J. T. THOMPSON.

MACHINE TOOL.

APPLICATION FILED JULY 10, 1919.

1,368,583.

Patented Feb. 15, 1921

3 SHEETS—SHEET 1.

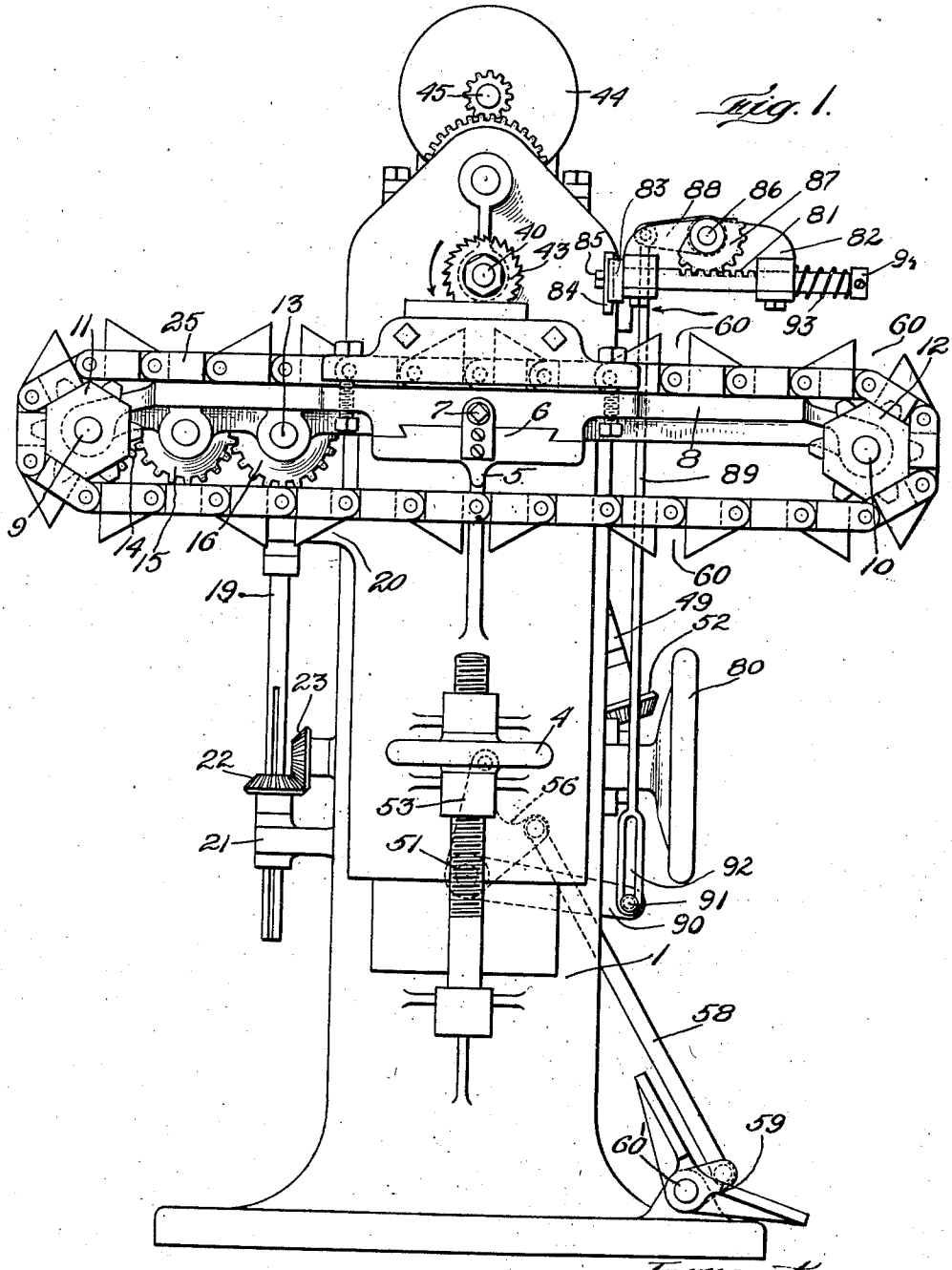


Fig. 1.

Inventor:
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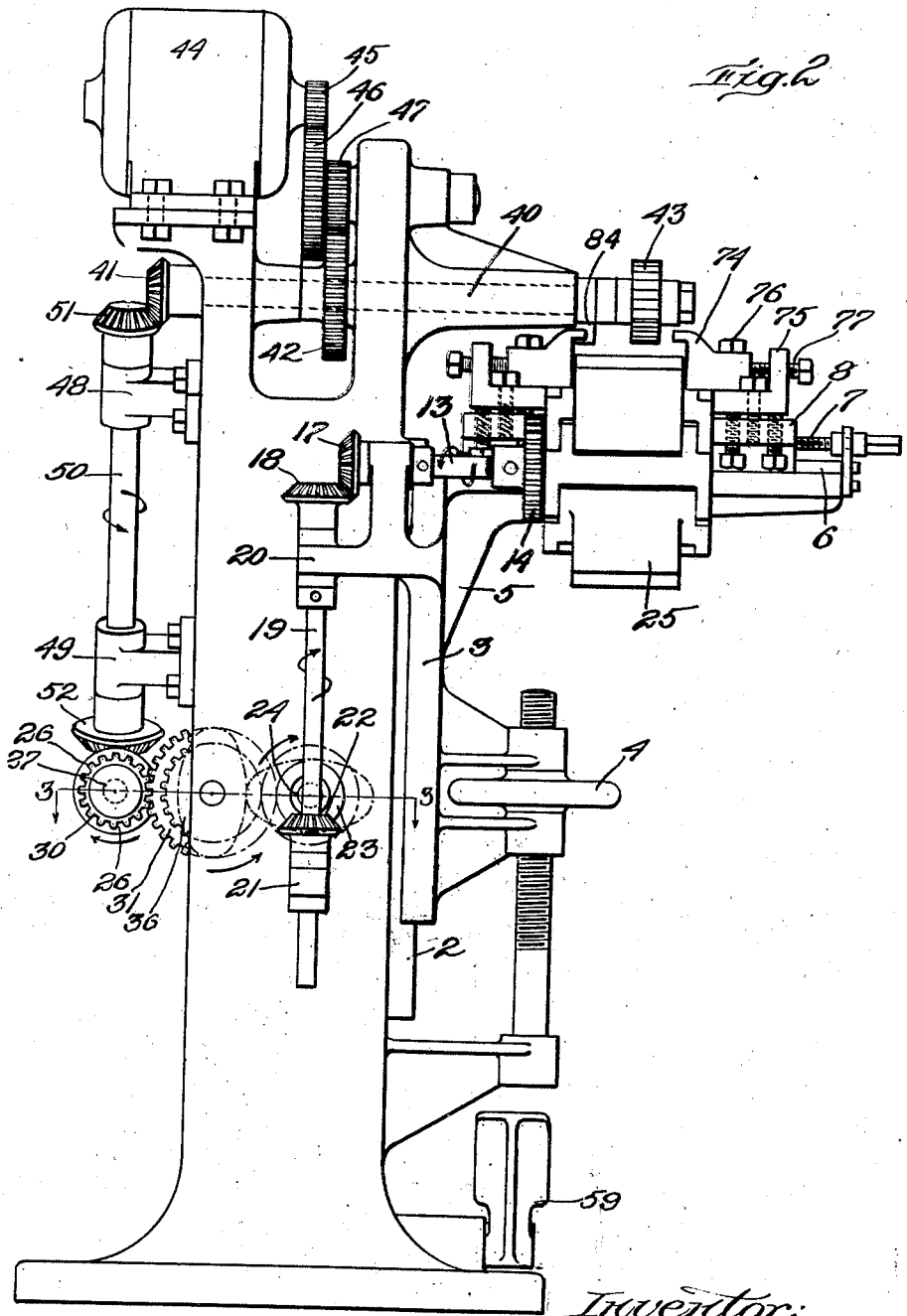
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3 SHEETS—SHEET 2.

Fig. 2



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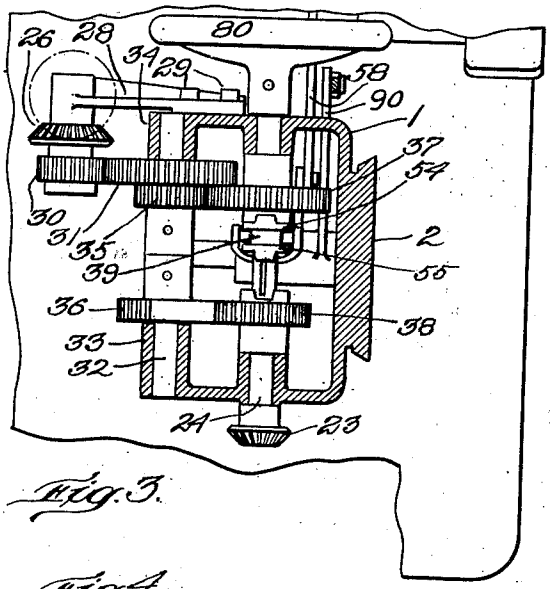


Fig. 3.

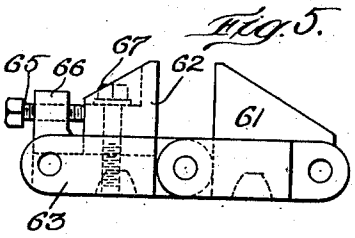


Fig. 5.

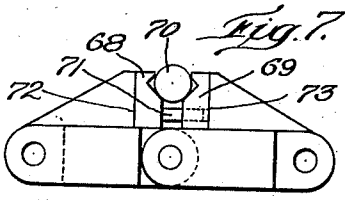
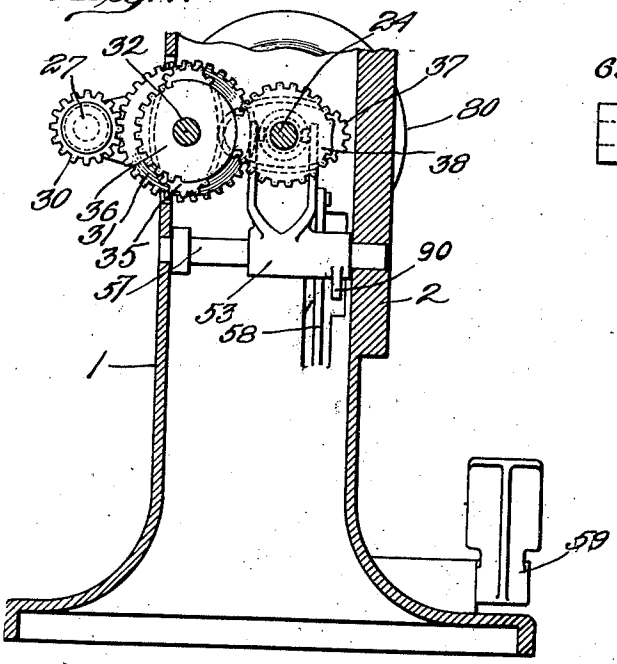


Fig. 7.

Fig. 4.



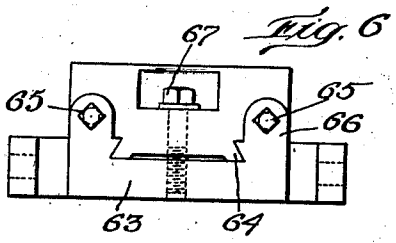
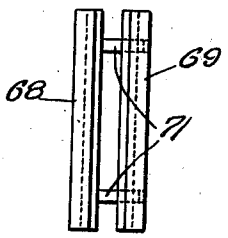


Fig. 6

Fig. 8.



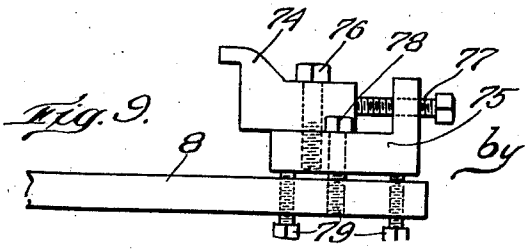


Fig. 9.

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UNITED STATES PATENT OFFICE.

JOHN TALIAFERRO THOMPSON, OF NEWPORT, KENTUCKY, ASSIGNOR OF ONE-HALF TO THOMAS F. RYAN, OF NEW YORK, N. Y.

MACHINE-TOOL.

1,368,583. Specification of Letters Patent. Patented Feb. 15, 1921.

Application filed July 10, 1919. Serial No. 309,832.

To all whom it may concern:

Be it known that I, JOHN TALIAFERRO THOMPSON, a citizen of the United States, and resident of Newport, in the county of Campbell and State of Kentucky, have invented new and useful Improvements in Machine-Tools, of which the following is a specification.

This invention relates to an automatic feed for machine tools and more particularly to a feeding belt which is adapted to automatically clamp the stock in relation to the belt, feed it past a cutting tool and automatically release the stock after work has been performed upon it.

In the quantity production of machine parts or of small articles, the cost of production is largely determined by the item of labor. If the work to be done upon an article by any single operation is small compared with the labor of setting up the work in the machine ready for the operation, the labor cost then largely exceeds all other costs incident to the production of the article. Any reduction therefore in the time consumed in setting up work in the machine decreases to a great extent the cost of production. It is therefore the principal object of my invention to reduce the time and labor consumed in setting up articles or machine parts for operations thereupon, to secure a simple and efficient means for feeding articles to an operating means or tool, to provide automatic means for securely holding the articles while work is being performed upon them and automatically to release and drop the finished articles. A further object of the invention is to provide means whereby the articles may be fed past the tool or operating means during the performance of work upon the articles or may be fed up to the tool or operating means and held stationary during the performance of work. A further object is to provide means whereby if stock is improperly set in the chucks the feeding means is automatically stopped before the tool is endangered.

In order that the nature of my invention may be more clearly understood I have illustrated one embodiment of the invention in the accompanying drawings. In this embodiment the invention has been shown by way of example applied to a milling machine, but it is to be clearly understood that the invention is as well adapted for use in any machine tool either for working on metal or wood, or for use in any machine in which it is desired to successively feed a large number of articles past mechanism for operating thereupon.

In the drawings,—

Figure 1 is a front elevational view of a milling machine provided with my improved feeding attachment;

Fig. 2 is a side elevational view of the milling machine shown in Fig. 1;

Fig. 3 is a transverse section through the pedestal of the machine on line 3—3 of Fig. 2 showing the gearing for driving the feeding attachment;

Fig. 4 is a partial vertical section through the pedestal showing transmission gearing for driving the feeding attachment either intermittently or at a variable speed;

Fig. 5 is a detail showing two feeding belt links and the chuck jaws which they carry;

Fig. 6 is an end view of one of the links shown in Fig. 5;

Fig. 7 is a detail view showing a modified chuck having both jaws fixed, a jig positioned within the chuck jaws;

Fig. 8 is a top view of the jig shown in Fig. 7; and

Fig. 9 is a detail of the clamp for preventing the feeding belt and stock from chattering when under the cutting tool.

Referring more particularly to Figs. 1 and 2, I have shown a milling machine having a pedestal 1 provided with a vertical track 2. Traversable upon the track 2 by means of a hand wheel 4 is a carriage 3. This carriage is provided at its upper end with a horizontal bracket 5 provided with a horizontal track 6. Traversable upon the track 6 by means of a screw 7 is a table 8.

Journaled in the ends of the table 8 in suitable journals are shafts 9 and 10 carrying sprocket wheels 11 and 12. The sprocket wheel 12 turns idly on shaft 10, and sprocket wheel 11 is splined to the shaft 9 to be turned thereby.

The shaft 9 is driven from the horizontal shaft 13 carried by the table 8, through gears 14, 15 and 16, the gear 16 being splined to shaft 13 but slidable thereon. Splined upon the shaft 13 is a bevel gear 17 with which a bevel gear 18 meshes. The gear 18 is mounted upon the upper end of vertical shaft 19 journaled in bearings 20 and 21 carried by the vertically traversable carriage 3. Splined to the shaft 19, but longi-

tudinally movable thereon is a bevel gear 22 which meshes with gear 23 carried on the horizontal shaft 24 journaled in the pedestal 1. The arrangement of gearing above described permits the table 8 to be raised, lowered or traversed horizontally to position work carried thereby with respect to the cutting tool, while maintaining a driving connection between the shaft 24 and the sprocket wheel 11. Mounted upon the table 8 and belted over sprocket wheels 11 and 12 is a stock feeding belt 25, the nature of which will hereinafter more fully appear.

For the purpose of driving the shaft 24 and thereby driving feed belt 25, I have provided transmission gearing shown in Figs. 3 and 4. This gearing comprises a driving gear 26 journaled upon stub shaft 27 mounted in bracket 28 attached to the pedestal 1 by stud bolts 29. Integrally connected to the gear 26 is a pinion 30 which meshes with a gear 31 fast on shaft 32 journaled in bearings 33 and 34. The shaft 32 is also provided with an elliptical driving gear 35 and an intermittent gear 36. These gears 35 and 36 mesh with similar gears 37 and 38 loosely mounted upon shaft 24. Slidable along but splined to the shaft 24 between gears 37 and 38 and adapted to engage the clutch members formed upon the hubs thereof is a clutch member 39. When the clutch member 39 is in engagement with the gear 37 as shown in Fig. 3, the feed belt is driven at a variable speed, and when the member is in engagement with gear 38 the belt is driven intermittently. For the purpose of moving the feed belt to position a piece of stock in proper relation to the cutter as in initially setting the machine for a specified type of work, a hand wheel 80 is provided on the end of the shaft 24.

Mounted in journals in the upper end of pedestal 1 and above table 8 is a shaft 40 carrying a driving gear 41, a gear 42 and a milling cutter 43. The shaft 40 is driven from a motor 44 through reduction gears 45, 46, 47. Journaled in bearings 48 and 49 carried by the pedestal 1 is a vertically disposed shaft 50 carrying gears 51 and 52, meshing respectively with gear 41 on the cutter spindle 40 and with gear 26 on stub shaft 27.

For the purpose of shifting the clutch member 39 to stop the carriage 25 or drive it variably or intermittently the member 39 may be shifted along shaft 24 by means of yoke 53 embraced between flanges 54 and 55 on member 39. The yoke 53 is provided with a bell crank arm 56 and is journaled in the pedestal 1 on shaft 57. The arm 56 is connected by a link 58 to a treadle 59 which is pivoted to the pedestal at 60'. In one position of the treadle, as illustrated in Fig. 1, the gear 37 is clutched to the shaft 24 and gears 35 and 37 drive the belt 25 at a variable speed, *i. e.*, faster when bringing stock toward the cutter than when the stock is being fed past the cutter.

When the treadle is pressed toward the left as viewed in Fig. 1, until the two arms of the treadle lie substantially in a horizontal plane, through the action of link 58 and yoke 53, the sliding clutch member 39 becomes disengaged from gear 37 and remains in a position intermediate of and out of engagement with both gears 37 and 38. The belt 25 thereupon receives no power and remains stationary. When the treadle 59 is depressed toward the left to its extreme limit, the clutch member 39 is moved into engagement with gear 38 and the feed belt is driven intermittently through gears 36 and 38, *i. e.*, the belt is advanced for a predetermined period to bring stock beneath the cutter 43 and is then held stationary for a further predetermined period while the cutter performs its cutting operation upon the stock.

The feed belt 25 above referred to comprises chucks shown more in detail in Figs. 5 and 6 forming links of the belt. Each chuck comprises two chuck members or jaws carried by separate links of the belt, one member 61 being formed integral with a link and the other member 62 being adjustable relative to the link 63 which carries it for the purpose of adjusting the distance between the chuck jaws to accommodate stock of different thicknesses. To permit this adjustment the member 62 is connected to the link by a dovetail tongue 64. Set screws 65 carried in lugs 66 on link 63 bear against the member 62 for adjusting it with respect to link 63. After adjustment the member may be clamped in its adjusted position by bolt 67. By referring to Fig. 1 it will be evident that as the belt moves over sprocket 12, the jaws of the chuck being carried by adjoining links of the belt, the jaws are opened and stock may be readily inserted. As the jaws move over the top of the sprocket the jaws gradually close upon the stock gripping it securely. This grip upon the stock is retained until the stock has been carried across table 8, when as the jaws move down over sprocket wheel 11, they open releasing the stock.

In Figs. 7 and 8 I have shown a jig for holding a small irregularly shaped piece of stock in proper position within the feed belt chuck 60' to be operated upon by the cutting tool. This jig comprises two members 68 and 69 adapted to embrace the stock, and as illustrated the members on their contiguous faces are provided with grooves for engaging a cylindrical piece of stock 70. The member 68 is provided with dowel pins 71 which are arranged to engage in openings in the member 69 for alining the two members of the jig. The jig is provided

with substantially parallel outer faces 72 and 73 which when the stock is positioned within the jig are so spaced apart that the jaws of the chuck 60′ securely grip it and the stock therein during the movement thereof beneath the cutter. With jigs of this type pieces of stock may be quickly and accurately positioned in the chucks of the belt as the belt passes up over the sprocket wheel 12.

In order that the stock held by the chucks of the feed belt may not chatter under the action of the cutting tool, the belt is held firmly against the table 8 by clamps 74. The clamps 74 are slidably secured on supports 75 being held thereto by bolts 76, and capable of adjustment thereon by means of set screws 77. The clamps may thus be moved laterally over the edges of the belt and also over the edges of the stock if desired. The support 75 may in turn be raised and lowered with respect to the table 8 by means of bolt 78 and set screws 79 to adjust the pressure of the clamp 74 against the belt.

It may sometimes happen in the operation of the machine that a piece of stock will be inaccurately positioned in a chuck 60′ of the feed belt in such a manner that it would project to too great an extent above the table 8 of the machine and thus cause the cutting tool 43 to make an excessive cut therein. This would not only spoil that particular piece of stock but endanger the cutting tool. To obviate this difficulty I have provided an automatic throw out device for stopping the feed belt when a piece of stock approaches the cutter which would, through its excessive projection above the table 8, endanger the cutting tool. This device is best illustrated in Fig. 1 and comprises a rack 81 slidable in the support 82 which is suitably secured to the pedestal 1 above the table 8. The rack bar 81 at its end toward the cutter 43, is provided with a clamping head 83 within which a downwardly extending finger 84 may be adjustably secured by a bolt 85. Journaled in the support 82 above the rack 81 is a rocker-shaft 86 provided upon its forward end with a segmental gear 87 which meshes with the rack 81, and upon its rear end with an arm 88. The arm 88 is connected by a link 89 to an arm 90 formed integrally with the hub of the clutch shifting yoke 53. The connection between the link 89 and the arm 90 is by a pin and slot construction as shown at 91 and 92 in Fig. 1. A spring 93 surrounding the rack bar 81 and positioned between the collar 94 on the bar and the support 82 is provided to return the throw out device to normal after its operation.

The throw out device functions as follows: Assuming that the clutch member 39 has been thrown into the position shown in Figs. 1 and 3 and that the belt 25 is therefore traveling at a variable speed, if a piece of stock approaches the cutting tool which projects too far above the table 8, the stock will engage the end of gage finger 84 and move the rack bar 81 forwardly against the tension of spring 93 toward the cutter as the belt continues its movement. This forward movement of the rack bar will cause, through the engagement of segmental gear 87 with the rack bar, a rocking movement of the shaft 86 which is transmitted to the clutch yoke 53 through the arm 88, link 89 and arm 90. This movement results in throwing the clutch member 39 out of engagement with the driving gear 37 before the stock has advanced into engagement with the cutting tool, and the consequent stopping of the feed belt.

By the provision of the pin and slot connection 91 and 92 between the link 89 and the arm 90, the operator is enabled to control the operation of the feed belt without operating the throw out device.

In operation if for example it is desired to perform a milling operation upon a plurality of pieces of stock, the machine is started and the treadle 59 depressed into the position illustrated in Fig. 1. The feed belt 25 thereupon travels across the table 8 at a variable speed, relatively fast in bringing a set of chuck jaws 60′ into proximity to the cutter 43 and more slowly during the period in which the chuck is passing beneath the cutter. As successive chucks 60 pass upwardly over the sprocket wheel 12 at the right-hand end of the machine, the jaws of the chucks open permitting the operator to insert pieces of stock therebetween or if the stock cannot be accurately gripped by the chuck permitting him to insert stock which has previously been assembled in jigs as above described. As the feed belt 25 passes off of sprocket wheel 12 upon the horizontal table 8 the jaws of the chucks 60′ close upon the pieces of stock securely holding them therein.

As successive chucks approach the central region of the table 8 beneath the cutter the edges of the belt links move beneath the adjustable clamps 74 whereby they are held firmly against the table 8 and prevented from releasing the stock from the chuck jaws while the cutter is operating upon the stock. The clamps 74 also prevent the chucks and stock from chattering due to the action of the cutting tool thereon.

After chucks holding finished pieces of stock have left the central region of table 8, the feel belt 25 carries them down over sprocket wheel 11 at the left-hand end of the machine. As the belt passes downwardly over this sprocket wheel the chucks 60′ open releasing the finished pieces of stock. Should the operator desire to perform machining operations upon the stock

requiring the stock to be held stationary during such operations, he would depress the treadle 59 to shift the belt driving gears in such a manner that the belt 25 would be driven intermittently. Then during each period when the stock is held at rest beneath the cutter or tool, the table could be suitably raised or adjusted to bring the stock temporarily against the cutter.

From the foregoing it is apparent that I have provided an improved feeding attachment for a machine tool, which is simple in construction, which renders the machine far more efficient, which enables the operator to rapidly and accurately position pieces of stock thereon to be fed past a cutting tool, which automatically releases the stock after the tool has made its cut, and which may be operated either at a variable speed or intermittently in accordance with the nature of the operations to be performed.

What I claim is:

1. In a machine tool or the like, a cutting tool, a table, an endless carriage comprising a linked belt arranged to be traversed over said table past said tool, said belt being provided with stock engaging chucks, and means for restraining the stock while being operated upon by the tool including a guide under which the stock is adapted to slide.

2. In a machine tool or the like, a cutting tool, a table, an endless carriage comprising a linked belt arranged to be traversed over said table past said tool, said belt being provided with stock engaging chucks, and means for restraining the stock while being operated upon by the tool, said means having a stationary guide overhanging the stock in close relationship thereto so that the belt is free to move thereunder but is restrained from movement away from the table.

3. In a machine tool or the like, a cutting tool, a table, an endless carriage comprising a linked belt arranged to be traversed over said table past said tool, said belt being provided with stock engaging chucks, and means for restraining the stock while being operated upon by the tool including surfaces for engaging both the belt and the stock.

4. In a machine tool or the like, a cutting tool, a table, an endless carriage comprising a linked belt arranged to be traversed over said table past said tool, said belt being provided with stock engaging chucks, and means for restraining the stock while being operated upon by the tool, said means having stationary guides overhanging the belt and stock in close relationship thereto with surfaces engaging the belt and the stock respectively, said surfaces being so spaced from the table that the belt and stock are free to move thereunder but are restrained from movement away from said table.

5. In a machine tool or the like, a cutting tool, a table, an endless carriage comprising a linked belt arranged to be traversed over said table past said tool, said belt being provided with stock engaging chucks, and means for restraining the stock while being operated upon by the tool, said means having stock-engaging members adjustable lengthwise of the stock.

6. In a machine tool or the like, a cutting tool, a table, an endless carriage comprising a linked belt arranged to be traversed over said table past said tool, said belt being provided with stock engaging chucks, and means for restraining the stock while being operated upon by the tool, said means having stationary guides overhanging the belt and stock in close relationship thereto with surfaces engaging the belt and the stock respectively, said surfaces being so spaced from the table that the belt and stock are free to move thereunder but are restrained from movement away from said table, said guides being adjustable conjointly as a unit.

7. In a machine tool or the like, a cutting tool, a table, an endless carriage comprising a linked belt arranged to be traversed over said table past said tool, said belt being provided with stock engaging chucks, and means for restraining the stock while being operated upon by the tool, said means having stationary guides overhanging the belt and stock in close relationship thereto with surfaces engaging the belt and the stock respectively, said surfaces being so spaced from the table that the belt and stock are free to move thereunder but are restrained from movement away from said table, said guides being adjustable relatively to each other.

8. In a machine tool or the like, a cutting tool, a table, an endless carriage comprising a linked belt arranged to be traversed over said table past said tool, said belt being provided with stock engaging chucks, and means for restraining the stock while being operated upon by the tool, said means having stationary guides overhanging the belt and stock in close relationship thereto with surfaces engaging the belt and the stock respectively, said surfaces being so spaced from the table that the belt and stock are free to move thereunder but are restrained from movement away from said table, said guides being adjustable relatively to each other and conjointly as a unit.

9. In a machine tool or the like, a cutting tool, a table, an endless carriage comprising a linked belt arranged to be traversed over said table past said tool, said belt being provided with stock engaging chucks, and means for restraining the stock while being operated upon by the tool, said means having stationary guides overhanging the belt and stock in close relationship thereto with surfaces engaging the belt and the stock respectively, said surfaces being so spaced from the table that the belt and stock are

free to move thereunder but are restrained from movement away from said table, said guides being adjustable relatively to each other along the plane of the table and conjointly as a unit transversely of said plane.

10. In a machine tool or the like, a stock supporting carriage comprising a linked belt having sets of opposed chuck jaws one set on each of the successive sets of juxtaposed links, one jaw of each set being bodily movable toward and from the other jaw of the set and means for positively holding the movable jaws in position.

11. In a machine tool or the like, a cutting tool, sprocket wheels, and a stock feeding belt geared to said sprocket wheels, said belt comprising links provided at their pintle connections with sets of opposing chuck jaws for gripping the stock, said jaws being arranged to open to receive stock to be worked as said belt passes up over one of said sprocket wheels, to close and grip the stock as the belt passes horizontally beneath said tool and to open again releasing the finished stock as the belt passes downward over the other sprocket wheels, one jaw of each set being bodily adjustable toward and from the other jaw of the set and means for positively holding the adjustable jaws in position.

12. In a machine tool or the like, a cutting tool, a table, an endless carriage comprising a linked belt arranged to be traversed over said table and beneath said tool, said belt being provided with automatically opening and closing chuck jaws for gripping stock, and means for preventing chattering of the stock carried thereby while being worked upon by said tool, said means having stationary guides overhanging the marginal portions of the belt in close relationship thereto so that the belt is free to move thereunder but is restrained from movement away from said table.

13. In a machine tool or the like, a cutting tool, a table, an endless carriage comprising a linked belt arranged to be traversed over said table and beneath said tool, said belt being provided with automatically opening and closing chuck jaws for gripping stock, and adjustable guides juxtaposed to each edge of said belt for preventing chattering of the stock carried thereby while being worked upon by said tool, said guides having flanges overhanging the marginal portions of the belt in close relationship thereto so that the belt is free to move thereunder but is restrained from movement away from said table.

14. In a machine tool or the like, a cutting tool, an endless carriage provided with automatically opening and closing chucks, gearing for variably driving said carriage, and means for shifting said gearing whereby said chucks may be advanced at a variable speed in succession past said tool or successively brought to rest in proximity to said tool.

15. In a machine tool or the like, a cutting tool, an endless carriage provided with automatically opening and closing chucks, means for driving said carriage, and means for automatically stopping said carriage when the stock engaged in said chucks is so positioned therein as to endanger said tool.

16. In a machine tool or the like, a cutting tool, an endless carriage provided with automatically opening and closing chucks, means for driving said carriage, a clutch for connecting and disconnecting said driving means, and means adapted to be engaged by stock carried by said chucks for throwing said clutch to disconnect said driving means when the stock is so positioned in said chucks as to endanger said tool.

17. In a machine tool or the like, a cutting tool, an endless carriage provided with automatically opening and closing chucks, means for driving said carriage, a clutch for connecting and disconnecting said driving means, manual means for operating said clutch, and automatic means adapted to be engaged by stock carried by said chucks for throwing said clutch to disconnect said driving means when the stock is so positioned in said chucks as to endanger said tool.

18. In a machine tool or the like, a cutting tool, a traveling carriage provided with chucks to hold stock in position to be engaged by said cutting tool as the stock is carried past the tool by the carriage, and means for automatically stopping said carriage when the stock engaged in said chucks is so positioned therein as to endanger said tool.

19. In a machine tool or the like, a cutting tool, a traveling carriage provided with chucks to hold stock in position to be engaged by said cutting tool as the stock is carried past the tool by the carriage, and means for automatically stopping said carriage when the stock engaged in said chucks is so positioned therein as to endanger said tool, said means including a control member extending into the path of the stock when the stock is in a danger position.

20. In a machine tool or the like, a cutting tool, a traveling carriage provided with chucks to hold stock in position to be engaged by said cutting tool as the stock is carried past the tool by the carriage, means for driving said carriage, a clutch for connecting and disconnecting said driving means, and means adapted to be engaged by stock carried by said chucks for throwing said clutch to disconnect said driving means when the stock is so positioned in said chucks as to endanger the tool.

Signed by me at Boston, Massachusetts, this twenty-sixth day of June, 1919.

JOHN TALIAFERRO THOMPSON.