(Model.) 4 Sheets—Sheet 1.

J. FORBES.

FEEDING MECHANISM FOR SEWING MACHINES.

No. 420,595. Patented Feb. 4, 1890.

Fig. 1.

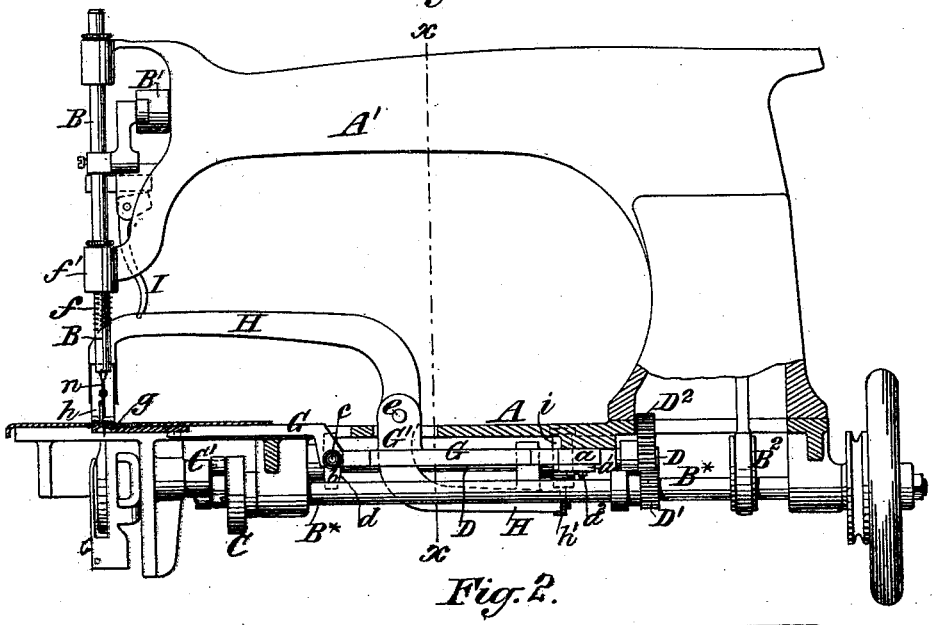


Fig. 2.

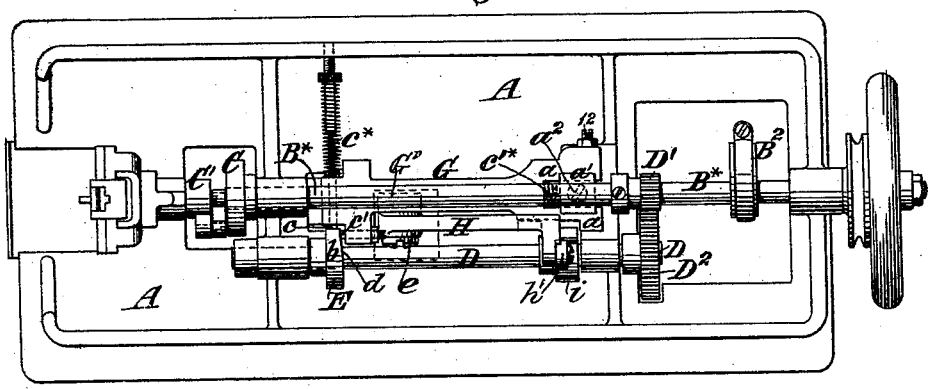
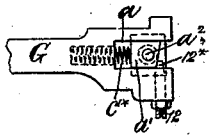


Fig. 2.*



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J. FORBES.

FEEDING MECHANISM FOR SEWING MACHINES.

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Fig. 3.

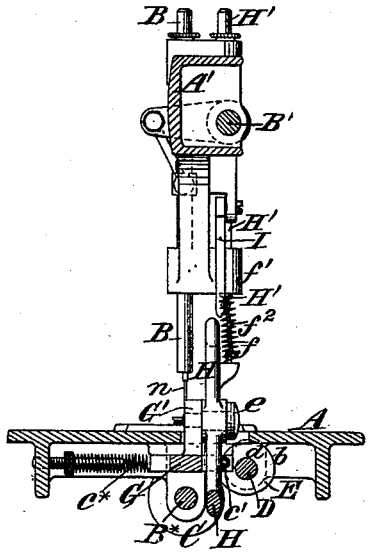


Fig. 4.

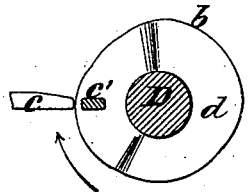


Fig. 7.

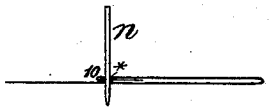


Fig. i.

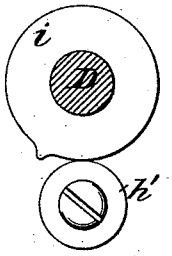


Fig 8

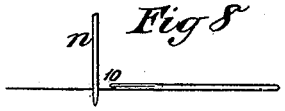
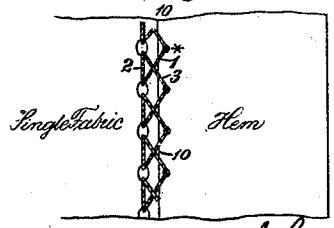


Fig. 6.



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FEEDING MECHANISM FOR SEWING MACHINES.

No. 420,595. Patented Feb. 4, 1890.

Fig. 9.

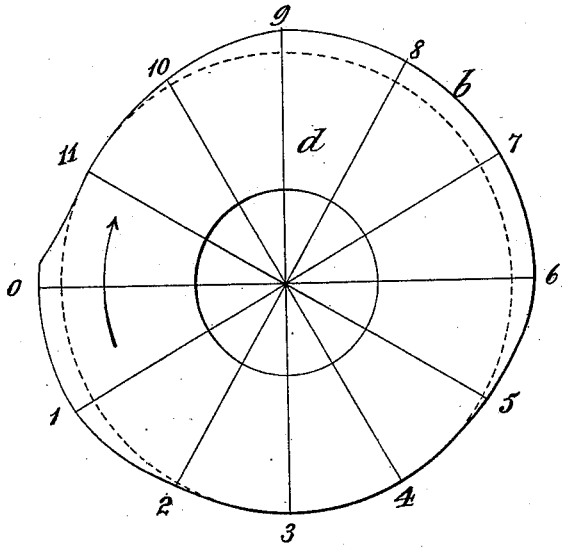
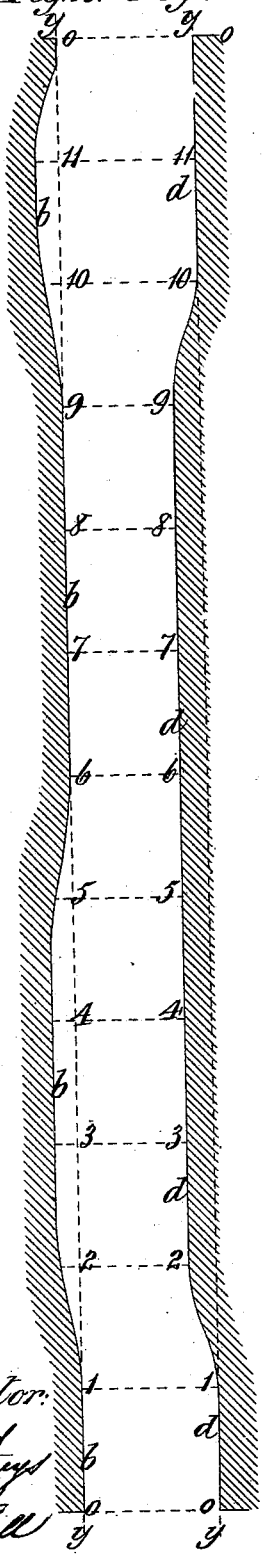


Fig. 10. *Fig. 11.*



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FEEDING MECHANISM FOR SEWING MACHINES.

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Fig. 12.

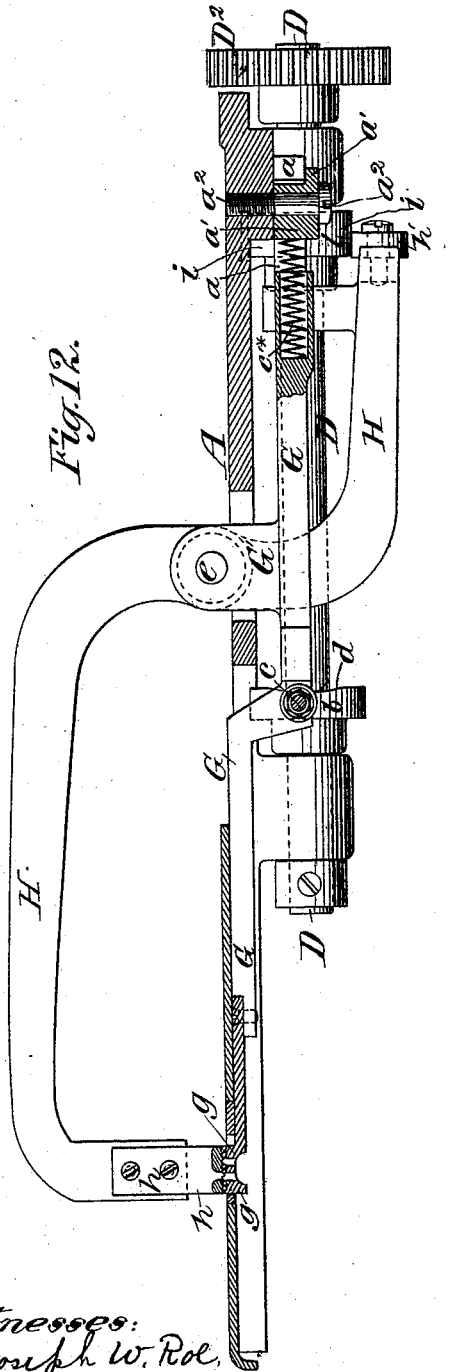
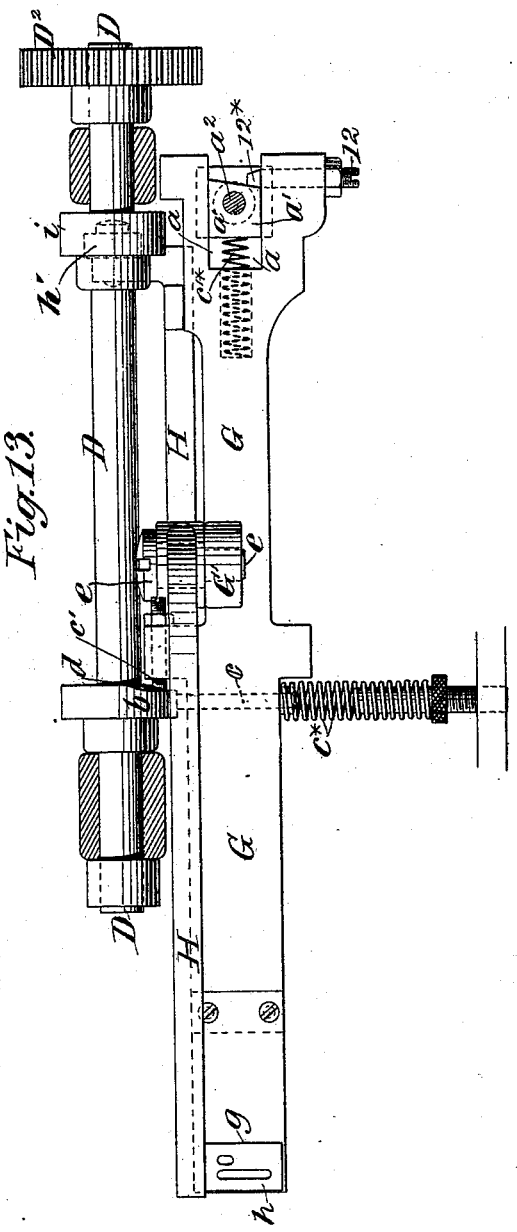


Fig. 13.



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UNITED STATES PATENT OFFICE.

JOHN FORBES, OF BROOKLYN, NEW YORK.

FEEDING MECHANISM FOR SEWING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 420,595, dated February 4, 1890.

Application filed December 13, 1886. Serial No. 221,372. (Model.)

To all whom it may concern:

Be it known that I, JOHN FORBES, of the city of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in Sewing-Machines, of which the following is a specification, reference being had to the accompanying drawings.

This invention has for its object the production of stitching having the appearance of what is known as "hemstitching," produced by hand needle-work, by means of a sewing-machine the needle of which and also its shuttle or equivalent device for interlacing the thread or threads of which the stitch is composed having only the same movements which they have for producing a seam; and to this end my invention consists in the improvement hereinafter described and claimed in the feed mechanism of a sewing-machine, whereby the cloth or fabric to be stitched has imparted to it relatively to a sewing-machine needle which has a simple longitudinal motion to and fro into and from the fabric, certain obliquely-forward and directly-backward movements by which the stitching having the appearance of hemstitching is produced.

Figure 1 in the accompanying drawings is a front elevation, partly in section, of a sewing-machine having my invention applied. Fig. 2 is an inverted plan of the same. Fig. 2* is a top view of one end of the feed-bar. Fig. 3 is a transverse vertical section of the same in the plane indicated by the line *x x* in Fig. 1, and showing the parts on the left of that line. Fig. 4 is a side view, on a larger scale than Figs. 1, 2, and 3, of the cam which produces the feed movement; and Fig. 5 is a corresponding side view of the cam for operating the presser. Fig. 6 is a diagram of the face of a piece of work, showing the stitches. Figs. 7 and 8 represent transverse sections through the fabric, showing the change of its position relatively to the needle consequent upon its forward movements obliquely in opposite directions. Fig. 9 is a side view of the feed-cam on a scale several times enlarged; and Figs. 10 and 11 are respectively diagrams of the peripherical and side profiles of the two cam-surfaces of said cam on a scale corresponding with Fig. 9, showing the projection of the profiles from an imaginary straight line *y y*, and showing the mutual relations of the said profiles. Fig. 12 represents a side view of the feed mechanism, partly in section, on a larger scale than that of Figs. 1, 2, and 3, showing also a portion of the bed-plate in section. Fig. 13 is a plan view of the feed mechanism as it would appear if the bed-plate were removed from the machine.

Similar letters of reference indicate corresponding parts in the several figures.

The machine represented will be recognized as of the well-known Wheeler & Wilson sewing-machine type, that machine having been selected for the illustration of my invention for the reason that it serves the purpose as well as any other.

A designates the bed-plate; A′, the arm; B, the needle-bar, and *n* the needle.

B* designates the main shaft, furnished with the eccentric B^2 for operating the needle-actuating rock-shaft B′, and with the crank C for operating the rotary shaft C′ of the loop-taker or shuttle-driver.

The parts above mentioned are all well known, and therefore need no further description. The needle has only the ordinary reciprocating rectilinear motion.

D designates the shaft of the feed-cams E *b d*, arranged in bearings below the bed-plate parallel with the main shaft. For the purpose of my invention this shaft D is so geared with the main shaft as to make but one revolution for every three revolutions of the main shaft, and consequently one revolution for every three complete to-and-fro motions of the needle and corresponding movements of the loop-taker or shuttle. The gearing of the two shafts together is represented as being effected by a pinion D′ on the main shaft and a spur-gear D^2 on the feed-shaft.

G is the feed-bar or feeder-carrier, having rigidly attached to it the ordinary rough-surfaced feed-dog or feeder *g*, and arranged below the bed-plate so that it is capable of moving longitudinally and laterally. The said bar or carrier is provided at one end with a fork or slotted head *a*, into which is fitted a block *a′*, which is free to oscillate horizontally upon a pin a^2, which is screwed into the bed-plate, and the said bar or carrier is also

provided with two studs $c\,c'$, to be acted upon by the cam-surfaces b and d, which are both represented as constructed on a single cam or cam-barrel E, fast on the shaft D, the cam-surface b, which is on the periphery of said cam or barrel, acting on the stud c to produce the forward and backward movements of the feeder and the fabric, and the cam-surface d, which is on one side of the said cam or barrel, acting on the stud c' to produce the lateral movements of the fabric which combine with the forward movements to make the latter take oblique directions. A spring c^* is applied between the margin of the bed-plate A and front of the feed-bar G, as shown in Fig. 2, to hold the stud c in contact with the cam-surface b for forward and backward feeding operations, and a spring c'^* is applied between the said block and the inner end of the slot or fork a of the feed-bar to keep the stud c' in contact with the cam-surface d for the lateral feeding operations.

In order to provide for varying the lateral feed and the width of the hem-stitch, a stop-screw 12 is screwed through the front prong of the fork a of the feed-bar, and the point 12* of this screw intrudes into the fork a, as shown in Figs. 2* and 13, in such manner as to stop the movement of the bar G to the left. This intruding point being taper, by screwing the screw in or out the movement of the bar G to the left is more or less restricted and the variation in the feed thereby produced.

H is the presser, consisting of a lever pivoted by a fulcrum-pin e to a post G', provided on the feed-bar G, and projecting upward therefrom through an opening in the bed-plate. This presser, which is provided with a foot h, that is preferably roughened on its sole, is represented as connected with the ordinary presser-carrying bar H' of the sewing-machine, so that it may be lifted from the work like the ordinary presser by means of the presser-lifting lever I commonly used to lift said bar, and the said presser has its pressure-spring f applied between it and the lower guide f', provided on the sewing-machine head for said bar. The connection represented between said presser and the bar H consists of a link f^2, (see Fig. 3,) passing through said spring f.

In order to lift the presser at proper intervals—viz., once during every revolution of the feed-shaft and after every third operation of the needle and shuttle or loop-taker, as hereinafter described—a cam i (see Figs. 1, 2, and 5) is provided on the feed-shaft D to operate on a bowl h', provided on the lower end of the presser-lever H.

Before describing in detail the construction of the feed-cam surfaces b and d, I will explain the movements of the feeder and presser and of the fabric to be produced by said cam-surfaces in making the three separate and distinct successive stitches by which the complete hem-stitch is produced, reference being had to Figs. 6, 7, and 8, in which the line 10 represents the inner edge of the hem, the single fabric being on the left of this line and the doubled fabric of the hem on the right. I will first suppose the needle to have passed through the hem, as shown in Fig. 7, and returned from it at the point *, Fig. 6, and that a stitch has been completed at that point. The first movement of the fabric held by the combined feeder and presser is then forward and laterally to the right, and brings the single part of the fabric opposite the needle, as shown in Fig. 8, so that the next operation of the needle produces the diagonal stitch 1 from the hem to the single fabric. The second movement is directly backward, so that the next operation of the needle produces the stitch 2 entirely on the single part of the fabric. The third movement is forward and laterally to the left, so that the hem is again brought under the needle, the next operation of which produces the diagonal stitch 3 from the single fabric to the hem. The three stitches thus produced make a complete hem-stitch, and this has been made while the fabric has been held between the feeder and presser.

To prepare for a new hem-stitch, the cloth has to be released from the feeder, and hence while the needle is in the hem in the act of forming the stitch 3 and at the same time holding the cloth in position the presser is lifted by the action of the cam i on the main shaft to liberate the fabric, and the feeder and presser move back to take a new hold of the fabric for a repetition of three stitches like 1 2 3; but the presser comes down again and secures the fabric to the feeder before the needle leaves the fabric, and then after the needle has left the fabric the latter is again moved forward and to the right to enable the needle to pass again through the single part of the fabric and make a new diagonal stitch like 1. The next backward movement to make a new stitch like 2 in the thin part of the fabric brings under or very nearly under the needle that point in the fabric where the first-mentioned stitch 1 was finished and the first-mentioned stitch 2 was commenced, and hence the needle passes twice through the single fabric in the same place, and the result is the making in the thin part of the fabric of well-opened holes, which are enlarged by the drawing tight of the stitches.

I will now proceed to explain with reference to Figs. 9, 10, and 11 the construction of the cam-surfaces b and d. To facilitate this explanation, I have shown the periphery of b and the side face of d in Fig. 9 divided into twelve arcs and sectors of circles each of thirty degrees. The profile of the periphery of b, as shown in Fig. 9, consists of two arcs of larger radius, or nearly ninety degrees and thirty degrees, respectively, and four steps of nearly thirty degrees each connecting the larger and smaller arcs.

In order to enable the relative and simultaneous operations of the feed-bar of the pe-

riphery of *b* and the side face of *d* to be understood, I have in Fig. 10 projected the profile of the cam-surface *b* with reference to the imaginary straight line *y y* of a length corresponding with its circumference, and I have also represented in Fig. 11 the profile of *d* with reference to a similar line *y y* parallel with the planes of rotation, and I have numbered the divisions of the profile-lines to correspond with the numbering of the divisions of the circle in Fig. 9, and have connected corresponding points in Figs. 10 and 11 by transverse dotted lines. In the last-mentioned figure it will be seen that the profile of *d* consists of two portions which are straight but in different planes and two connecting-steps, the more prominent of the said straight portions occupying two hundred and ten degrees of a circle and the less prominent occupying ninety degrees, and the two steps occupying thirty degrees each.

At the beginning of the operation hereinbefore described with reference to Figs. 6, 7, and 8, the needle being in but just coming out of the fabric, which is held between the feeder and presser, the corresponding points *o* of both cam-surfaces *b d* are in operation on the feed-bar, and while the short arcs 0 1 of *b* and the corresponding flat portion 0 1 of *d* are in operation the feeder and the fabric remain stationary. The action of the spring *c** while the step 1 2 of cam-surface *b* is in operation produces the first forward movement, while the corresponding step 1 2 on the cam-surface *d* produces the lateral movement to the right, the result being the oblique or diagonal movement of the feeder and fabric to the right. While the long arc 2 3 4 5 on the cam-surface *b* and the corresponding straight portion 2 3 4 5 on the cam-surface *d* are in action, the feeder is stationary, and the needle and shuttle. or loop-taker operate to produce the first stitch. The step 5 6 on the cam-surface *b* next coming into operation produces the direct backward movement of the feeder and the fabric, and while the long arc 6 7 8 9 is in operation the feeder and fabric are stationary and the needle and shuttle or loop-taker operate to produce the second stitch. While the step 9 10 of the cam-surface *b* operates, the spring *c** moves the feeder and the fabric forward, and at the same time the corresponding step 9 10 on the cam-surface *d* permits the spring *c'** to move them to the left, the result being the oblique or diagonal movement to the left. The short arc 10 11 of the cam-surface *b* and corresponding straight portion of the cam-surface *d* keep the fabric stationary while the needle and shuttle or loop-taker operate to produce the third stitch. Before the needle leaves the fabric after this stitch and before the step 11 0 on the cam-surface *b* comes into operation the presser is lifted by the cam *i* to release the fabric from the feeder, so that while the said step 11 0 operates to produce the direct backward movement of the feeder the fabric remains stationary, this last backward movement being for the purpose of taking a new hold of the fabric to commence the repetition of the three stitches which are produced to make the complete hem-stitch.

I am aware that stitching precisely similar to that produced by my invention has been produced by a sewing-machine in which forward and backward movements were given to the feeder by one cam and a side-to-side movement was given to the needle by another cam; but by giving to the feeding device all the movements necessary to make the needle operate on the fabric in two lines while the needle itself has but an ordinary reciprocating rectilinear movement I am enabled not only to very greatly simplify the hem-stitch mechanism, but am enabled to apply my invention to any sewing-machine without altering any of the parts of the machine except the feeding mechanism.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination of the feed-bar G, having a feed-dog at one end and forked or slotted at the other end, the fixed pivot a^2, the block a', fitted to said pivot and to the fork or slot of the feed-bar, and a cam having two surfaces, one for producing the movement of the feed-bar lengthwise on said block and the other for producing a movement of the feed-bar and block on said fixed pivot, and springs for moving the feed-bar in two directions, substantially as and for the purpose herein set forth.

2. The combination of the feed-bar G, having the fork or slot *a*, the fixed pivot a^2, the block a', fitted to said pivot and fork or slot, a cam for moving the said bar lengthwise and laterally, springs *c'** and *c** applied to the feed-bar to hold it in contact with the cam, and an adjustable stop-screw screwed into the feed-bar to stop against said block for the purpose of regulating the lateral feed movement, substantially as herein described.

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