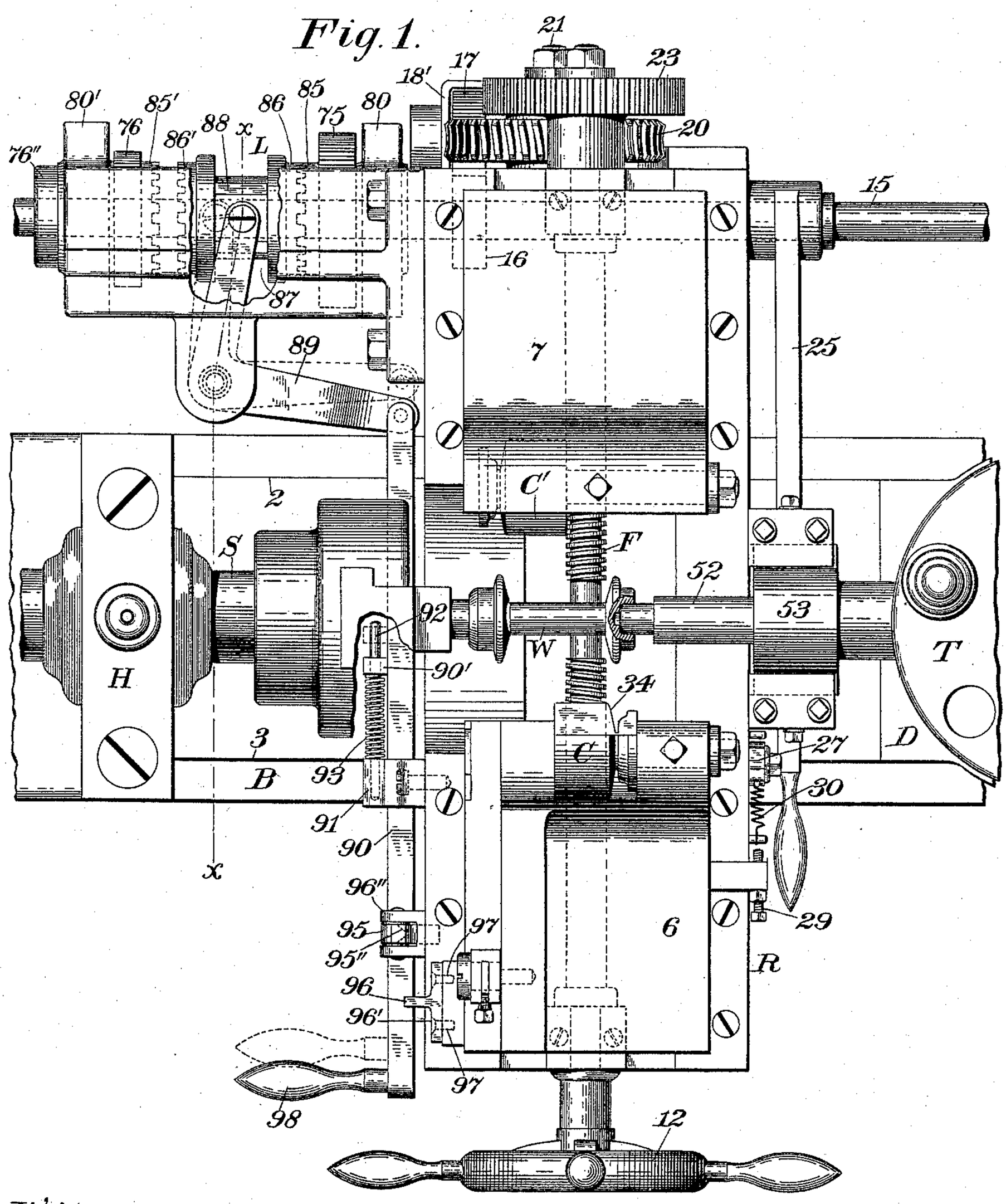
(No Model.) 3 Sheets—Sheet 1.

W. W. TUCKER.

FEED MECHANISM FOR TURNING MACHINES.

No. 540,285. Patented June 4, 1895.

Fig. 1.



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Inventor:
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By his Attorney,
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(No Model.) 3 Sheets—Sheet 2.

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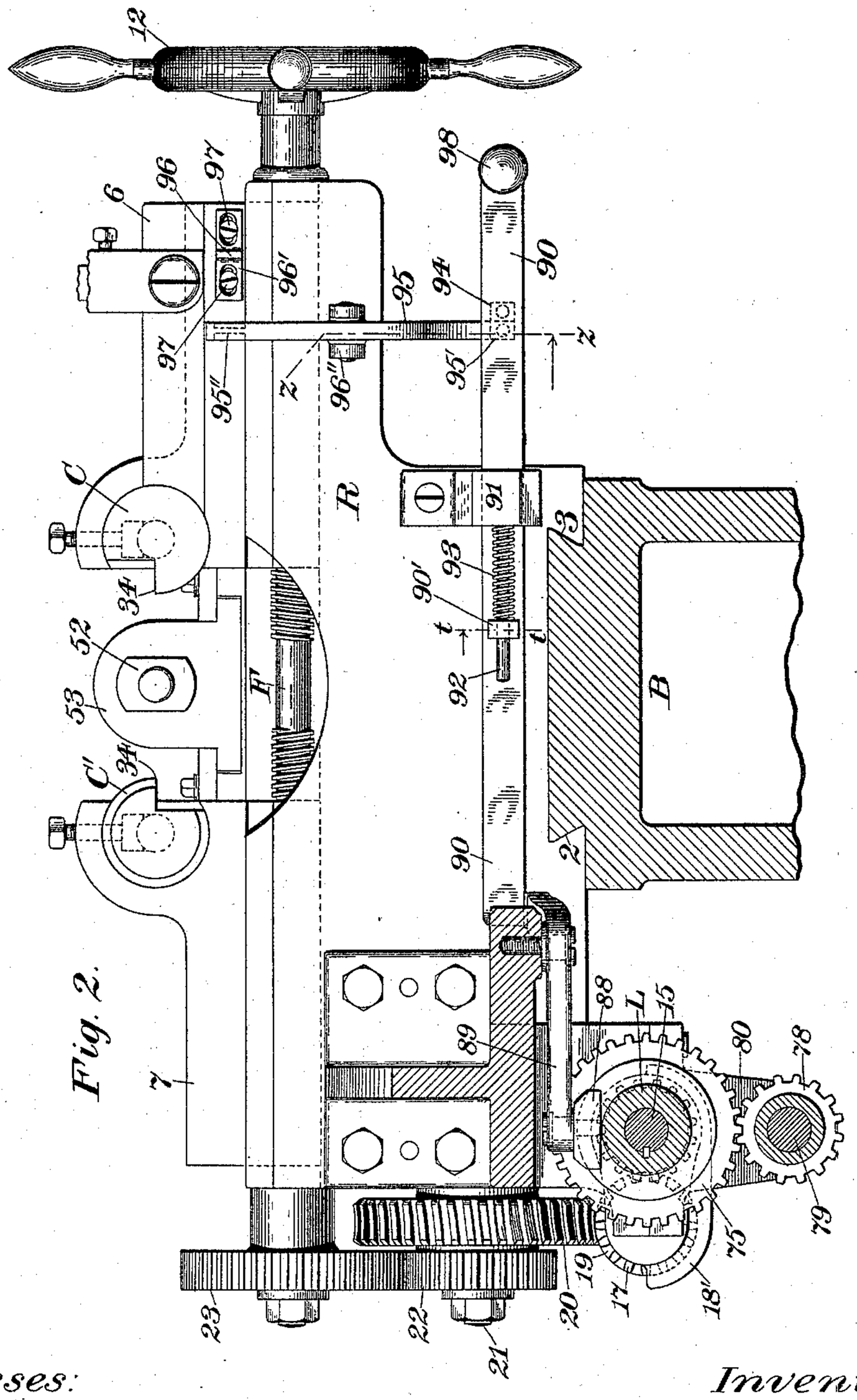

Fig. 2.

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(No Model.) 3 Sheets—Sheet 3.

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FEED MECHANISM FOR TURNING MACHINES.

No. 540,285. Patented June 4, 1895.

Fig. 3.

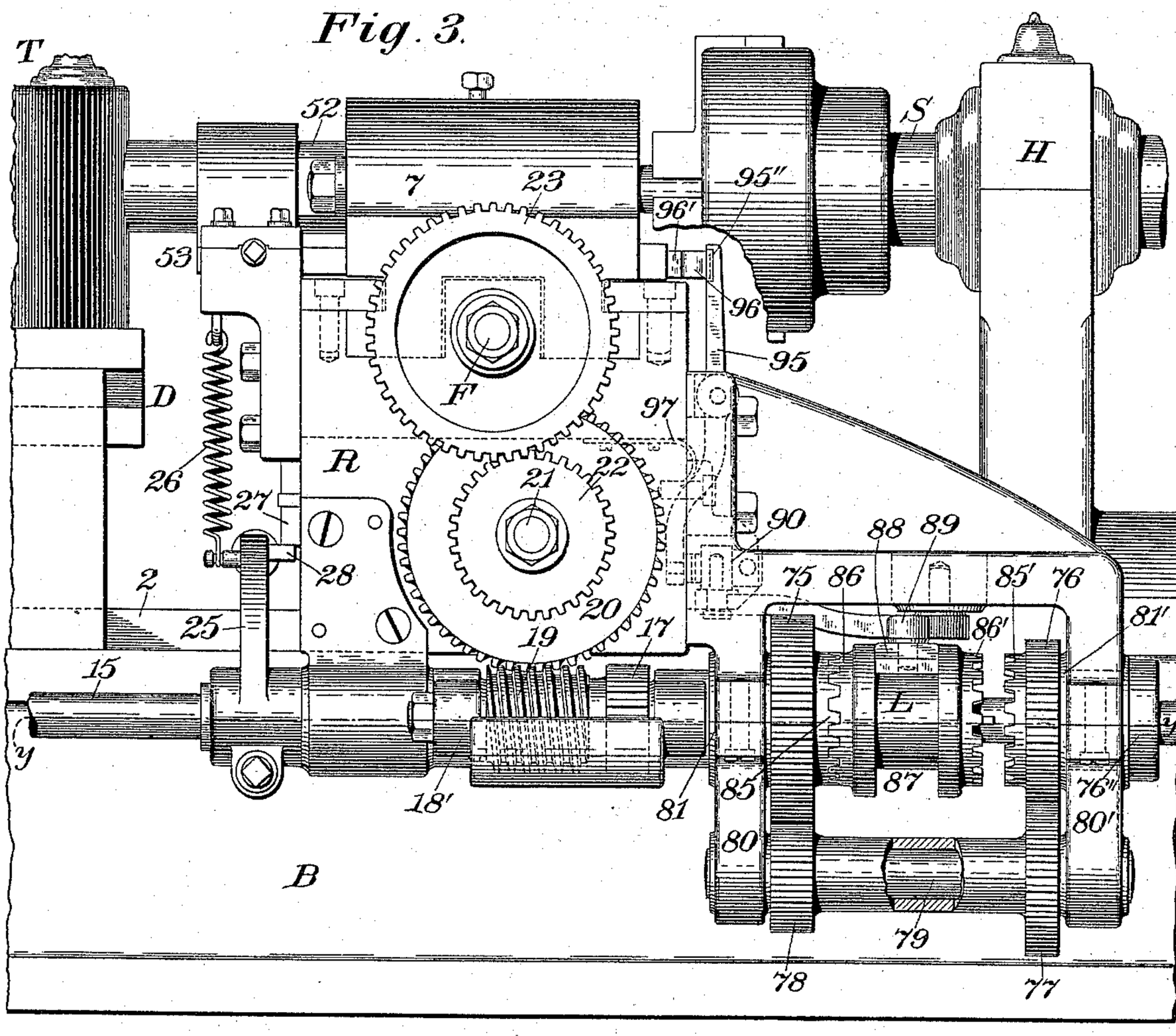


Fig. 4.

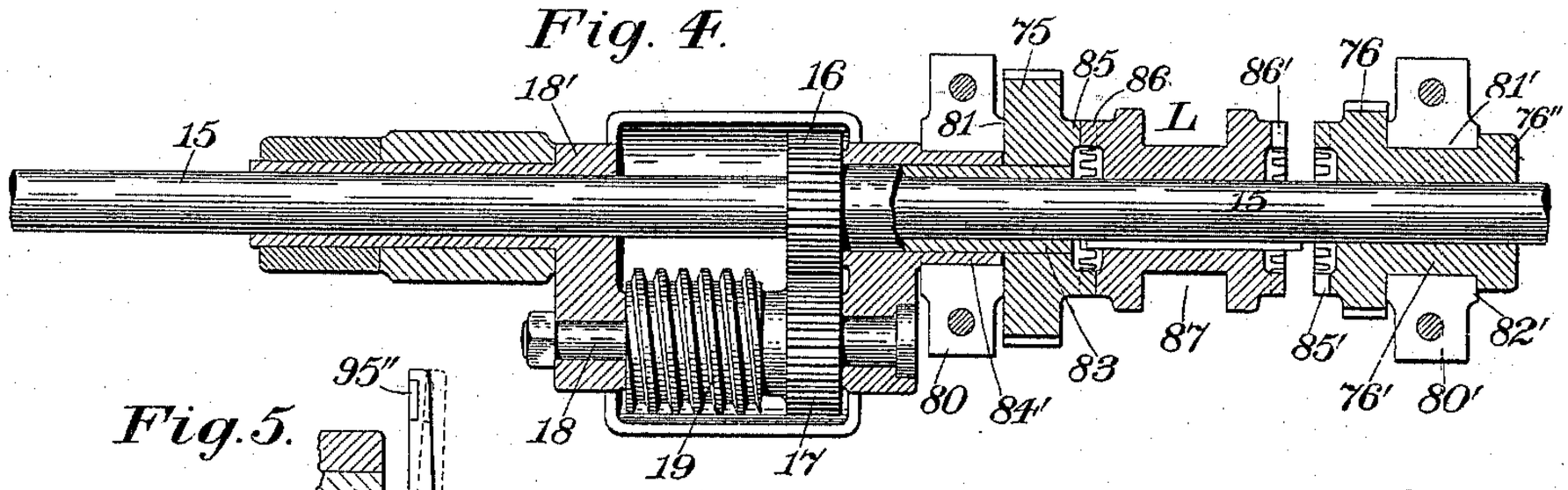


Fig. 5.

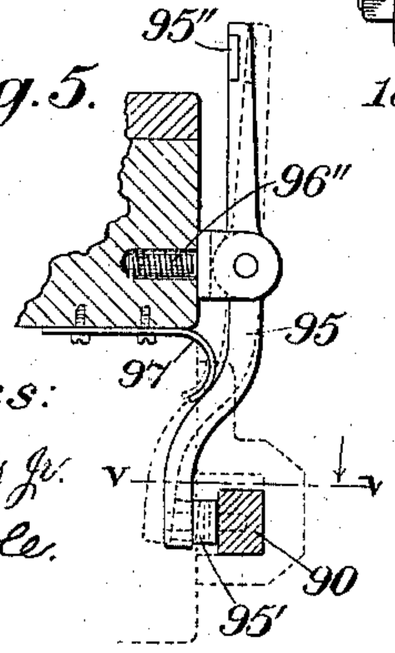


Fig. 6.

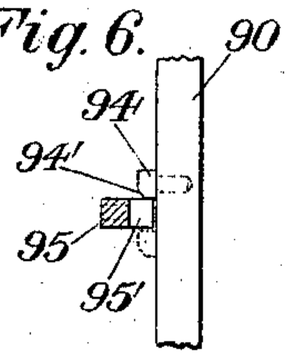
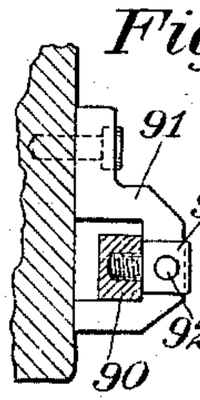


Fig. 7.



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Inventor:
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UNITED STATES PATENT OFFICE.

WILLIAM W. TUCKER, OF HARTFORD, CONNECTICUT.

FEED MECHANISM FOR TURNING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 540,285, dated June 4, 1895.

Application filed February 15, 1895. Serial No. 538,565. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM W. TUCKER, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Feed Mechanism for Turning-Machines, of which the following is a specification.

This invention relates to turning-machines, and more especially to machines of that class adapted for metal turning; the object of the invention being to provide a machine of this class, in which a relatively-short longitudinal surface of a blank, or rod, may be turned with a relatively-rapid speed of operation, and a relatively-long longitudinal surface of said blank or rod may be turned with a relatively-slow speed of operation, as compared with that of the turning of the relatively-short, longitudinal portion of such rod or blank, and to carry out the two turning operations successively; so that in a machine of a given capacity, when operating upon the stock at one rate of speed, which rate is necessarily slow in turning a relatively-long longitudinal portion or surface of the stock or blank, any portion of such stock or blank, which is of a different cross-section from that of the major portion of the stock, and is relatively short in longitudinal direction, as compared with such major portion of the work, may be turned with a relatively-rapid speed of operation, as compared with, and either before or after, the turning of the longer turning of the blank, and the capacity of the machine correspondingly increased.

Another object of the invention is to provide, in connection with a turning-machine, adapted for operating upon stock having one portion thereof relatively short in longitudinal direction, as compared with the other, and of a greater cross-section than that of the other, means for turning down the relatively-short portion of the stock with a relatively-rapid rate of operation; and means for automatically decreasing the rate of turning the stock at the beginning of the turning of the longer portion of the piece being operated upon.

In the drawings accompanying and forming part of this application, Figure 1 is a plan of a turning-machine constructed in accordance with my present improvements, portions of the apparatus being removed to show the construction. Fig. 2 is a transverse sectional end elevation, the section being taken in line *x x*, Fig. 1. Fig. 3 is a rear elevation looking from the upper side of Fig. 1. Fig. 4 is a horizontal longitudinal sectional plan, the section being taken in line *y y*, Fig. 3. Fig. 5 is a detail vertical sectional elevation, the section being taken in line *z z*, Fig. 2, looking in the direction of the arrow. Fig. 6 is a detail horizontal sectional plan, the section being taken in line *v v*, Fig. 5, looking in the direction of the arrow. Fig. 7 is a detail sectional elevation taken in line *t t*, Fig. 2, and also looking in the direction of the arrow.

Like characters designate like parts in all the figures.

My invention comprises, in part, and in combination with a frame having a rotary stock-carrying spindle, and with a cutter disposed at one side of the spindle-axis and adapted for movement toward and from the same; means for feeding the cutter toward and from the spindle at the rate of movement, to turn down the stock with a corresponding speed of operation; and means for varying, or automatically changing, the rate of feed of the cutter toward the spindle after a predetermined period of opertion, to thereby vary the speed of the turning operation upon the stock, all of which will be hereinafter more fully described.

My present improvements are designed for use in connection with a machine for turning bicycle-hub blanks or other hub-blanks, and are particularly applicable to the hub-blank-making machine shown in my Patent No. 527,907, granted October 23, 1894. In this former patent, I have shown a machine particularly adapted and intended for the formation of finished hub-blanks from a continuous metallic rod, while in the present case my improvements are especially designed for the turning down of hub-blanks previously formed in the usual manner of forging articles of this kind.

It will be remembered, that in my former patent, a cutter was given a progressive feed toward the stock, during the entire operation of turning the rod, which rate of feed was maintained, unchanged throughout the en-

tire operation. This feed was necessarily a slow one, owing to the fact that the blanks had to be formed from a continuous rod of approximately the same cross-section at all points thereof, and hence a long cutting-edge was at times operating upon the blank, both during the turning down of the central journal portion of the hub, and during the subsequent turning of the flanged or dished portions of the hub-blank. In the present case, however, owing to the fact that, as before stated, the hub-blank is first roughly formed by forging, to approximate to the shape of the finished article, it is not necessary that the cutter or cutters operate continuously upon the long, central, journal portion, or hub proper, of the blank; but only that said cutter, or cutters, turn the blank during a portion of the operation. Although it is necessary, of course, that the cutter be fed at the same relatively-slow rate of movement in both cases, during the turning down of the journal portion of the hub-blank, it is not essential that such slow feed of the cutter be maintained during the turning of the flanged or dished portions of the hub-blanks, when said blanks are first formed approximately to shape by forging; and, in the present application, I have shown, and will hereinafter describe means for feeding the cutter at a relatively rapid rate of movement, during the turning of the flanged portions of the blank, as compared with the rate of feed of said cutter, during the turning of the journal portion of the blank.

For the purposes of the present application, only so much of a turning, or hub-blank-making machine is herein shown, as is necessary for clearly illustrating the operation of my present improvements; and for a more detailed description of the same, reference is made to my prior patent hereinbefore referred to.

The framework of the machine, which may be of any suitable construction for carrying the several operative details, is shown herein as similar to the ordinary lathe-frame, and as consisting of a bed B, having the usual, longitudinal slideways 2 and 3. A turret T, is also shown as supported in the usual manner, upon a sliding carriage D, which carriage will be reciprocated, longitudinally of the bed in any suitable or well-known manner, and will be held in place by any well-known means. At the opposite end of the machine, a spindle-carrying head is shown at H, as supporting for revolution a work-carrying spindle S, which will be driven from any suitable source of power. Not herein shown.

Between the turret T and the spindle H, a slide-rest is shown at R, as supported upon the bed B, and disposed transversely thereto. This slide-rest is, or may be, formed of two horizontally-disposed slide-blocks, both of which are movable together longitudinally of the machine, suitable fastening means being provided to maintain the slide-rest in its adjusted position upon the bed. This slide-rest R has slideways at its upper side, and ranging transversely of the bed B, two oppositely-disposed cutter-carrying slides 6 and 7, being shown as supported therein, one at each side of the longitudinal axis of the spindle; a right-and-left-hand screw F, being also shown as extending through the slide rest, and adapted for simultaneously actuating both of the cutter-slides, toward or from, the spindle. This feed-screw is held against longitudinal movement in any well known manner, and as a means for rotating the same, to actuate the cutters carried by slides 6 and 7, I have shown herein an automatic changeable-drop-feed mechanism in connection therewith. This feed-mechanism is shown as having a horizontal shaft 15, journaled in bearings at the rear of the frame of the machine; and a pinion 16 which meshes with a pinion 17 upon a worm shaft 18, carrying a worm 19, adapted to mesh with a worm-wheel 20, carried upon a stud 21, having a gear-wheel 22, driving a corresponding gear-wheel 23 upon the feed-screw F. The shaft 15 is driven by any suitable means, not herein shown, and the worm-shaft 18 is shown as rotatively-supported in bearings in the arm of a bracket or rock-frame 18′, mounted for oscillation upon the shaft 15; a shifting-lever 25, being shown connected with this rock-frame, and having a spring 26 for normally holding the lever elevated, and the worm out of engagement, with the worm-wheel. In the drawings, however, the normal position is not illustrated, as the worm is shown in engagement with said worm-wheel. The lever 25 is shown as having a lug 28, adapted to be engaged by the lower end of a lever 27, pivoted to the rest R; the lever 27, having its upper arm in the path of movement of a tripping device, such as the adjustable-stop 29, carried upon one of the tool-carrying slides; and also having a spring 30 for normally maintaining the lower end of this locking-lever in engagement with the catch or lug 28. The movements of these levers 25 and 27 will be limited by suitable stops.

The construction of the drop-feed devices, just described, is substantially identical with that of the corresponding mechanism illustrated in my prior patent, hereinbefore referred to; and, for a more particular description of the details of said feed devices, reference may be had to said patent.

In practice, the feed-screw F will be provided at one end thereof, with a hand-wheel 12, by means of which the screw may be turned to bring the cutters into working position, or to retract the same, when the feed mechanism is thrown out of working position. In the form thereof, herein shown, the cutters, designated respectively by C and C′, are approximately circular in cross-section, each of these tools being cut away at one side, to form a cutting-edge 34, the contour of said cutting-edge, in the present case, conforming to the contour of one-half of the wheel-hub which is to be

turned. The two cutters are so constructed, and so adjusted, relatively to each other, and to the blank, as to finish the turning of the entire hub-blank at one continuous operation, one cutter acting upon and turning one-half, and the opposite cutter turning the other half, of the forging; and the cutters acting upon opposite sides, and at opposite ends of the forging, and having their inner cutting edges in overlapping planes. The construction of the cutters, and of the slides, and the organization of the same, and their holding and adjusting devices, may be substantially the same as described in my patent hereinbefore referred to.

The turret T will preferably be provided with a series of tools (not shown), for drilling and counterboring one end of the rough forging, and is also provided with a carrying-pin 52 for engaging and centering that end of the forging which is adjacent to the turret, and for supporting the said end during the entire cutting operation. This carrying-pin preferably slides through, and is guided in, the longitudinal bore of a supporting guide-block, shown at 53, as fixedly-carried intermediate of the turret and the blank to be operated upon. This guide-block is also preferably provided with adjusting-screws, for permitting adjustment thereof, and for locking the same in its adjusted position.

It will be evident from the foregoing description, that if the pinion 16, were fixedly-secured to the shaft 15, the feed-screw F, with the worm 19 in mesh with the worm-wheel 20, would be continuously actuated at the same speed of movement, and that the rate of feed of the cutters would always be the same. In order to provide for a variable rate of feed of said cutters, the pinion 16 is shown, however, as loosely mounted upon this shaft 15, and as in connection with a differential train of gearing for imparting, in accordance with the action of a suitable clutch device, a faster or slower rotative movement to the pinion 16. In the form thereof herein shown, the differential train of gearing comprises a pair of terminal gears, or spur wheels 75 and 76, loosely mounted upon the shaft 15, and a second pair of co-operating, connected spur wheels 77 and 78, sleeved upon a pin or stud 79, fixed transversely of a bracket formed by two hangers 80 and 80′, depending from the rear side of the slide-rest R. Each of the spur-wheels 75 and 76 is shown as held in place in one direction, longitudinally of the shaft 15, and relatively to the hangers 80 and 80′ by the flanged sides of the bearings 81 and 81′ of these hangers. As a means for facilitating the adjustment of members of the differential train in position, each of these hangers is shown as formed in two parts, the line of division being along the median line of the journal formed in the bearings 81 and 81′, and the two halves of each hanger being bolted together. The spur-wheel 76 is also shown as having a long hub, or journal 76′, and a flanged end 76″ upon said hub, and engaging the face 82′ of the bearing 81′, while the spur-wheel 75 is shown as having a long hub or sleeve 83, mounted upon the shaft 15 and within the bushing 84′ of the rock-frame 18′. The sleeve 83 is also shown as having fixedly-secured to the end thereof the pinion 16, so that the rotation of the spur-wheel 75 will also actuate said pinion. The gear-wheels 76 and 77 are shown herein as a one-to-one train of gears, and the gear-wheels 78 and 75, as a one-to-two train of gears, so that when the pinion 16 is rotated directly by the spur-wheel 75, its speed of movement will be twice as great as when rotated from the spur-wheel 76 through the gear-wheels of the differential-train.

As a means for coupling either one of the spur-wheels 75 or 76 to the shaft 15, a clutch-sleeve, designated in a general way by L, is shown herein as splined upon the shaft 15 and intermediate of, and slidable into and out of operative relation with the two gear-wheels 75 and 76. Each of these gear-wheels is shown as having a clutch-member fixed to its inner end and designated respectively by 85 and 85′, and the clutch-sleeve L is also shown as having co-operating clutch-members 86 and 86′ upon its opposite ends. These clutch-members upon the sleeve L and upon the respective gear-wheels 75 and 76 are preferably formed with engaging-teeth, so that the coupling constitutes a double crown-clutch. Intermediate of the clutch-members 86 and 86′, the sleeve L is shown as formed with a peripheral-guideway or groove 87, the walls of which are adapted to receive, and be engaged by a friction-shoe 88, carried upon the end of a shifting-lever 89, pivotally-mounted upon the rest R. This shifting-lever is shown as of a bell-crank construction, and as having its opposite end pivotally-connected with one end of a slide 90, mounted for longitudinal reciprocation in a bracket 91, secured to the left-hand side of the slide-rest. The slide 90 is adapted and intended to hold the lever 89 in such a position, that during the first portion of the turning operation, the clutch-member 86 will be engaged with the co-operating clutch-member 85 of the spur-wheel; and this slide is also adapted to be automatically-shifted in position, so as to release the clutch-member 85, and to cause the engagement of the two members 85′ and 86′ of the opposite clutch, after a determined period of operation of the machine. In the present case, the slide 90 is shown as provided with a stop 90′ upon its outer side, said stop being herein shown as an eyebolt screwed into the slide, and adapted to permit the sliding of a rod or pin 92 therethrough. This guide-pin is shown as connected at its forward end to the bracket 91, and as carrying between the inner stop-faces of this bracket and the stop 90′, a spiral-spring 93, which is adapted to be held under compression, when the clutch-members 85 and 86 are in engagement.

As a means for normally holding the slide

90 in its forward position with the spring 93 under compression, said slide is shown as provided with a stop-pin 94 having an inclined face 94′, and this stop or pin is adapted to be engaged and held by a detent 95′, carried at the lower end of a lever 95, pivoted upon the left-hand side of the slide-rest R, for oscillation in a plane substantially parallel with the longitudinal axis of the machine. This lever has its pivotal point, in the present case, in an eyebolt 96″, screwed into the side of the slide-rest, and said lever is normally held by means of a spring, such as 97, in engagement with the forward side of the pin 94. As a means for releasing the detent 95′ from engagement with the pin 94 of the slide 90, the lever 95 is shown as provided at its upper end with a releasing-member 95″, formed as a portion of the lever itself, and having tapering faces converging toward the adjacent face of the slide-rest R; and, as a means for engaging this releasing-member, and releasing the detent 95′ from engagement with the pin 94, a tripping-arm 96 is shown herein as mounted upon the slide 6 of one of the cutters for movement with such cutter-slide, this tripping-device being reciprocatory across the face of the member 95″.

From the foregoing, it will be evident that during the turning down of the flanged or dished portions of the forging W (which it will be understood has been first drilled and counterbored at that end thereof, which is engaged by the carrying-pin 52), the clutch-members 85 and 86 will be in engagement, and the spur 16, rotating in unison with the shaft 15, will feed the screw F with a relatively-rapid rate of movement, and thereby also the cutters C and C′. During this portion of the operation, the slide 90 will lie in its forward position with the pin 94, engaged by the detent 95′ of the lever 95, and with said pin in advance of said lever, the parts being in the positions shown in full lines in the drawings, and the spring 93 being under compression. The tripping device 96, is preferably adjustable, in any desired manner, longitudinally of the slide 6, as shown in Fig. 2, the adjustment being effected in this case by means of screws 97, engaging the walls of longitudinal slots in the carrier-plate 96′, upon which the tripping-arm is secured. If the tripping-arm has been properly adjusted, it will be evident, that when the first stage of the turning operation is completed; that is, the turning of the flanged or dished portions of the blank, and immediately before the beginning of the turning of the journal portion of the hub-blank, the tripping-arm will engage the adjacent, tapered side of the releasing-member 95″, and throw the upper arm of the lever 95 toward the left-hand side of the machine, against the action of the spring 97; and, by the oscillation of this member upon its pivot, will cause the release of the detent 95′ from the stop 94 upon the slide 90, whereupon the slide will be actuated toward the rear of the machine by the spring 93, and the shifting-lever 89 will be thrown to the position shown in dotted lines in Fig. 1, the clutch-member 86 being at the same time released from the co-operating member 85, and the coupling of the members 85′ and 86′, being effected. The gear-wheel 76 will then rotate in unison with the shaft 15, and the spur-wheel 75 and the pinion 16 will rotate with a relatively-slow movement, as compared with the rate of rotation of the shaft 15, and hence the feed-screw F will feed the cutters C and C′ with a relatively-slow movement, during the turning down of the journal portion of the hub-blank, as compared with the rate of feed of said cutters, during the turning of the flanged or dished portions of this blank; and this relatively-slow rate of feed of the cutters will be maintained until the completion of the turning operation, when the stop, or trip 29, will engage the upper end of the locking-lever 27, and release the lower end of said lever from the stop 28 upon the lever 25, when the rock-frame 18′ will be oscillated upon the shaft 15, and the worm 19 disengaged from the teeth of the worm-wheel 20 in the usual manner. After the completion of the operation, it will of course, be understood that the slide 90 will be returned to its forward position, as by means of the operating-handle 98, before the beginning of the turning of another blank, and that the cutters will also be retracted, by means of the hand-wheel 12, actuating the feed-screw F; also that the normal positions of the worm, and of the controlling levers and devices therefor, will be re-established.

It will be obvious, that, by means of my improved turning-machine, one portion of the stock may be turned down at a relatively-rapid rate of operation, and that the other, or long portion of the stock may be turned at a relatively-slow rate of operation, and that by this provision of a changeable feed, the capacity of such a machine will be very greatly increased. These movements are especially advantageous in the operation of a machine of the class which has been herein particularly described, as a great saving of time is effected by first forming the blanks approximately to shape, as by forging, and then finishing said blanks by first turning down, with a relatively-rapid speed of operation, the flanged or dished portions of the hub-blank, and subsequently turning off only a small portion of the journal surface, or hub proper of the blank, by a relatively-slow feed of the cutters.

Having thus described my invention, I claim—

1. In a machine of the class specified, the combination with a rotary stock-carrying spindle; and with a turning-down cutter disposed at one side of the spindle axis, and adapted for reciprocation toward and from the same; of changeable-speed feeding mechanism for reciprocating said cutter toward said spindle, at different rates of movement,

for thereby turning down the stock at different rates of speed, substantially as described.

2. In a machine of the class specified, the combination with a rotary stock-carrying spindle; and with a turning-down cutter disposed at one side of the spindle-axis, and adapted for reciprocation toward and from the same; of means for reciprocating said cutter toward said spindle at one rate of movement, and thereby turning down the stock at one rate of speed; and automatic changeable-speed feeding mechanism connected with the cutter for automatically changing the rate of reciprocation of said cutter, after a predetermined period of operation, and thereby turning down the stock at a different rate of speed, substantially as described.

3. In a machine of the class specified, the combination with a rotary stock-carrying spindle; and with a turning-down cutter disposed at one side of the spindle axis, and adapted for reciprocation toward and from the same; of means for reciprocating said cutter toward said spindle, at a relatively-rapid rate of operation, and thereby turning down the stock at a relatively-rapid rate of speed; and automatic changeable-speed feeding mechanism connected with the cutter for automatically changing the rate of reciprocation of the cutter, and reciprocating said cutter toward said spindle, at a relatively-slow rate of operation, after a predetermined period of the relatively-rapid rate of reciprocation of the cutter, to thereby turn down the stock at a relatively-slow rate of speed, substantially as described.

4. In a machine of the class specified, the combination with a rotary stock-carrying spindle; of two oppositely-disposed cutters located one at each side of the spindle-axis, and adapted for reciprocation toward and from the same; means for simultaneously reciprocating said cutters toward said spindle at one rate of movement, and thereby turning down the stock at one rate of speed; and automatic changeable-speed feeding mechanism connected with the cutters for automatically changing the rate of reciprocation of said cutters after a predetermined period of operation and simultaneously reciprocating the cutters toward the spindle at a different rate of movement, to thereby turn down the stock, at a different rate of speed, substantially as described.

5. In a machine of the class specified, the combination with a rotary stock-carrying spindle; of two oppositely-disposed cutters located one at each side of the spindle-axis, and adapted for reciprocation toward and from the same; means for simultaneously reciprocating said cutters toward said spindle at a relatively-rapid rate of movement, and thereby turning down the stock with a relatively-rapid rate of speed; and automatic changeable-speed feeding mechanism connected with the cutters for automatically changing the rate of reciprocation of said cutters after a predetermined period of operation and simultaneously reciprocating the cutters toward the spindle, at a relatively-slow rate of movement, to thereby turn down the stock at a relatively-slow rate of speed, substantially as described.

6. In a machine of the class specified, the combination with a rotary stock-carrying spindle, of two oppositely-disposed cutters located one at each side of the spindle-axis, slides supporting said cutters; feed mechanism for simultaneously actuating said slides toward or from each other; a driving-shaft, a differential gear-train operatively-connected with the feed mechanism, and having its terminal gears loosely-mounted upon the driving-shaft; clutch-devices operative with said shaft, and adapted for operatively-connecting either of said terminal gears with said shaft; shifting mechanism normally holding one of said clutch devices in engagement with one of the terminal gears of the differential train; and a tripping device operated with a cutter-slide, and adapted for actuating the shifting mechanism, after a predetermined period of movement of said slide to release said clutch device, and connect the opposite clutch device with the other terminal-gear of the differential train, substantially as described.

7. In a machine of the class specified, the combination with a rotary stock-carrying spindle, and with a cutter disposed at one side of the spindle-axis, and adapted for movement toward and from the same; of a changeable-drop-feed mechanism controlling said cutter, and adapted for actuating the cutter toward the spindle, at one rate of movement for a predetermined period; means, connected with the cutter, for automatically changing the rate of feed of said feed mechanism at the end of said period of operation; and automatic let-off devices for disconnecting said feed mechanism from operative connection with the cutter at the end of the turning operation, substantially as described.

8. In a machine of the class specified, the combination with a rotary stock-carrying spindle, of two oppositely-disposed cutters located, one at each side of the spindle-axis, and adapted for movement toward and from the same; a changeable-drop-feed mechanism controlling said cutters, and adapted for simultaneously actuating the same toward the spindle at one rate of movement for a determined period; means actuated by one of said cutters for automatically changing the rate of feed of said feed mechanism at the end of said period of operation; and automatic let-off devices for disconnecting said feed mechanism from operative connection with the cutter at the end of the turning operation, substantially as described.

9. In a machine of the class specified, the combination with a rotary stock-carrying spindle, and with a cutter disposed at one side

of the spindle-axis, and adapted for move ment toward and from the same; of a slide-rest; a slide supporting said cutter, and carried by the slide-rest; feed mechanism for actuating said slide toward or from the spindle; a driving-shaft; a differential gear-train operatively-connected with the feed mechanism, and having its terminal gears loosely-mounted upon the driving-shaft; clutch devices, operative with said shaft, and adapted for operatively-connecting either of said terminal gears with said shaft; a shifting-lever normally holding one of said clutch devices in engagement with one of the terminal gears of the differential train; an actuating-slide mounted upon the slide-rest, and connected with said shifting-lever; a detent normally holding said slide against longitudinal movement; a tripping-device carried by the cutter-slide, and adapted for releasing said detent after a predetermined period of operation; and a spring for actuating said slide upon the release of said detent, and thereby actuating the shifting-lever, and releasing the clutched terminal gear of the differential train, and clutching the opposite terminal gear of said train, substantially as described.

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