Oct. 12, 1948. W. E. TWAMLEY 2,451,367

FEED MECHANISM

Filed April 17, 1945 2 Sheets-Sheet 1

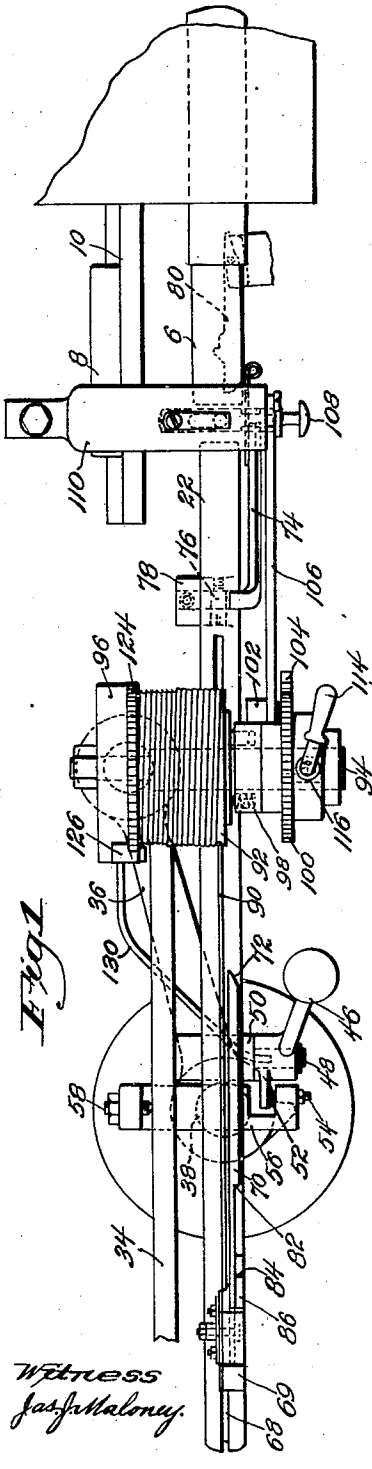

Fig. 1

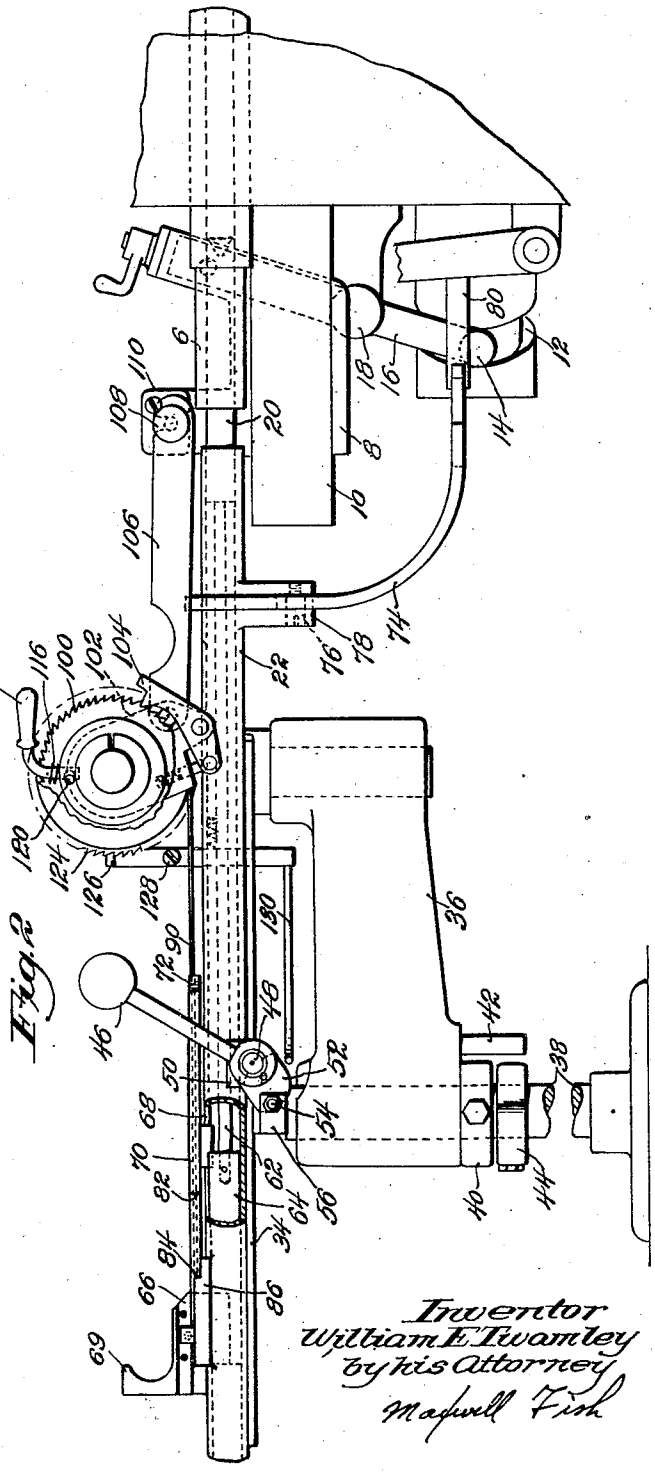

Fig. 2

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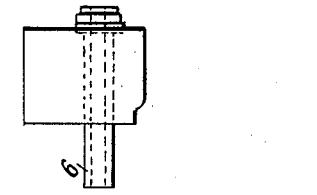
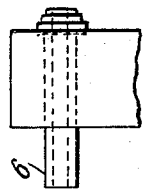
Filed April 17, 1945 2 Sheets-Sheet 2





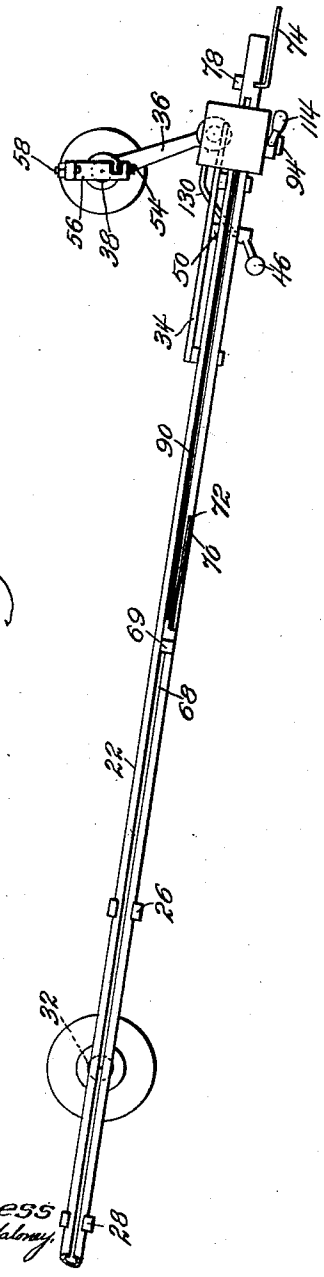


Fig. 3

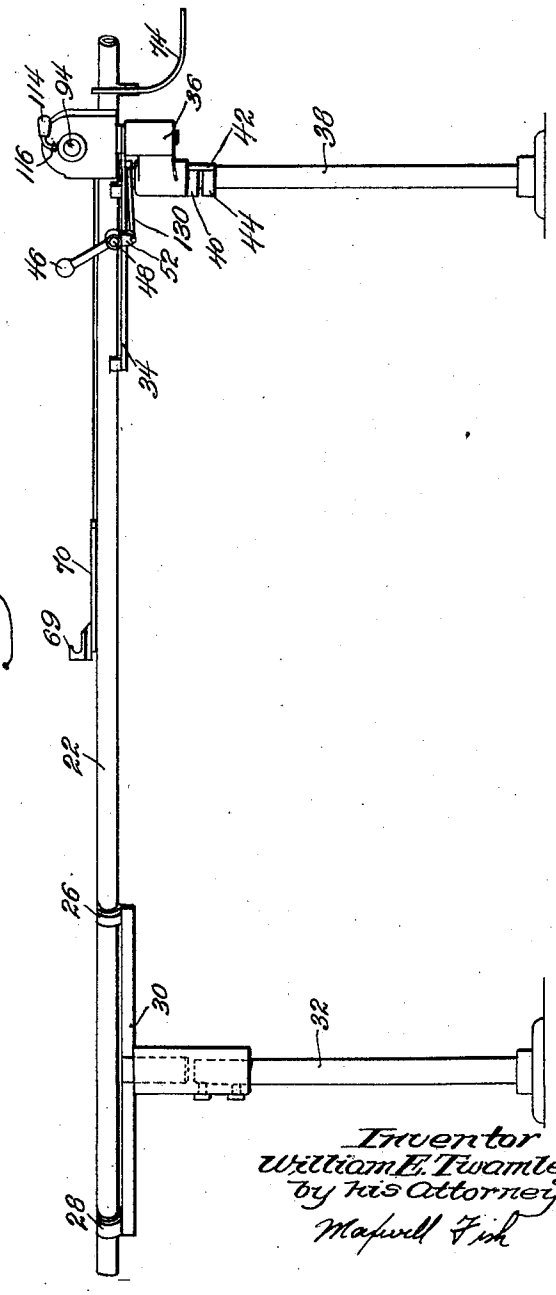


Fig. 4

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2,451,367

UNITED STATES PATENT OFFICE

2,451,367

FEED MECHANISM

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Application April 17, 1945, Serial No. 588,829

10 Claims. (Cl. 29—59)

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The present invention relates to improvements in feed mechanism for screw and similar machines for fashioning articles successively from bar stock, which machines are provided with a hollow rotating spindle through which the work is fed by successive stepped movements against a stock stop preparatory to the performance of the several fashioning and cutting-off operations required for the manufacture of each successive article by the machine.

It is a principal object of the invention to provide for use with automatic screw and similar machines, a novel and improved feed mechanism of the general type comprising a stock tube in alignment with the machine spindle and a pusher operating therein for supporting and for imparting stepped advancing movements to a feeding bar of stock, which mechanism will be simple in construction, efficient in operation, and will be well adapted for the rapid and convenient replenishing of the machine by the operator as the bar feeding in the machine is used up.

In the preferred form of the invention, the stock tube with its associated pusher for supporting and feeding bar stock into the machine is carried on two standards, being slidably mounted adjacent its rear end in a bracket which is swivelled on the rear standard, and mounted at its forward end on a swinging arm hinged to the near standard to provide for a lateral swinging movement of the forward end of the stock tube out of alignment with the hollow spindle for the loading of bar stock therein. A manual stock tube locking lever provided with a cammed locking surface serves to lock the stock tube in operative position. The pusher has imparted thereto a stepped feeding movement to advance the bar of stock being operated upon by means of a feed device which comprises a drum supported integrally with the stock tube, and a cable connected with the pusher and arranged to be wound on the drum. Stepped feeding movements are imparted to the drum through connections operated from the feed slide of the machine including a disconnectible link, a feed pawl and ratchet, and a friction driving connection interposed between the ratchet and the drum. Associated with the driving connections above described, is a checking ratchet which is secured to turn with the drum, and a cooperating spring-pressed pawl which is normally operative to prevent a reverse unwinding movement of the drum.

Further in accordance with the invention, an improved mechanism is provided for automatically stopping the machine upon exhaustion of the feeding bar stock, which in the illustrated form of the invention comprises an abutment carried by the pusher and arranged for engagement with a stop member as the pusher reaches the extreme limit of its advancing movement. This abutment is constructed and arranged for adjustment on the pusher longitudinally of the stock tube, and includes an indicating device to assist the operator in adjusting the abutment to stop the machine when the length of the feeding bar stock has been reduced to a length that will not permit the completion of one full length article for which the machine has been set up.

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Further in accordance with the invention, mechanism is provided for controlling the operation of the drum and cable actuating mechanism to prevent inadvertent rotation of the drum by the operator in a direction to unwind the cable, with a consequent snarling of the cable under its guard. A primary consideration in the operation of the drum and cable mechanism is to maintain the cable in a substantially taut or straightened position at all times. To this end, it is important that movement of the pusher and wind-up drum in the wind-up direction be instituted only by the manual or power rotation of the drum, and that movement of the pusher and drum in the opposite direction as, for example, when the pusher is moved rearwardly to its starting position, be effected only by movement of the pusher itself. During the normal operation of the machine in which the drum is first moved in a wind-up direction manually to advance the new bar of stock through the hollow spindle of the machine into operating position, and is thereafter given a stepped advancing movement following the severing of each successively formed article therefrom through the power operation of the machine, the checking ratchet and pawl above described are effective to prevent any possible inadvertent movement of the drum in the reverse or unwinding direction. In accordance with the invention, mechanism is provided which is rendered operative automatically upon the release of and movement of the stock tube laterally to the loading position, to render the checking ratchet and pawl inoperative, and thus to permit the pusher to be drawn rearwardly with an accompanying unwinding movement of the drum either by direct manual operation or by forcing a new bar of stock rearwardly into the stock tube. In accordance with this feature of the invention, a tail is provided on the spring-pressed checking pawl which is arranged to be engaged by the feed tube locking

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lever upon movement of the lever to its unlocking position.

With the above stated and other objects in view as may hereinafter appear, the several features of the invention consist also in the devices, combinations and arrangement of parts hereinafter described and claimed, which together with the advantages to be obtained thereby will be readily understood by one skilled in the art from the following description taken in connection with the accompanying drawings, in which Fig. 1 is a detail plan view of a feed mechanism for an automatic screw machine illustrating in a preferred form the several features of the invention, only so much of the machine and feed mechanism associated therewith being shown as is believed necessary to illustrate the connection of the present invention therewith; Fig. 2 is a view in front elevation of substantially the parts shown in Fig. 1; Fig. 3 is a plan view on a smaller scale of the feed mechanism and of the rotating spindle of an automatic screw machine, the parts being shown with the forward end of the stock tube swung to one side to the loading position; and Fig. 4 is a view in front elevation of the parts shown in Fig. 3.

The feed mechanism which forms the subject-matter of the present invention is shown in the drawings as embodied in an automatic screw machine of the general type illustrated in the patent to Rich No. 2,120,842, which machine is provided with a hollow rotating spindle generally designated at 6 and a reciprocated feed slide 8 supported on ways 10 at the rear side of the spindle 6. In accordance with the usual construction of these machines, motion is imparted to the slide 8 from a harmonic motion producing cam 12 which acts through connections including a follower roll 14 and cam lever 16 supported to turn on a fixed pivot 18 to drive the feed slide 8.

The stock feeding mechanism of the present invention takes the form of a pusher generally designated at 20 which is adapted for engagement with the rear end of the feeding bar of stock and is mounted to slide within a bar stock supporting stock tube 22 in axial alignment with the rotating hollow spindle 6 of the machine. As best shown in Figs. 3 and 4 of the drawing, the stock tube 22 is supported for axial movement in friction bearings 26, 28 in a bracket 30 swivelled on a rear standard 32 bolted to the floor. At its forward end the stock tube 22 is rigidly secured in a bracket 34 which is pivotally supported on a swinging arm 36 mounted to turn on a standard 38 bolted to the floor adjacent the machine. A collar 40 rigidly secured to the standard 38 provides an axial thrust bearing support for the swinging arm 36. The arrangement of these parts is such that a swinging movement of the arm 36 from the position shown in Figs. 1 and 2, will cause the forward end of the stock tube 22 to be swung laterally out of alignment with the screw machine into an alternative loading position. During this movement the stock tube supported on the bracket 30 swings about its pivotal mounting on the standard 32, and is permitted to slide rearwardly through the friction bearings 26, 28 in the bracket. The swinging movement of the arm 36 and stock tube 22 to the loading position is limited by engagement of a downwardly extending pin 42 on the arm 36 with an abutment formed on a stop collar 44 secured to the standard 38.

A manually operable device is provided for swinging the stock tube from one to the other of its operating and loading positions and for latching the stock tube in its normal operating position. As best shown in Figs. 1 and 2, the control device referred to comprises a manually operable lever handle 46 carried on a pivot pin 48 in a block 50 secured to the under side of the bracket 34 and stock tube 22. The lever 46 is provided with a cam offset 52 which is arranged for the operative position of the stock tube to be moved into engagement with an adjustable stop screw 54 carried on the laterally offset forward end of a supporting arm 56 formed on the upper end of the standard 38. The arm 56 is provided at its rear end with an upwardly extending ear in which is mounted a second stop screw 58 for engagement with the rear face of the bracket 34, so that for the locking position of the lever handle 46 shown in Figs 1 and 2, the stock tube is rigidly clamped in its operating position by the engagement of the lock screw 54 and 58 respectively with the cammed locking surface 52 of lever arm 46, and with the rear face of the bracket 34. In order to move the stock tube to its loading position, the operator after disconnecting the feed link hereinafter more fully to be described, moves the lever handle 46 in a counter-clockwise direction from the position shown in Figs. 1 and 2, so that the cam abutment 52 is moved out of alignment with the screw stop 54, and then pulls the entire assembly forward, swinging the supporting arm 36 about its pivot, so that the loading end of the stock tube is moved forwardly or laterally to the loading position shown in Figs. 3 and 4, out of alignment with the hollow spindle 6 of the machine.

The pusher 20 identified as a cylindrical element having a freely rotatable stock engaging nose and arranged to slide freely within the stock tube, is connected by a spacing rod 62 with an operating number 64 also slidable within the tube and provided with an upwardly extending flange 66 which extends through a longitudinally extending slot 68 formed in the upper surface of the stock tube. The operating member 64 including the flange 66 has mounted thereon a finger control 69 to enable the operator readily to withdraw the pusher by hand. The operating member 64 and flange 66 also carry a forwardly extending abutment rod 70 which is freely adjustable longitudinally of the control member 64. The abutment member 70 is provided at its forward end with a cam surface 72 which is arranged to be brought into engagement with a trip lever 74 as the pusher 20 reaches an extreme forward position in which there remains only the waste end of the feeding bar stock in the hollow spindle 6 of the machine. The trip member 74 is mounted on a pivot 76 on a depending lug 78 on the stock tube 22, and is provided with a forwardly curved lower end which is arranged to engage with a member 80 forming part of the stop motion of the machine. The cammed end 72 acts to trip the member 74 and thereby to render the stop member 80 operative to stop the machine. In order that the abutment 70 may be positioned in accordance with the length of article being produced by the machine to stop the machine when a waste end of the feeding bar is too short to permit the completion of one article of such length, a cut-out forming a shouldered surface 82 is provided in the abutment rod 70 and a cooperating cut-out having a shouldered surface 84 is formed in a member 86 fixed to the finger control 69 into which an article such as those being produced by the machine can be laid.

Adjustment of the abutment bar 70 is then made so that the article is engaged at one end by the shouldered forward end 82 of the abutment rod and at its other end by the shouldered surface 84.

The mechanism for advancing the pusher 20 comprises a cable 90 which is connected to the finger control element 69 of the pusher, and is arranged to be wound on a drum 92 loosely supported to turn on a stud 94 carried by an upwardly extending arm 56 formed integrally with the bracket 34 and stock tube 22. The drum 92 is connected by means of a friction clutch generally indicated at 98 with the sleeve hub of a feed ratchet 100 also loosely mounted on the stud 94. A downwardly extending arm 102 loosely supported to turn on the sleeve hub of the feed ratchet 100 has mounted thereon a feed pawl 104 which is spring-pressed into engagement with the ratchet 100. A disconnectible driving link 106 pivotally connected at one end to the pawl arm 102 and at its other end to a pin 108 carried on an overarm projection 110 of the feed slide 8 provides means for imparting a reciprocatory movement to the pawl arm 102 and pawl 104. The element 108 is in the form of an axially shiftable plunger, and is provided with a flattened portion which is rendered operative upon pushing the plunger 108 outwardly to disconnect the link 106 from the overarm projection 110 of the feed slide 8. For the manual operation of the drum 92, a hand lever 114 is provided fitted into a radially extending socket in the sleeve hub of the feed ratchet 100, and having an offset handle portion which is normally swung inwardly to the inoperative position shown in Figs. 1 and 2, by means of a torsion spring 116 acting on the shank of the handle. When it is desired to wind the drum 92 in a wind-up direction, the operator has only to swing the handle 114 outwardly to a right angle position in which a flattened shank portion of the handle is engaged by a pin 120, and thereafter to apply pressure to the handle to turn the drum in a counterclockwise direction from the position shown in Figs. 1 and 2. Should the operator inadvertently attempt to turn the handle and drum in a clockwise direction, which would tend to unwind and snarl the portion of the cable extending to the pusher, the handle will tend to swing inwardly on its pivot to the inoperative position.

In accordance with the invention, a checking mechanism is provided in the form of a checking ratchet and pawl to prevent rotational movement of the drum in the reverse or clockwise direction. This mechanism acts to prevent any inadvertent movement of the drum in the reverse direction by the operator during machine operation, and acts also to maintain the feed mechanism in its fully advanced position subsequent to each stepped advancing movement of the feed pawl and ratchet. The checking mechanism comprises a checking ratchet 124 secured to the drum and arranged to be acted upon by a spring-pressed pawl 126 which is pivoted intermediate its length on a pivot pin 128, and at its lower end is formed with an offset 130 which extends into the path of movement of the tail 52 of the manually operable level 46. Under normal conditions of operation in which the feed ratchet 100 and drum 92 are rotated in a counterclockwise direction either manually or by the operation of the power driven feed pawl and ratchet, the checking pawl 126 is permitted to ride over the teeth of the ratchet 124. Any tendency of the drum 92 to be rotated in the reverse or clockwise direction will be instantly checked by engagement of the pawl 126 with the teeth of the ratchet 124.

The operation of loading a new bar of stock into the machine and of putting the machine in operation thereon, will be briefly described as follows: As an old bar feeding in the machine is reduced to a waste end too short for the completion of one full length article of the sort being manufactured, the cammed abutment 72 of the member 70 engages with and rocks the stop lever 74, causing the member 80 forming part of the machine stop motion to be tripped, thus allowing the next motion of the cam lever 16 to stop the machine. The operator now pulls the pin 108 forwardly to disconnect the feed link 106 which is permitted to drop to an inoperative hanging position. The operator then moves the locking lever 46 counterclockwise from the position shown in Fig. 2 to the position shown in Fig. 4, thus unlocking the stock tube and at the same time causing the checking pawl 126 to be moved out of engagement with the checking ratchet 124. The operator next grasps the finger control 69 to move the pusher manually in a rearward direction out of the hollow spindle 6 of the machine, this movement being accompanied by an unwinding movement of the cable 90 and drum 92 which is permitted by the disengagement of the checking pawl 126 from its ratchet 124 above set forth. The stock tube is now swung forwardly to the loading position shown in Fig 3, and a new bar of stock is inserted into the stock tube from the forward end, thus causing the pusher to be moved rearwardly to its fully retracted position. The stock tube is now moved again into alignment with the hollow spindle 6 of the machine, and the locking lever 46 is moved in a clockwise direction to lock the stock tube in its operative position and to release the checking pawl 126 so that it is brought into engagement with its ratchet 124. The feed link 106 is operatively connected with the pin 108 to re-establish the driving connection for the feed pawl 104 from the feed slide 8. Finally, the operator grasps and swings the handle 114 outwardly to its limiting right angle position with relation to the feed ratchet 100 and then manually rotates the handle and associated parts including the drum 124 in a counterclockwise direction to advance the leading end of the new bar of stock through the hollow spindle 6 against the usual stock stop of the machine. The machine is now in a position to be again tripped into active operation.

It will be understood that the invention is not limited to the specific embodiment shown, and that various deviations may be made therefrom without departing from the spirit and scope of the appended claims.

What is claimed is:

1. A mechanism for feeding bar stock into an automatic screw or similar machine having a hollow work receiving spindle, which comprises a stock tube, supporting means on which the leading end of the tube is shiftable between an operative position in alignment with the spindle and a loading position out of alignment with the spindle, a pusher mounted within the stock tube, a drum and cable feeding device supported integrally with the stock tube and connected to advance the pusher, a step feeding device actuated in timed relation with the operation of the machine, a friction driving connection therefrom for advancing the drum, manual means for rotating the drum, a checking device normally

operative to prevent a reverse cable unwinding movement of the drum, and a device for locking the tube in the operative position shiftable to release the tube and also to render the checking device inoperative.

2. A mechanism for feeding bar stock into an automatic screw or similar machine having a hollow work receiving spindle, which comprises a stock tube, supporting means on which the leading end of the tube is shiftable between an operative position in alignment with the spindle and a loading position out of alignment with the spindle, a pusher mounted within the stock tube, a drum and cable feeding device supported integrally with the stock tube and connected to advance the pusher, a step feeding device actuated in timed relation with the operation of the machine, a friction driving connection therefrom for advancing the drum, manual means for rotating the drum, a checking device including an element shiftable between operative and inoperative positions to prevent a reverse cable unwinding movement of the drum, yieldable means urging said element to the operative position, and a device shiftable between locking and release positions comprising a locking means for the tube and control means for said element operable respectively in the locking position of said device to lock the tube and to permit movement of said element to its operative position, and in the release position of said device to release the tube and to move said element to the inoperative position.

3. A mechanism for feeding bar stock into an automatic screw or similar machine having a hollow work receiving spindle, which comprises a stock tube, supporting means on which the leading end of the tube is shiftable between an operative position in alignment with the spindle and a loading position out of alignment with the spindle, a pusher mounted within the stock tube, a drum and cable feeding device supported integrally with the stock tube and connected to advance the pusher, a step feeding device actuated in timed relation with the operation of the machine, a friction driving connection therefrom for advancing the drum, manual means for rotating the drum, a checking device arranged to be rendered operative and inoperative including yieldable means acting normally to render said device operative to prevent cable unwinding movement of the drum, and a control device shiftable between locking and release positions comprising locking means for the tube and control means for said checking device operable respectively in the locking position of said control device to lock the tube and to render the checking device operative, and in the release position of said control device to release the tube and to render the checking device inoperative.

4. A mechanism for feeding bar stock into an automatic screw or similar machine having a hollow work receiving spindle, which comprises a stock tube, supporting means on which the leading end of the tube is shiftable between an operative position in alignment with the spindle and a loading position out of alignment with the spindle, a pusher mounted within the stock tube, a drum and cable feeding device supported integrally with the stock tube and connected to advance the pusher, a stepped feeding device actuated in timed relation with the operation of the machine including a ratchet and a friction connection therefrom for rotating the drum, a manually operable lever pivotally mounted on the

ratchet arranged when urged in one direction to act on the ratchet to rotate the ratchet and drum in the wind-up direction, and arranged when urged in an opposite direction to be swung inwardly against the ratchet, a checking device normally operative to prevent a reverse cable unwinding movement of the drum, and a device for locking the stock tube in operative position shiftable to release the tube and also to render the checking device inoperative.

5. A mechanism for feeding bar stock into an automatic screw or similar machine having a hollow work receiving spindle, which comprises a stock tube, supporting means in which the leading end of the tube can be swung laterally between an operative position in alignment with the spindle and a loading position out of alignment with the spindle, a pusher mounted within the stock tube, a drum and cable feeding device supported integrally with the tube and connected to advance the pusher, driving means including a feed ratchet and pawl and a yieldable connection for rotating the drum to advance successive portions of the feeding bar stock into the machine, manual means for rotating the drum to position the leading end of a new bar of stock in the machine, a checking ratchet secured to the drum, and a spring-pressed pawl engaging therewith to prevent a reverse cable unwinding movement of the drum, and locking means including a manually operable locking lever arranged for one position of the lever to lock the tube in operative position and arranged in an alternative position of the lever to release the tube for movement to the loading position and to engage with and move the spring-pressed pawl out of engagement with the checking ratchet.

6. A mechanism for feeding bar stock into an automatic screw or similar machine having a hollow work receiving spindle, and a reciprocating feed slide, which comprises a stock tube, means supporting the stock tube in alignment with the spindle, a pusher mounted within the stock tube, a drum and cable feeding device connected to advance the pusher, a pawl and ratchet feed device, and a friction driving connection therefrom for advancing the drum, connections from the feed slide for reciprocating the pawl, and a checking ratchet secured to the drum and a pawl cooperating therewith to prevent a reverse cable unwinding movement of the drum.

7. A mechanism for feeding bar stock into an automatic screw or similar machine having a hollow work receiving spindle, a reciprocating feed slide and a stop element acting when rendered operative to stop the machine, which comprises a stock tube, a pusher mounted within the stock tube, a drum and cable feeding device connected to advance the pusher, a pawl and ratchet feeding device and a friction driving connection therefrom for advancing the drum, connections from the feed slide for reciprocating the pawl, a checking pawl and ratchet operative to prevent a reverse cable unwinding movement of the drum, means controlled by the pusher for stopping the machine upon exhaustion of the bar of stock feeding therein comprising an abutment on the pusher adjustable axially of the pusher in accordance with the length of article produced in the machine, and a trip member arranged to be engaged thereby for actuating the machine stop element to stop the machine.

8. A mechanism for feeding bar stock into an automatic screw or similar machine having a hollow work receiving spindle, a reciprocating feed

slide, and a stop element acting when rendered operative to stop the machine, which comprises a stock tube, supporting means on which the leading end of the tube is shiftable between an operative position in alignment with the spindle and a loading position out of alignment with the spindle, a pusher mounted within the stock tube, a drum and cable feeding device supported integrally with the tube and connected to advance the pusher, a feed ratchet and pawl, and a friction driving connection therefrom for advancing the drum, connections from the feed slide including a disconnectible feed link for reciprocating the pawl, manual means for rotating the drum, a ratchet and pawl checking device normally operative to prevent a reverse cable unwinding movement of the drum, an abutment carried by the pusher adjustable axially thereof in accordance with the length of article produced from the feeding bar stock, a trip member arranged to be engaged by said abutment for actuating the stop element to stop the machine upon exhaustion of a bar feeding in the machine, and a device for locking the tube in the operative position shiftable to release the tube and simultaneously to render the checking device inoperative.

9. A mechanism for feeding bar stock into an automatic screw or similar machine having a hollow work receiving spindle, a reciprocating feed slide, and a stop element acting when rendered operative to stop the machine, which comprises a stock tube, supporting means on which the leading end of the tube is shiftable between an operative position in alignment with the spindle and a loading position out of alignment with the spindle, a pusher mounted within the stock tube, a drum and cable feeding device supported integrally with the tube and connected to advance the pusher, a feed ratchet and pawl, and a friction driving connection therefrom for advancing the drum, connections from the feed slide for reciprocating the pawl, manual means for rotating the drum, a ratchet and pawl checking device normally operative to prevent a reverse cable unwinding movement of the drum, an abutment carried by the pusher adjustable axially thereof in accordance with the length of article produced form the feeding bar stock, a trip member arranged to be engaged by said abutment for actuating the stop element to stop the machine upon exhaustion of a bar feeding in the machine, and a device for locking the tube in the operative position shiftable to release the tube and simultaneously to render the checking device inorperative.

10. A mechanism for feeding bar stock into an automatic screw or similar machine having a hollow work receiving spindle, which comprises a stock tube, supporting means on which the leading end of the tube is shiftable between an operative position in alignment with the spindle and a loading position out of alignment with the spindle, a pusher mounted within the stock tube, a drum and cable feeding device supported integrally with the stock tube and connected to advance the pusher, a step feeding device actuated in timed relation with the operation of the machine, a friction driving connection therefrom for advancing the drum, manual means for rotating the drum, a checking device comprising a checking member shiftable between operative and inoperative positions and means yieldably engaging said checking member in the operative position to prevent reverse cable unwinding movement of the drum, and a device shiftable between locking and release positions comprising a locking means for the tube and means for rendering said checking device operative and inoperative adapted for the operative position of said device to lock the tube in the operative position and simultaneously to permit said yieldably actuated checking member to be moved to the operative position.

WILLIAM E. TWAMLEY.

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