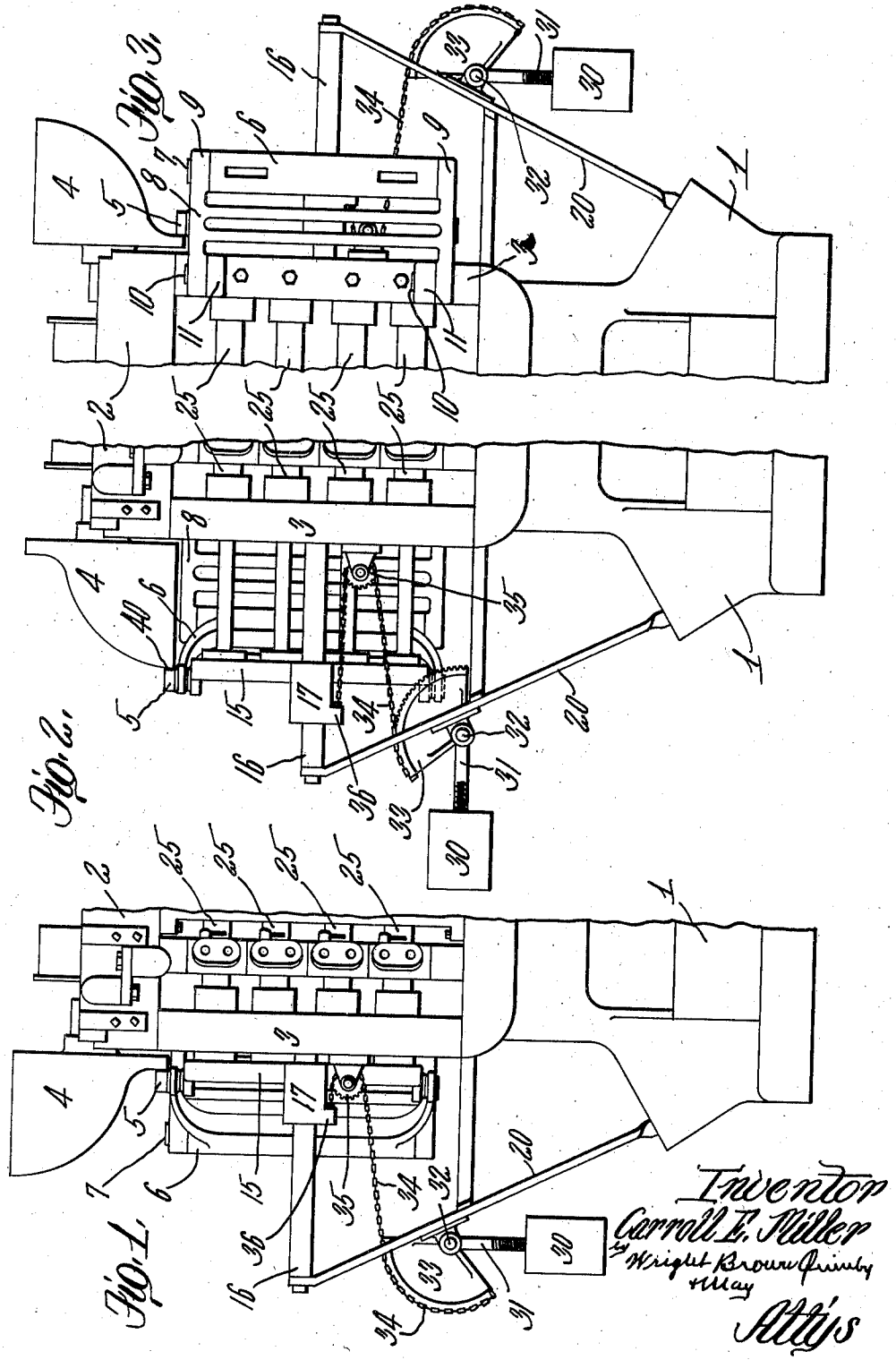
Nov. 22, 1938. C. E. MILLER 2,137,849

WORK FEEDING MECHANISM

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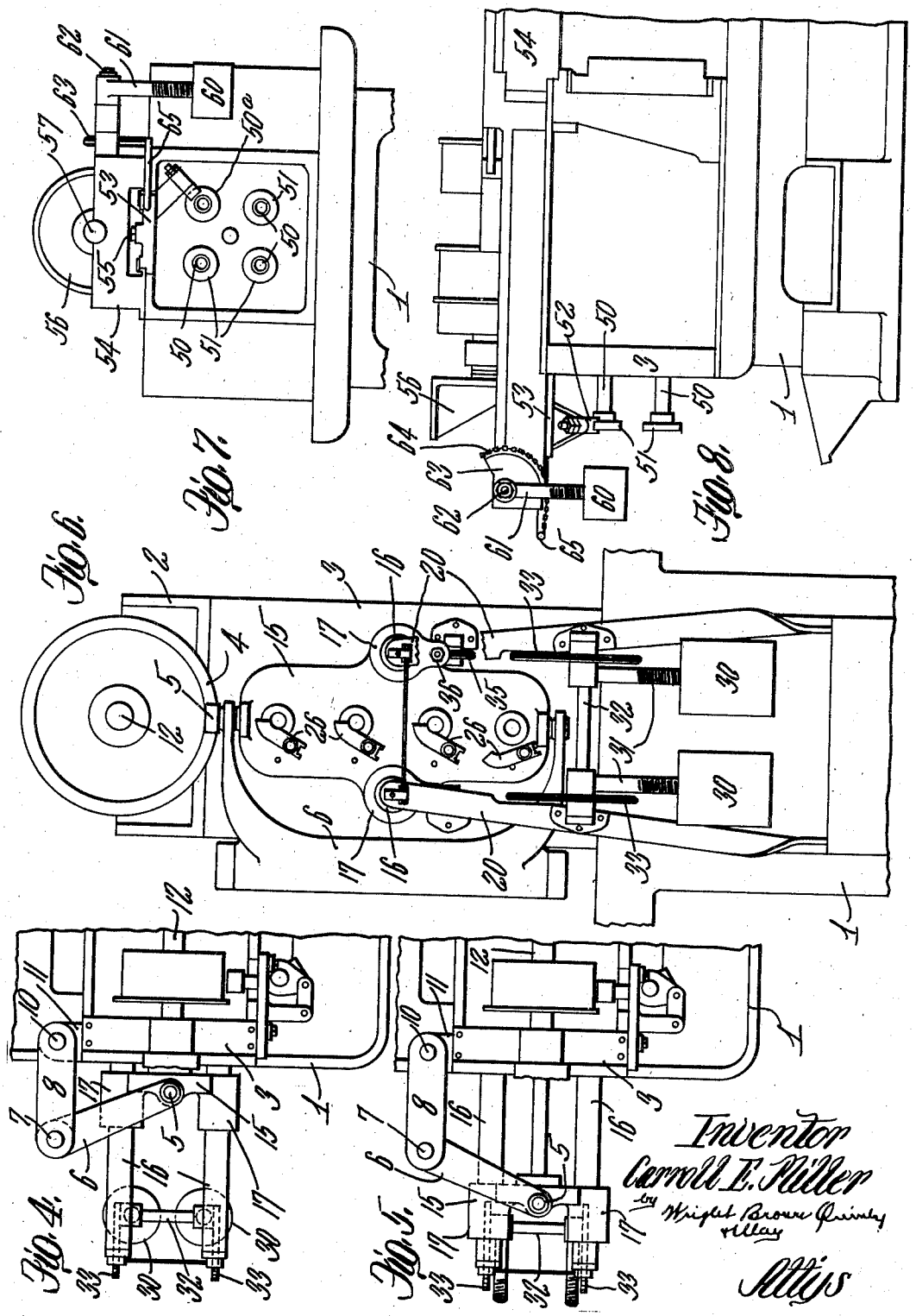


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WORK FEEDING MECHANISM

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5 Claims. (Cl. 29—62)

This invention relates to the feeding of work, and more particularly, stock in the form of a bar or the like, as practiced in an automatic lathe or screw machine. In such machines a definite length at the forward end of the stock is machined during each complete machine cycle and is then cut off, and the stock is thereafter moved forwardly by an amount determined by the position of a stock stop and is then clamped preparatory to a succeeding machining operation.

In order to move the stock forwardly a reciprocatory frictional gripping means for the stock is commonly employed, the stroke of which is made to exceed the length to be fed so as to insure a sufficient feed, the gripping means slipping on the stock after the stock being fed has been positively stopped. This has resulted in the stock being stopped with considerable violence when it strikes the positive stop, causing undesirable stresses, wear and noise.

An object of the present invention is to provide a feeding mechanism, which, while exerting sufficient force to insure the proper feed of the stock, will bring the stock up to the stop without substantial shock or without the necessity of the feeding means slipping over the stock. To these ends, means are provided for decreasing the force on the stock as it approaches the stopped position, and for providing a non-positive feed motion. A simple means for so decreasing this force comprises a lever through which the force of a weight or the like is so arranged as to have a decreasingly effective action during the feeding travel of the stock feed, and such a mechanism is herein illustrated.

For a more complete understanding of this invention, reference may be had to the accompanying drawings in which

Figures 1 and 2 are fragmentary elevations of a multiple spindle automatic lathe of the type shown in the Cone Patent No. 1,765,130 granted June 17, 1930, and showing an embodiment of this invention applied thereto, the mechanism being shown at the end and at the start, respectively, of a stock feeding action.

Figure 3 is a fragmentary elevation of the opposite side of the machine and showing the mechanism in the position of Figure 1.

Figures 4 and 5 are fragmentary plan views of the parts shown in Figures 1 and 2, respectively, the actuating cam being broken away.

Figure 6 is a fragmentary end elevation of the parts as shown in Figure 1.

Figure 7 is a fragmentary end elevation of an automatic lathe of another type and showing an application of the invention thereto.

Figure 8 is a fragmentary side elevation of the same.

Referring first to the construction shown in Figures 1 to 5, inclusive, at 1 is shown a machine base, and at 2 a frame member spaced above said base and substantially parallel thereto and supported by suitable other frame pieces such as 3. Within the frame piece 2 and substantially horizontal is positioned a cam shaft 12 on the outer end of which is an edge cam 4. Against the outer edge of this cam rides a cam follower 5 on a vertically pivoted yoke member 6. As shown best in Figure 3, this yoke member is pivoted as at 7 to a link 8 which has upper and lower arms 9 pivoted at 10 to brackets 11 carried by an upright frame member such as 3 on one side of the machine. The yoke member 6 has its ends pivoted concentric with the follower roll 5 to a slide 15 mounted for reciprocation on a pair of guide bars 16, the slide 15 being provided with a pair of guide sleeves 17 through which the guides 16 are passed. The outer ends of the guide bars 16 may be supported as by bracket arms 20 from the machine base 1.

The machine is provided with a plurality of hollow work spindles as 25 arranged in superposed relation as shown in the Cone Patent No. 1,765,130 to which reference has heretofore been made. Each of the work spindles is provided with a reciprocatory feed tube as noted in said patent, and these feed tubes extend through the slide 15 and may be attached to move therewith as by means of individual latch members 26 as shown in Figure 6. These feed tubes may be of any suitable or usual type, such, for example, as those commonly used in connection with the feeding of bar stock which is held in the spindle at suitable times in the operation of the machine as by spring collets. Whenever it is desired to effect a feeding movement of any particular stock feed tube, it is latched to the slide 15 to partake of the motion of this slide, the three upper sleeves being shown as so connected in Figure 6, while the lowest one is released therefrom. Feeding motion of such feed tubes as may be latched to the slide 15 is produced on inward motion of the slide 15 toward the rear end of the machine in opposition to the cam 4 which is so shaped as at suitable times to effect the retraction of the feed slide.

As shown, the means for producing motion of the slide 15 in feed direction comprises one or

more weights, as **30**, which are shown as carried by arms such as **31** secured to a rock shaft **32**. Also secured to this rock shaft are one or more segments **33**. About each of these segments passes a flexible connecting member **34** such as a chain or the like, which is carried inwardly and about a guide sprocket **35** and then to the slide to which it is secured as at **36**, shown as on portions of the guide sleeves **17**.

When the slide **15** is in its retracted position as moved by the high point **40** of the cam **4** (see Figure 2), the slide **15**, together with the feed sleeves latched thereto, are in retracted position and the weights **30** are in raised position, gravity thus effecting a biasing action tending to move the slide **15** and the feed tubes latched thereto in feeding direction. As soon as the cam **4** is turned so as to permit this feeding motion to take place, the weights return toward their vertical positions shown in Figures 1 and 6, and as they so return their effective lever arms tending to turn the segments **33** correspondingly decreases until when their supporting arms **31** are in substantially vertical position, there is no biasing effect to move the feed tubes in feeding direction. The parts are so proportioned that the weights **30** reach substantially this non-biased position when the stock is in butting relation to the stock stop. Thus the tendency to feed the stock is greatest at the start of the feeding action and is reduced to substantially zero when the stock reaches its fed position and is positively stopped by the stock stops. Thus the stock is brought up against the stops with a gentle action, the pressure being determined by the length of the effective lever arm and the mass and mounting of the weight, and since the feed is not positive, the stock-gripping means of the feeding tubes is not required to slip over the work during the motion thereof in feeding direction.

In Figures 7 and 8 the invention is shown as applied to a multiple spindle automatic machine of a well known "Cone" type where a plurality of work-holding spindles are carried in a drum which can be indexed about an axis to bring the spindles successively into various angular positions or stations where work may be done on the stock carried by the several spindles. As shown in Figure 7 there are four work spindles, though more or less than four might be employed if desired, each being provided with its own feed tube **50** provided with a head **51** by which it may be engaged and actuated. As shown there is one station wherein the stock is fed, this being shown at **50***a* in Figure 7 and as each of the spindles arrives in its turn at this station, the work may be fed for subsequent tooling operations. As shown the feeding means comprises a yoke member **52** between the arms of which the head **51** of the feed tube in feeding position may pass. This yoke **52** is shown as carried by a slide **53** mounted for reciprocation in the top frame member **54** of the machine and having a cam follower **55** with which cooperates an edge cam **56** on the horizontal cam shaft **57** by which the various operations of the machine may be controlled.

The biasing of the feeding means to feeding position is accomplished, as shown, by the weight **60** carried by an arm **61** fixed to a rock shaft **62** and this rock shaft is shown as carrying a segment **63** about which passes a flexible pull element such as a chain **64**, the opposite end of which is secured to an arm **65** carried by the outer portion of the slide **53**. Thus as the cam **56** is turned to permit the follower **55** to move to the right, as shown in Figure 8, the corresponding feed tube is actuated by the weight **60** in feeding direction, the biasing force decreasing as its effective lever arm decreases as the arm **61** approaches a vertical position, as shown in Figures 7 and 8. The retracting motion of the engaged feed tube is effected by the cam **56**, which, as its high point approaches toward contact with the cam follower **55**, moves the slide **53** in retracting direction, and raises the weight **60** with the arm **61** toward the horizontal, thus increasing the effective lever arm through which the weight **60** acts and increasing its biasing effect on the feeding mechanism. Here again, the parts are so arranged and proportioned that the stock reaches the stock stop at or shortly before the weight **60** reaches its non-biasing position.

From the foregoing description of certain embodiments of this invention, it should be evident to those skilled in the art that various changes and modifications may be made without departing from its spirit or scope as defined by the appended claims.

I claim:

1. In combination, a hollow work spindle, reciprocable means for feeding work step by step through said spindle, means applying a force as the work feeding means moves in feeding direction progressively decreasing to a value so low that the work reaches its fully fed position without substantial shock, and means for retracting said feeding means.

2. In combination, a hollow work spindle, means for feeding work through said spindle and means for actuating said feeding means, said actuating means including a lever having an effective length variable during the feeding action of said feeding means and with said effective length so short at the completion of the feed that the feed stops without substantial shock.

3. In combination, a hollow work spindle, reciprocable means for feeding work through said spindle, means for retracting said feeding means, and means acting with a decreasing force as said feeding means approaches a limit of feeding motion for actuating said feeding means, said force being so small at said limit that the feed stops substantially without shock.

4. In combination, a hollow work spindle, reciprocable means for feeding work through said spindle, means biasing said feeding means toward a limit of feed direction and with a force decreasing as said feeding means approaches said limit, said force being so small at said limit that the feed stops substantially without shock, and means for retracting said feeding means in opposition to said biasing means.

5. In combination, a hollow work spindle, a work feed sleeve reciprocable in said spindle and provided with work-gripping means, a slide movable substantially parallel to said spindle, means on said slide operatively connected to said feed sleeve, a substantially horizontal rock shaft, a sector carried by said rock shaft, flexible connections between said sector and slide, an arm carried by said rock shaft, a weight carried by said arm, said arm and weight being so angularly positioned that said weight is raised as said slide is retracted and acts with decreasing effort adjacent to vertical alinement with said rock shaft as said slide approaches its inmost position in its work-feeding stroke, and means for retracting said slide.

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