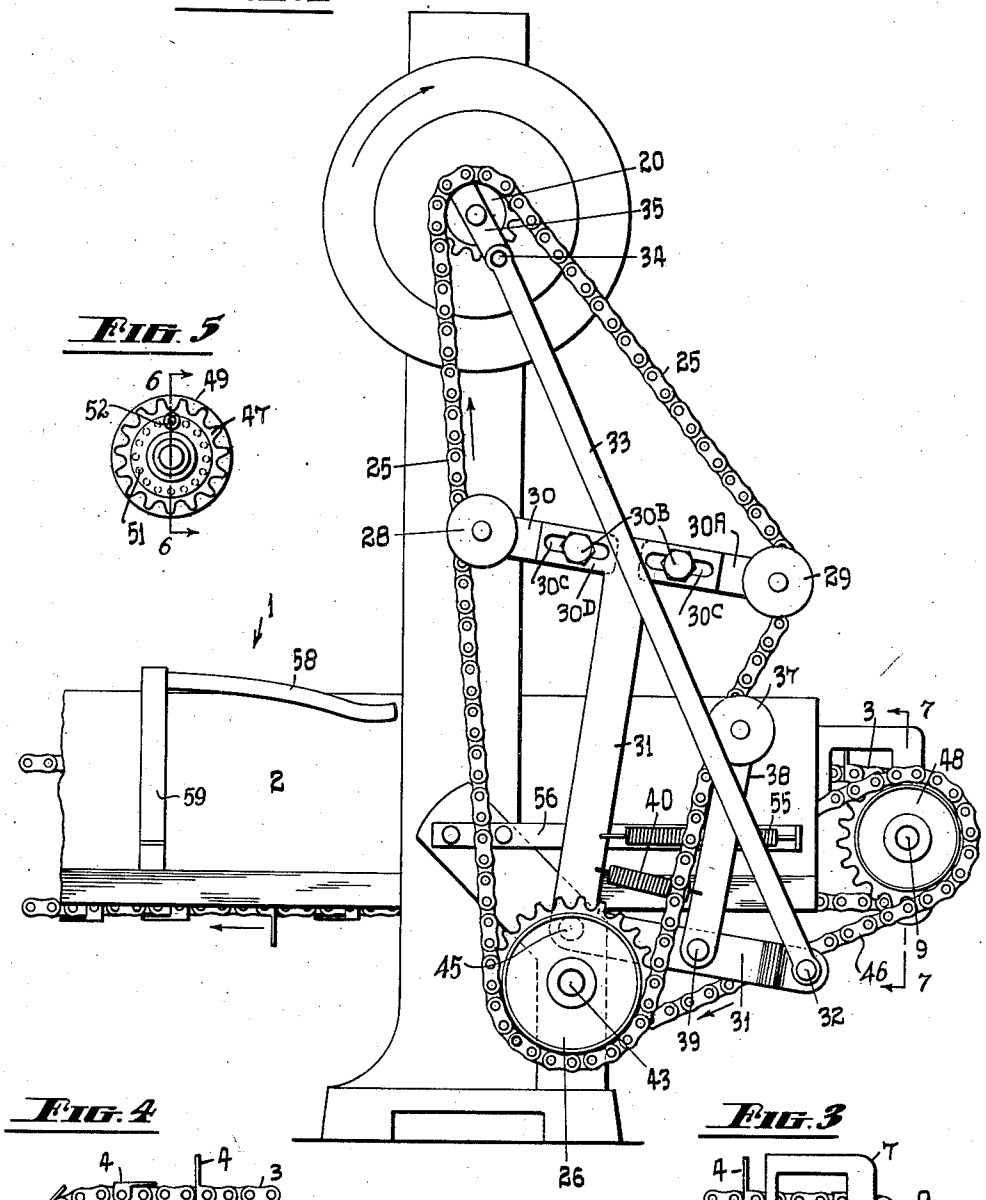


FIG. 5

FIG. 4

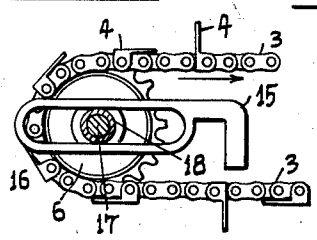
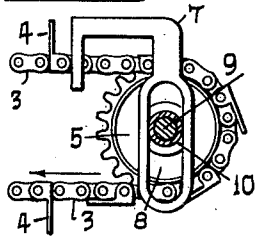


FIG. 3



INVENTOR: HOWARD DINGLE

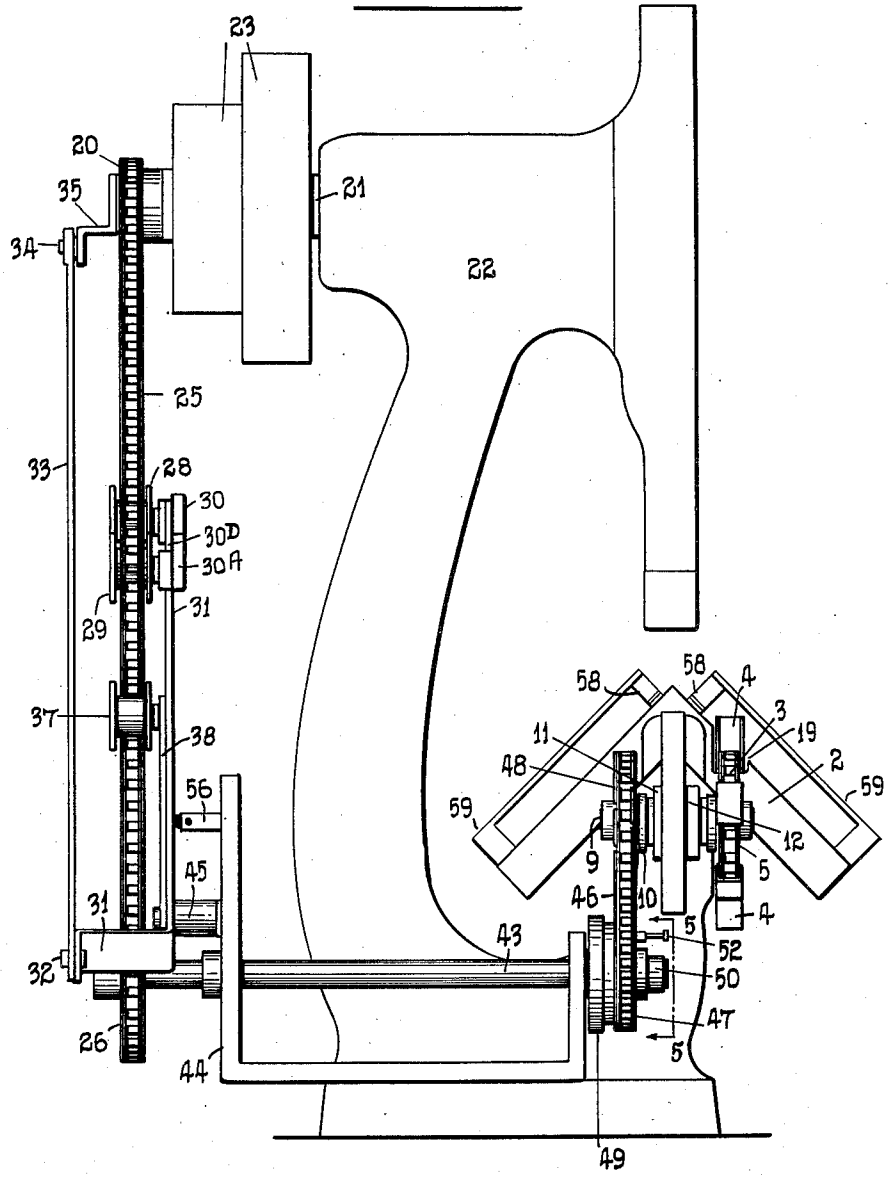
BY Haseltine, Lake & Co. ATTORNEYS

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STAPLING MACHINE

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FIG. 2



INVENTOR:
HOWARD DINGLE
BY Haseltine, Lake & Co.
ATTORNEYS

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STAPLING MACHINE

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FIG. 8

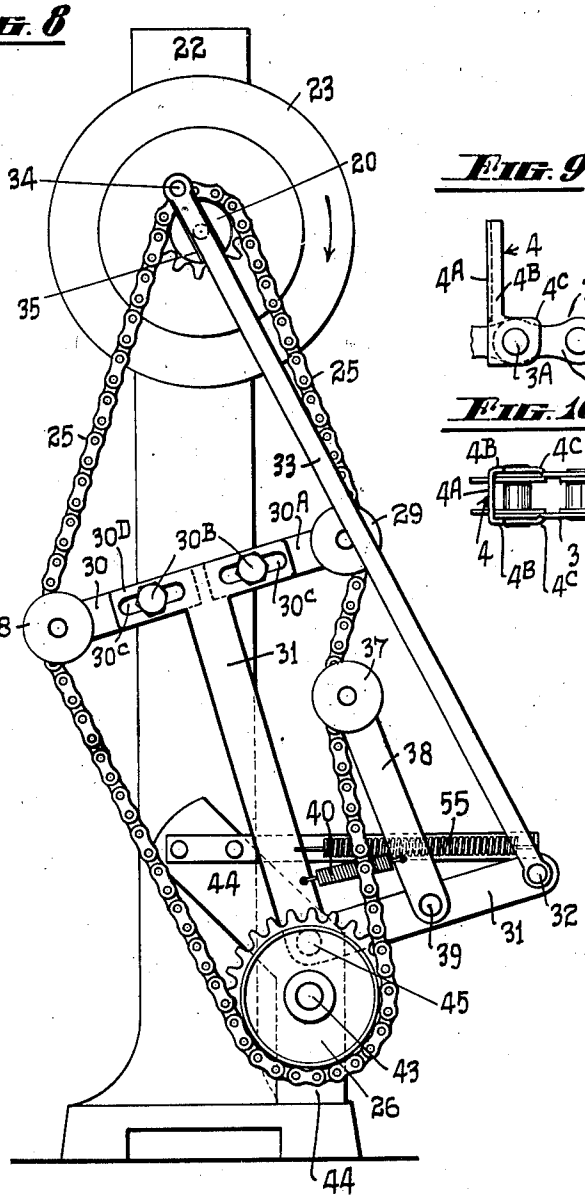


FIG. 6

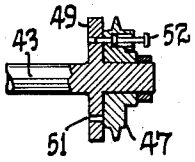
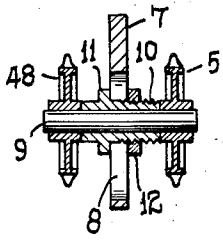


FIG. 9

FIG. 10

FIG. 7



INVENTOR:
HOWARD DINGLE
BY Haseltine, Lake & Co.
ATTORNEYS

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2,098,573

UNITED STATES PATENT OFFICE

2,098,573

STAPLING MACHINE

Howard Dingle, Kurralta Park, Australia, assignor to "McMahons" Limited, Adelaide, Australia

Application March 31, 1936, Serial No. 71,863
In Australia February 19, 1936

7 Claims. (Cl. 1—7)

This invention relates to improvements in stapling and like machines and its object is to render such machines safer, faster and surer in operation.

It is customary in stapling machines to insert the books or the like to be stapled into the machines manually and then by operation of a suitable control to cause a staple or staples to be inserted. This action, being manually carried out and requiring very accurate positioning of the books or the like, has been the cause of many accidents and injury to the operator's fingers as well as causing a certain amount of delay with a consequent reduction of the number of books or the like which can be stapled by the machine in a given time.

According to my invention the machine is made automatic, that is to say, the machine is so constructed that the books or the like to be stapled are simply fed to it and are automatically positioned therein and stapled and ejected. This ensures that the maximum number of staples will be inserted in a given time, it also gives greater accuracy with regard to the spacing of the staples, and removes the danger of injury to the operator.

In brief the invention consists in the utilization of a conveyor which moves the books or the like, hereinafter termed books but including any matter to be stapled, through the stapling machine, any synchronizing gears which drive the conveyor but causes it to be stopped during the operation of stapling. It may be described as a hesitating feeder for stapling and like machines.

But in order that my invention may be the more clearly understood it will now be described with reference to the accompanying drawings in which:—

Fig. 1 is an elevation of a stapling machine incorporating the automatic feed mechanism,

Fig. 2 is an end elevation of same,

Fig. 3 is a detailed sectional view of the conveyor chain adjustment at one end,

Fig. 4 is a similar view of the conveyor chain adjustment at the other end,

Fig. 5 is a view of the adjusting mechanism incorporated in the conveyor chain drive as seen in the direction of the arrows along the line 5—5 in Fig. 2,

Fig. 6 is a central section on line 6—6 of Fig. 5,

Fig. 7 is a section on line 7—7 of Fig. 1,

Fig. 8 is a view corresponding to Fig. 1 but showing only the intermittent drive mechanism and showing the position of the chain and associated parts after a half revolution of the driving sprocket 20,

Fig. 9 is a side elevation of portion of the conveyor chain showing one of the adjustable fingers and

Fig. 10 is a plan view of the parts shown in Fig. 9.

The conveyor 1 comprises a work support member 2 having an inverted V shape and a conveyor chain 3 operating in association with the work support 2. This conveyor may however have cross-sections other than a V.

The conveyor chain 3 has a number of fingers 4 which are pivoted to the links of the chain so that they can be positioned flat along the chain to be inoperative, or so that they can be turned to be upright and operative. I prefer to position a number of these fingers along the chain every second link as shown, or even every link, so that a ready selection can be made of the fingers which are to be operative to allow for different sizes of books to be stapled.

The fingers 4 upon the chain 3 comprise a back portion 4A having two side portions 4B, which latter portions engage the link pivots 3A of the chain. To prevent the fingers from being displaced after they have been swung to operative position or to inoperative position the corners 4C of the side members 4B are slightly inturned to cause a clip action, the corners engaging over the upper edges of the side members 3B of the links of the chain 3 when the fingers are in operative position, and engaging under the lower edges of such side members when the fingers are in their inoperative position.

The conveyor chain 3 passes over a drive sprocket wheel 5 at one end and over a sprocket wheel 6 (see Fig. 4) at the other end. The sprocket wheel 5 at the drive end is supported in a bracket 7 secured to the work support 2, the bracket having a slot 8 to enable the sprocket to be adjusted vertically to permit different sized sprocket wheels to be used, as for when different speeds of the chain are required. The supporting of the spindle 9 (see Fig. 7) of the sprocket wheel 5 is by means of a bearing member 10 which projects through the slot 8 and has a collar 11 at one side of the slot 8 and a nut 12 at the other side to permit the member 10 to be locked in position.

The adjustment of the sprocket wheel 6 at the other end is horizontal to allow compensation for different lengths of chain, such for instance as is caused by using a different size of sprocket wheel at the other end. In this a bracket 15 secured to the work support and, having a slot 16, is used and the spindle 17 is supported in a member 18

in a manner similar to the member 10 as illustrated in Fig. 3..

The conveyor chain 3 operates in a groove 19 in the work support 2.

The intermittent drive for this conveyor, which forms an important feature of this invention, comprises a sprocket wheel 20 secured upon the shaft 21 of the stapler, the stapler being indicated by 22 and being of any usual or approved construction, suitably driven through the stepped pulley at 23.

A chain 25 passes around the sprocket wheel 20 and down and around a sprocket wheel 26 but this chain is given a greater length than would normally be required, for reasons which will later be explained.

The slack in the chain is taken up between idler pulleys 28 and 29 rotatably mounted upon a cross-arm 30—30A at the top of a T-shaped bell crank 31 which is pivoted at 45 to a bracket 44. One arm of the bell crank terminates in the cross-arm 30—30A and the other arm has a pivotal connection 32 to a connecting rod 33. The other end of the rod 33 has a pivotal connection 34 to a crank 35 secured to rotate integrally with the sprocket wheel 20 and shaft 21. The cross-arm 30—30A is preferably made in two parts as shown, each part being secured to the bell crank 31 by means of a bolt 30B passing through slots 30C in a short cross-piece 30D at the top of the bell-crank 31. This enables adjustment to be made to allow for different lengths of chain.

A further idler pulley 37 is mounted upon an arm 38 pivoted at 39 to the bell crank 31. A spring 40 between this arm 38 and the one arm of the bell crank 31 causes the pulley 37 to keep the chain taut.

It will be seen that as the shaft 21 rotates the sprocket wheel 20 and the crank 35 are carried around with it causing the chain 25 to be driven, and at the same time causing the idler pulleys 28 and 29 to be moved from side to side by means of the connection 33 between the bell crank 31 to the crank 35. This oscillation of the idler pulleys 28 and 29 causes the slack of the chain to be transferred from one side to the other during each revolution of the shaft 21 and it will be realized that this will cause the drive of the chain to the sprocket wheel 26 to be intermittent. This action can be understood by referring to Fig. 1 in which the clock-wise rotation (indicated by the arrow) of the sprocket wheel 20 is at that moment giving a normal drive to the sprocket wheel 26 but as this rotation continues the crank 35 will move the idler pulleys 28 and 29 to the left causing the chain on that side to be lengthened and consequently causing the peripheral speed of the sprocket wheel 26 to be greater than the peripheral speed of the sprocket wheel 20 by reason of the additional drive given to the chain in lengthening its effective distance at that side. After the sprocket wheel 20 has turned through a half revolution, (see Fig. 8), the idler pulleys 28 and 29 will come to rest and then start to move to the right and during such movement the drive applied to the chain 25 will be taken up in the transference of the slack of the chain from the left side to the right side, and consequently no drive will be transmitted to the sprocket wheel 26 during that period.

For the drive which is applied to the chain 25 to be taken up in the transference of the slack of the chain from the left side to the right side it will, of course, be necessary to give to the bell crank 31 the correct amount of movement, this being such that the amount of chain wound over the sprocket 20 during a half revolution of that sprocket is taken up in the movement of the idler pulley 28 from the position shown in Fig. 8 to that shown in Fig. 1.

The above has been found in practice to be an ideal method of attaining an intermittent drive in that the original timing which was lost during the pause can be quickly regained. While one embodiment of the invention has been disclosed herein as an illustration thereof it is not so intended to limit the invention inasmuch as many variations in the structure of the parts or the arrangement thereof may be made without departing from the spirit of the invention, the scope of which is indicated by the claims herein.

The drive from the sprocket wheel 26 is transmitted to a shaft 43 supported in a bracket 44 secured to the stapler frame 22, said bracket 44 also supporting the bell crank 31 by means of the aforesaid pivotal connection 45.

From the shaft 43 the motion is transmitted by means of a chain 46 and sprocket wheels 47 and 48 to the shaft 9 and thus to the conveyor chain 3.

The sprocket wheel 47 (Fig. 5) is rotatably mounted upon the shaft 43 and is confined between a disc 49 and a collar 50 upon such shaft, both the latter being secured to such shaft. The disc 49 has in it a series of holes 51 (Fig. 5) and the sprocket wheel 47 carries a pin 52 adapted to be inserted into any one of the holes 51 by suitable rotational positioning of the sprocket wheel 47 relatively to the disc 49.

A spring 55 confined between a bracket 56 secured to the bracket 44 and the one member 31 of the bell crank is for the purpose of stabilizing the oscillatory movement of the bell crank.

Spring arms 58 having their one end secured to brackets 59 and having their other end normally in contact with the work support 2 are for the purpose of holding the book to be stapled in position upon the work support.

The operation of the machine is as follows:—

Adjustment is first of all made to the machine to enable it to staple books of the selected size. This adjustment comprises a selection of a sprocket wheel 5 of correct size to give the desired length of movement of each impulse given to the chain (which movement fixes the distance between the staples) and the fingers 4 corresponding to the correct spacing of the books are then turned up. The locality of the staple, relative to the end, can then be accurately selected by adjustment of the sprocket wheel 47 relative to the disc 49 and the machine is ready for operation.

In operation it is necessary only to place the books upon the work support whereupon they will be engaged by the fingers 4 on the conveyor chain 3, and carried forward on the work support to under the stapling machine, the machine inserting the staple while the book is at rest. The conveyor then moves the book to insert the next staple or alternatively to discharge that book and place the next book into position for stapling.

What I claim is:—

1. Improvements in and relating to stapling machines, consisting in a conveyor to feed books to be stapled through the machine, and means for driving the conveyor intermittently comprising:—a sprocket wheel upon a driven shaft

of the stapler, a sprocket wheel upon a shaft suitably supported in bearings and coupled to the conveyor, a chain having a comparatively large amount of slack interconnecting the two sprocket wheels, idler pulleys mounted upon a pivoted member, the chain engaging said idler pulleys, a crank upon the driven shaft of the stapler, and a rod connecting the pivoted member and the crank.

2. Improvements in and relating to stapling machines, consisting in a conveyor to feed books to be stapled through the machine, means for driving the conveyor intermittently comprising:—a sprocket wheel upon a driven shaft of the stapler, a sprocket wheel upon a shaft carried in a member supported upon the stapler, a chain interconnecting the two sprocket wheels of a length to provide a slack, idler pulleys mounted upon a cross-arm at the top of a T-shaped bell crank pivoted to the aforesaid member, the idler pulleys being positioned between the two sides of the chain and taking up the slack, a connecting rod between one arm of the bell crank and a crank upon the driven shaft of the stapler, and means to transmit motion from the shaft upon which the second sprocket wheel is secured to the conveyor.

3. Improvements in and relating to stapling machines consisting in a conveyor comprising a work support and a conveyor chain arranged to feed books to be stapled through the machine, means for driving the conveyor intermittently and causing it to stop during the operation of stapling comprising a sprocket wheel upon a driven shaft of the stapler, a second sprocket wheel supported in means secured to the stapling machine frame, a chain interconnecting the two sprocket wheels of a length to provide a slack, means to transfer the slack from one side of the chain to the other during each revolution of the driving sprocket wheel, sprocket and chain connection between the shaft to which is secured the second sprocket wheel, and a shaft which supports a sprocket wheel which in turn engages the conveyor chain.

4. Means according to claim 3 characterized in that the means for transferring the slack from one side of the chain to the other comprise idler pulleys supported upon arms adjustably secured upon a cross-arm integral with one arm of a bell crank, a pivotal connection between the bell crank and the means which support the aforesaid shaft carrying the second sprocket wheel, and a connecting rod between the end of the other arm of the bell crank and a crank secured to rotate with the sprocket upon the drive shaft.

5. Improvements in and relating to stapling machines, consisting of a work support, a conveyor chain passing along a groove in the work support, a sprocket wheel at each end of the work support to carry the chain, fingers pivoted to the chain to project from the groove when they are set to an upright position upon the chain, and means for driving the conveyor chain intermittently comprising, a sprocket wheel upon a driven shaft of the stapler, means secured on the frame for supporting a second sprocket wheel, a chain interconnecting the two sprocket wheels of a length to provide a slack, means to transfer the slack from one side of the chain to the other during each revolution of the driving sprocket wheel, and means to transmit motion from the second sprocket wheel to one of the sprocket wheels which carry the conveyor chain.

6. Improvements in and relating to stapling machines, consisting of a work support, a conveyor chain passing along a groove in the work support, a sprocket wheel at each end of the work support to carry the chain, fingers pivoted to the chain to project from the groove when they are set to an upright position upon the chain, and means for driving the conveyor chain intermittently comprising, a sprocket wheel upon a driven shaft of the stapler, means supported on said frame for supporting a second sprocket wheel, a chain interconnecting the two sprocket wheels of a length to provide a slack, a pivoted member, idler pulleys mounted upon said pivoted member, the chain engaging said idler pulleys, a crank upon the driven shaft of the stapler, a rod connecting the pivoted member and the crank, and means to transmit motion from the second sprocket wheel to one of the sprocket wheels which carry the conveyor chain.

7. Improvements in and relating to stapling machines, consisting of a work support, a conveyor chain passing along a groove in the work support, a sprocket wheel upon a shaft at each end of the work support to carry the chain, means to adjust the one sprocket wheel vertically, means to adjust the other sprocket wheel horizontally, fingers pivoted to the chain by means of the link pivots of the chain and adapted to project from the groove when they are set to an upright position upon the chain, and means for driving the conveyor chain intermittently comprising, a driven shaft upon the stapler, a sprocket wheel upon said driven shaft, means secured on the frame for supporting a second sprocket wheel, a chain interconnecting the two sprocket wheels of a length to provide a slack, a pivoted member, idler pulleys mounted upon said pivoted member, the chain engaging the said idler pulleys, a crank upon the driven shaft of the stapler, a rod connecting the pivoted member and the crank, and sprocket and chain connection between the shaft to which the aforesaid second sprocket wheel is secured and the shaft which supports one of the sprocket wheels at one end of the work support.

HOWARD DINGLE.