

No. 880,916.

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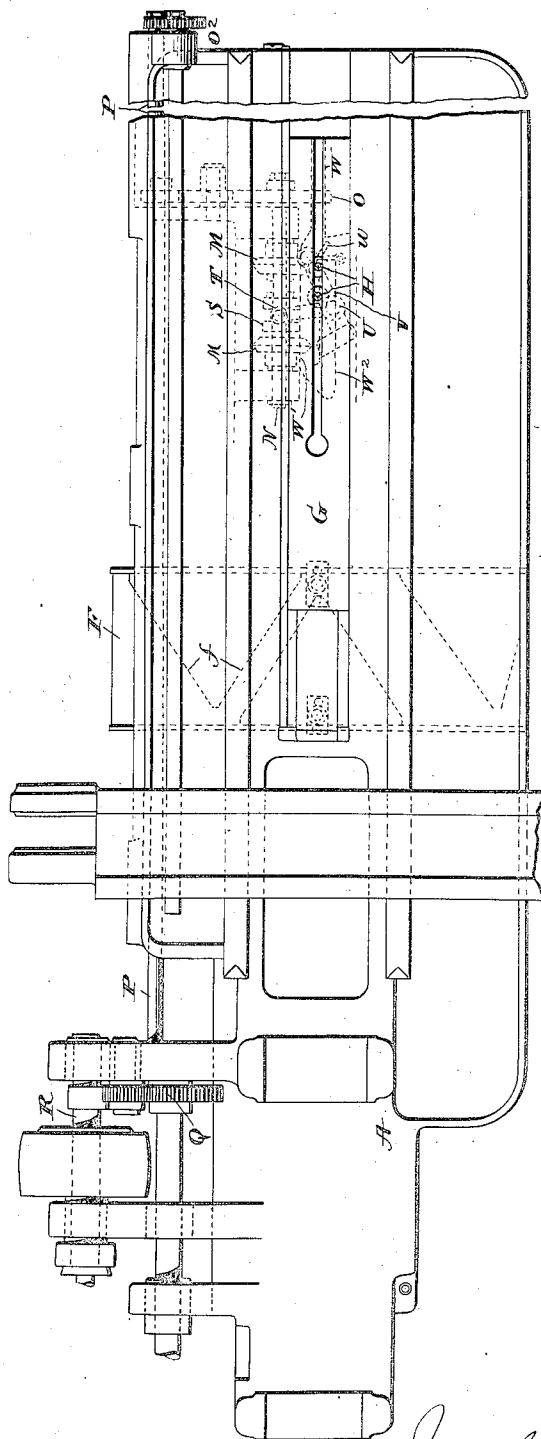
J. C. POTTER.

CARRIAGE FEEDING MECHANISM FOR LATHES, &c.

APPLICATION FILED NOV. 16, 1906.

5 SHEETS—SHEET 1.

*Fig. 1.*



Witnesses

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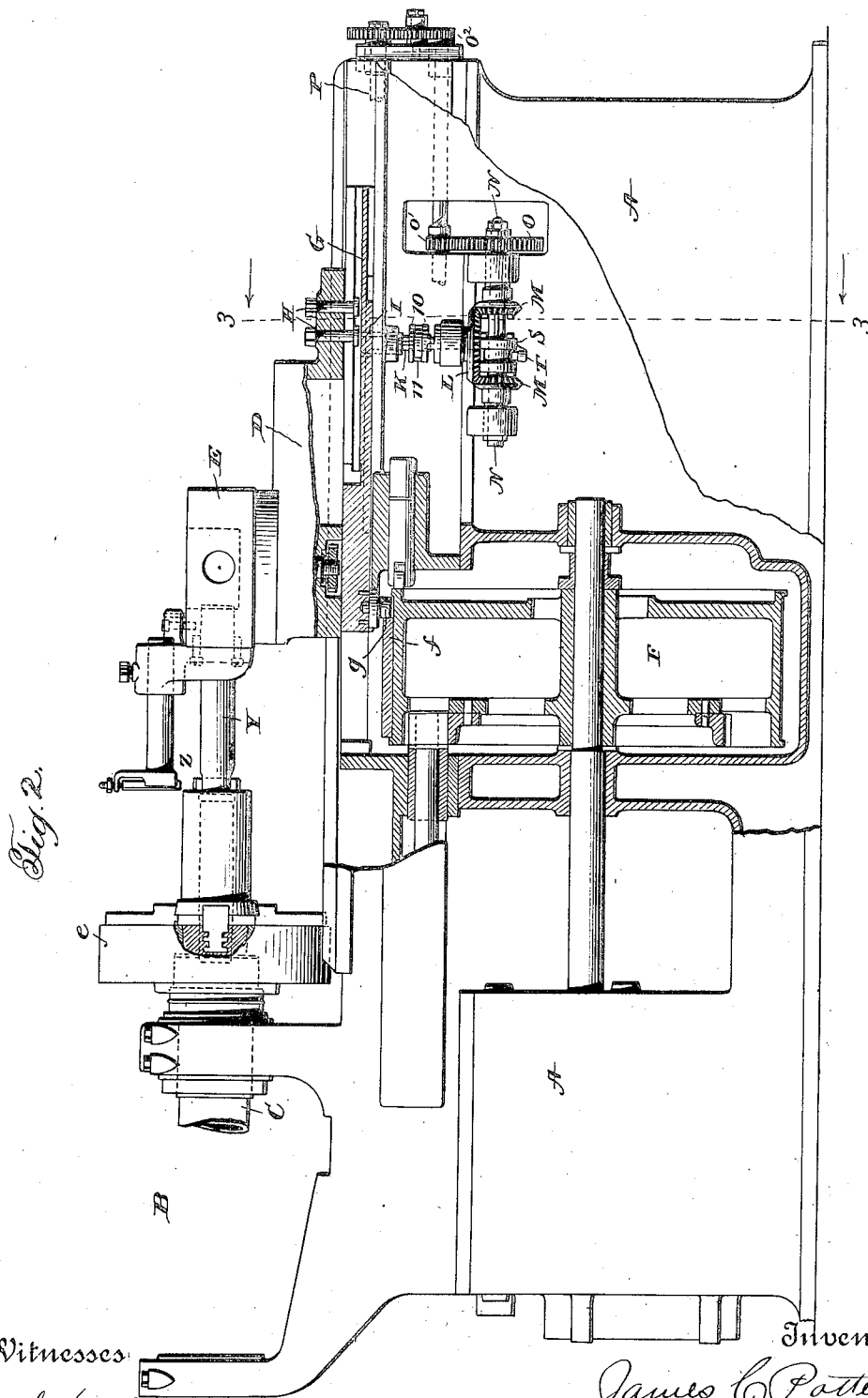
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5 SHEETS—SHEET 2.



## Witnesses

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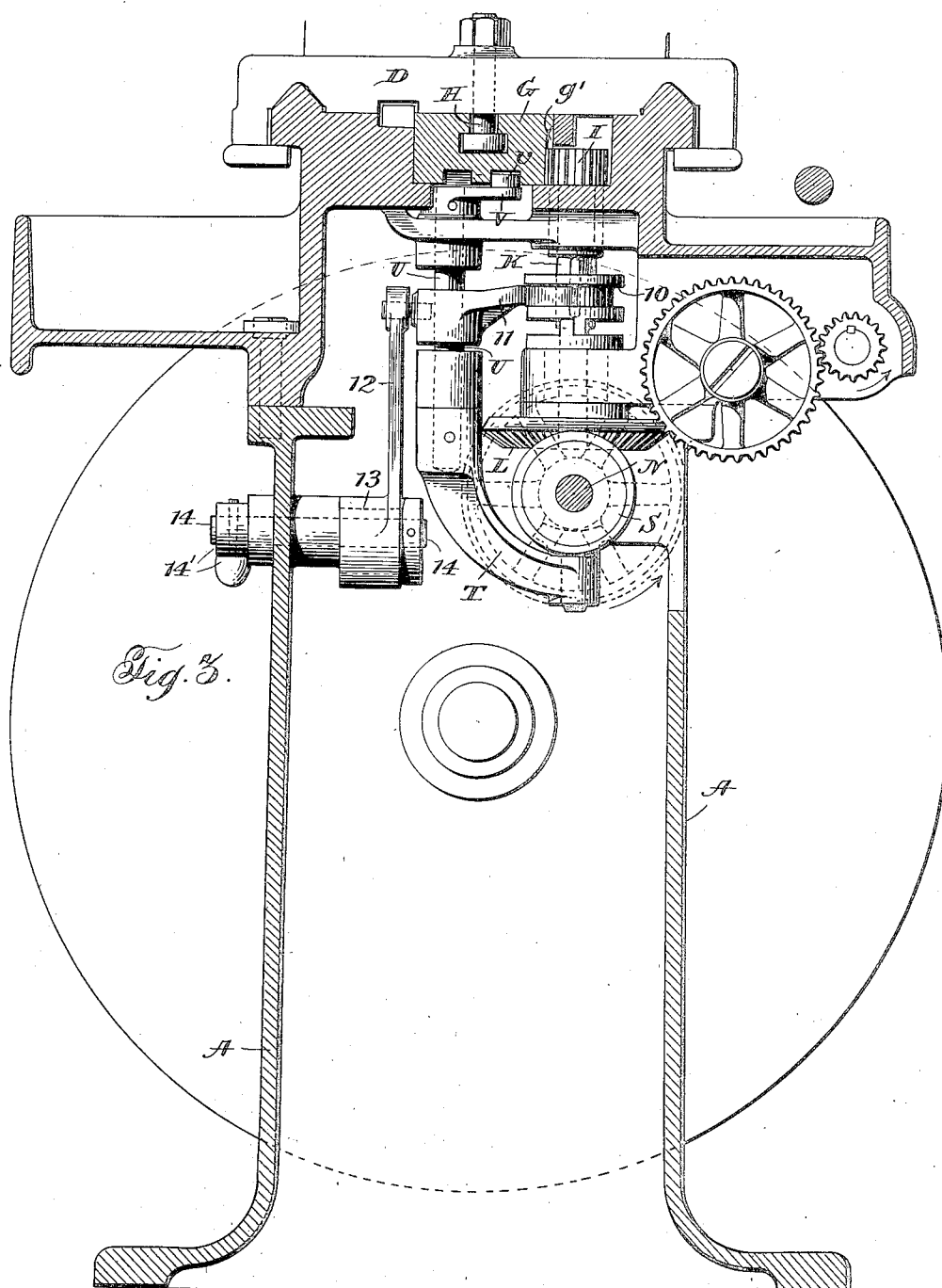


Fig. 3.

Witnesses

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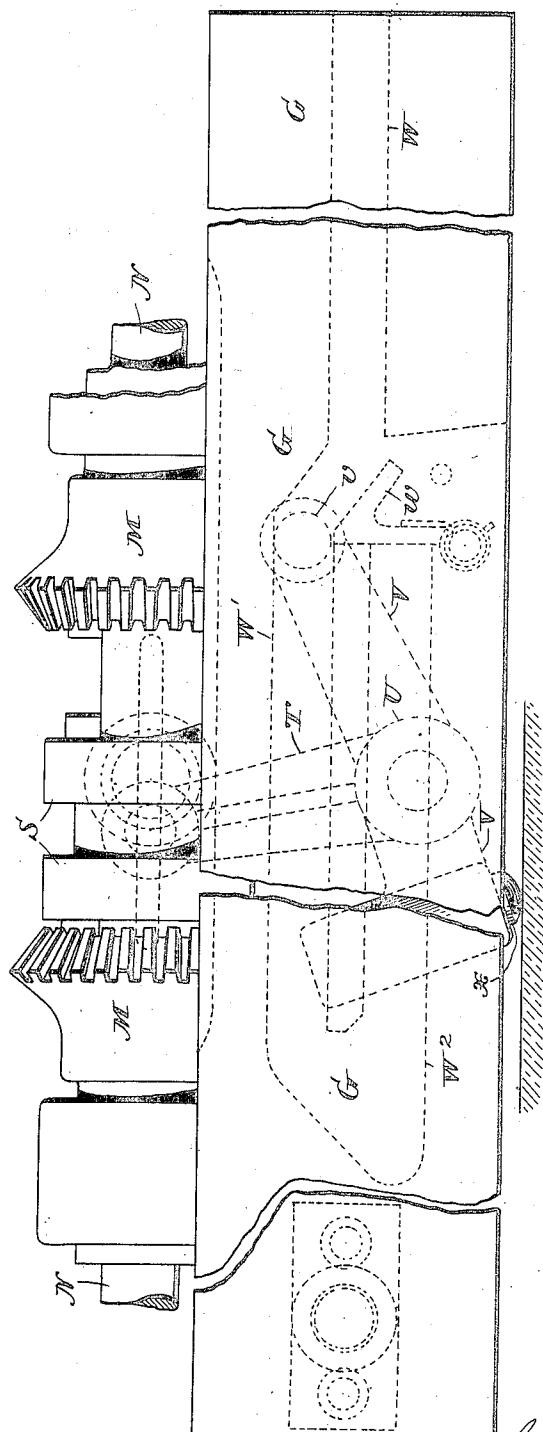
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APPLICATION FILED NOV. 16, 1906.

5 SHEETS—SHEET 5.

Fig. 5.



Witnesses

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# UNITED STATES PATENT OFFICE.

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## CARRIAGE-FEEDING MECHANISM FOR LATHES, &c.

No. 880,916.

Specification of Letters Patent.

Patented March 3, 1908.

Application filed November 16, 1906. Serial No. 343,751.

*To all whom it may concern:*

Be it known that I, JAMES C. POTTER, of Pawtucket, in the county of Providence and in the State of Rhode Island, have invented a certain new and useful Improvement in Carriage-Feeding Mechanism for Lathes, &c., and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 is a top plan view of a turret lathe in which my invention is embodied for reciprocating the turret slide; Fig. 2 a side elevation, partly in section; Fig. 3 a cross-section on line 3—3, Fig. 2; Fig. 4 a detail view, partly in plan and partly in section, showing the slide-reciprocating bar, with the parts in the position they occupy at the beginning of the forward movement of the slide; and, Fig. 5 a similar view showing the parts in the position they occupy on the return movement of the slide, at the time the change of slide moving mechanism is about to occur.

My invention relates to feed mechanisms for lathes, and its object is to overcome the limitations as to range of travel which inhere in or characterize said mechanisms, as heretofore constructed, and give any desired range of travel thereto, and to this end,—my invention consists in the feed mechanism constructed substantially as hereinafter specified and claimed.

The type of lathe in which I have embodied my invention, and which I show in the drawings as illustrative of one embodiment of my invention, is the familiar turret lathe in which a cam drum is employed to reciprocate the turret slide, such, for example, as shown in United States patent to Potter and Johnston Machine Co., June 7, 1904, No. 761,905. The employment of cams for reciprocating the turret slide is very desirable because cams are admirably suited for giving the varying speed of feed essential for the different turret tools, but they are seriously objectionable because of their limitations in respect of the range or extent of travel that can be imparted by them to the slide. Increase of travel of the slide necessitates increase of size of the cam-carrying drum, both as to width and diameter, and increase of diameter is objectionable because it compels increase in the height of the machine. And yet a long travel of the slide is very desirable both because of the quality or character of

the work desired and in manipulating or handling the machine. Thus, for example, in the use of a boring bar, it is important to support the forward end of the bar, as by entering it in the head stock spindle, but because of the length of the work, or for other reasons, the extent of travel of the slide produced by the cam will not admit of this. Again, the length of the turret tool may be such that considerable travel of the slide from the work may be required to enable the tool to clear the work when the turret is revolved. From what has been said, it therefore will be apparent that an increase of the travel of the slide to any extent desired, without enlarging the size of the drum, and consequent increase of the height of the machine, is a matter of great importance, and this I have accomplished by my invention.

Referring now to the drawings, A designates the frame of a turret lathe; B the head stock, in which is journaled the spindle C, carrying the chuck *c*; D the slide on which is mounted the tool turret E; and F the cam-carrying drum, all which parts are, or may be of usual construction and therefore need no particular description.

Attached to the bottom of the turret slide D, lengthwise thereof, is a bar G, the attaching means consisting of bolts H and a T-slot so that, when desired, the slide may be shifted relative to the bar to change its position. On the inner, or forward end of the bar G and on the bottom thereof, is a cam-engaging projection in the form of an anti-friction roller *g* which by the action of the cams *f* on the drum F moves the turret towards and from the head stock in the usual manner. As I have already explained, the extent of travel of the turret slide by the cams *f* is a limited one and any increase in its travel by the use of the cams is objectionable because of its compelling an increase in the height of the machine, and yet the demands of the work on these machines requires an increase of the travel of the turret slide. I have solved this problem by the provision of slide-reciprocating means additional or supplementary to the cams, and in the embodiment of my invention shown in the accompanying drawings, such means consist of rack teeth *g'* on one side of the bar G; a pinion I in mesh therewith, and mounted on the upper end of a short vertical shaft K, a bevel gear L on the lower end of said

shaft K, two bevel pinions M meshing with the bevel gear on diametrically opposite sides thereof and loosely mounted on a short horizontal shaft M, with which they are adapted to be alternately clutched so that the pinion I may be revolved in either direction, and a gear wheel O on the shaft N, which by gears  $o'$  and  $o''$  receives motion from a shaft P extending longitudinally at the rear of the machine, and which, by a train of gears Q, is revolved from a pulley-driven shaft R journaled in bearings on the rear side of the head stock.

Each of the bevel pinions M has a clutch face, and between them a clutch collar S is splined to the shaft N and is movable so that it may clutch either or neither pinion thereto. Said collar S is engaged by a lever T on the lower end of a vertical shaft U which at its upper end has an arm V having a roller  $v$  situated in a cam path or slot in the slide-actuating bar G, said slot or cam being composed of a centrally disposed longitudinally extending straight path W, and two longitudinally extending straight paths  $W'$  and  $W''$  arranged on either side of the transverse center of the bar, and connected with said centrally disposed path W by paths that diverge therefrom, and in one of said paths, as is common with this type of cam, there is a switch latch or gate  $w$  which permits the arm roller  $v$  to pass from the centrally disposed path W into only one (the path  $W'$ ) of the other straight paths. Said other, parallel, straight paths are connected at their ends opposite the single, central path, and when the roller has traversed the path  $W'$  it is moved to the other path  $W''$  (and the clutch collar S thereby shifted) by means of a coil spring X mounted in an extension of the roller-carrying arm V with one end bearing thereagainst and the other end, through the medium of a closed-ended tube or casing  $x$  bearing against a surface on the machine frame A. When the arm roller  $v$  is in the centrally disposed path W, the clutch collar S is held in mid position so that neither bevel pinion M is in mesh with the bevel gear L, and thus no motion be transmitted to the bar G thereby.

It will be seen that by the reciprocation of the bar G, with its cam paths, the clutch collar S, so long as the arm roller  $v$  is in the centrally disposed path W, will be maintained in mid-position, and no movement be imparted to the turret slide by the pinion I and rack, or said collar will be shifted to clutch one of the other of the bevel pinions M to their shaft, so as to revolve the rack-engaging pinion I and move the turret slide towards or from the work, according to which of the bevel pinions M is clutched to its shaft, such rotation of the bevel pinion, and consequent travel of the turret slide, continuing so long as the arm roller  $v$  is in the

respective cam path  $W'$  or  $W''$ . During the time the arm roller  $v$  is in the centrally disposed path W and of the consequent inaction of the rack-engaging pinion I, the turret slide is moved by the action of a cam  $f$  on the periphery of the cam drum F, and the movement of the turret slide at this time, in one direction, is for feeding the tool while doing its work, while during the time the arm roller  $v$  is in one of the straight paths  $W'$  or  $W''$ , none of the cams  $f$  of the drum F acts on the projection or roller  $g$  of the bar G, and the travel of the turret slide is produced wholly by the rotation of the pinion I, and the extent of the travel of such slide is, of course, entirely dependent upon the length of the rack and of the straight paths  $W'$  or  $W''$ , which length may be any that is desired. The movement of the bar G and the turret slide, during the time the clutch collar S is being shifted from one of its positions to another by the passage of the arm roller  $v$  from the straight path W to the straight path  $W'$  and from the straight path  $W''$  back to the straight path W, is effected by the cam plates  $f$  on the drum F.

The positions of the straight paths W,  $W'$  and  $W''$  with reference to the direction of travel of the turret slide are such, that, when the turret is at the extreme point of its travel away from the work, the arm roller  $v$  will lie in the end of the straight path  $W''$  nearest the work, and that bevel pinion M which rotates the pinion I in the direction to move the turret slide towards the work, will be clutched to its shaft, and will remain so clutched until the arm roller  $v$  has traversed the length of the path  $W''$  and reaches the switch latch or gate, at which time one of the feed cams  $f$  on the drum F will engage the projection or roller  $g$  on the bar G, so that further forward movement of the bar G and the turret slide, and the shifting of the clutch collar F to mid-position by the passage of the arm  $v$  to the inner end of the straight path W, will be effected by the action of said cam  $f$ . This forward travel of the turret slide while the arm roller  $v$  is in the straight path  $W''$  is utilized to bring the turret tool which is to be used into position to begin its work, and if, for example, such tool is a boring bar Y, it enables the portion of the latter in advance of the cutters to pass through the work supported by the chuck and enter a pilot bushing in the end of the spindle, so that, so to speak, the turret and spindle will be tied together and the boring bar rigidly supported at both ends while the cutting or boring is being done. It will, therefore, be evident that if the subject of work is a long piece, whether the amount of work to be done is long or short, I am enabled to rigidly support the tool-carrying bar at both ends. I have referred to the use of a boring bar merely as an illustration, for, as will be seen

from the illustration in Fig. 2 of the drawings, a tool Z for doing outside work may be used, such tool Z being mounted upon a bar that at one end is secured to the turret.

5 During the travel of the turret slide when the arm roller *v* is in the straight path *W'* the turret slide is moved to withdraw the boring or tool-supporting bar from the spindle or work to an extent, of course, corresponding  
10 with its movement when the arm roller *v* is in the straight path *W*<sup>2</sup>, by the action of the rack and pinion, the extreme portion of the rearward travel of the turret slide being effected by one of the return cams *f* on the  
15 cam drum *F*. The speed at which the turret slide is moved by the gearing that is independent of or in addition to, the cam drum *F*, is a constant one, the shaft *P* that receives its motion from the shaft *R* and from  
20 which power is taken to revolve the pinion *I*, which meshes with the rack on the bar *G*, rotating at a constant speed, which speed is one selected as best suited to effect the automatic revolution of the turret, the means for doing it, however, as the same forms no part  
25 of the present invention, need not be described.

It will be evident that by my invention the size of the cam drum *F* may be as small  
30 as is consistent with the extent of feed movement of the turret slide necessary to be given it while the turret tools are actually at work, inasmuch as such travel of the turret slide as is necessary or desirable for advancing or moving the tools into position  
35 for work, is produced or obtained by mechanism which has no such limitations or restrictions as to the extent of movement of the slide to be imparted thereby, as inheres  
40 in the cams *f* of the cam drum, and that such movement of the turret slide, independently of the cam drum, may be to any extent which the exigencies or needs of a particular machine may require. Besides  
45 the very important advantage of supporting the tool-carrying bar at the spindle end, which flows from my invention, there is also the advantage that, when the turret is to be revolved, it may be done even though it  
50 have tools of unusual length, because ample space may be provided to avoid contact of the tools with the work when the turret is revolved.

The cam-engaging projection or roller *g*  
55 of the bar *G* is always in proper time relation for engagement by the cams *f*, and this is true although the turret slide is shiftable, as is necessary to suit the work to be done, because of the connection between the tool  
60 slide and the bar *G* which permits the movement of the turret slide independently of the bar *G*.

To enable the turret slide to be actuated only by means of the cam drum *F*, which at  
65 times may be desirable, I provide means for

disengaging or unclutching the bevel gear *L* from its shaft *K* which means consists of an ordinary clutch collar 10 splined to the shaft *K* and movable out of and into engagement with the clutch collar or hub on  
70 said bevel gear, by means of an arm 11 slidably mounted, for convenience, upon the lever shaft *U* and which is connected by a link or bar 12 to an eccentric 13 on a shaft  
75 14 journaled in bearings on the frame *A* and projecting at the front thereof, where it is provided with an operating handle 14.

It is thought that the operation and advantages of my invention are made sufficiently clear from the foregoing description,  
80 so that no further setting forth thereof is necessary.

It is to be understood that though I have illustrated and described in detail the construction of a certain machine in which I  
85 have embodied my invention, the scope of my invention is not limited or restricted to such or any particular construction of machine.

Having thus described my invention, what  
90 I claim is:—

1. In a feed mechanism for feeding a tool, the combination of a traversable tool holder, a drum having cams arranged to act in succession to move the tool holder during one part  
95 of its traverse for the performance of work by the tool, and separate means arranged to be effective upon said tool holder to move it during another part of its traverse.

2. In a feed mechanism for feeding a tool, the combination of a traversable tool holder, means arranged to be effective upon said  
100 holder to move it back and forth during one part of its traverse, and separate means arranged to be effective upon said tool holder  
105 to move it back and forth during another part of its traverse.

3. In a feed mechanism for feeding a tool relative to its work, the combination of a traversable tool holder, a series of separate and  
110 oppositely acting cams to move said tool holder during that part of its traverse back and forth over the work, and separate tool holder moving means arranged to be effective during another part of its traverse.  
115

4. In a feed mechanism for feeding a tool relative to its work, the combination of a traversable tool holder, a cam drum for moving the same during that part of its traverse to  
120 and fro over the work, and separate tool holder moving means arranged to be effective during another part of its traverse.

5. In a feed mechanism, the combination of a traversable carriage, means for moving the same during one part of its traverse,  
125 comprising a series of successively acting cams, a shaft geared to the carriage, gearing connecting the shaft to a source of power, a clutch for controlling the connection of said shaft with its source of power, and a connec-  
130

tion between said first-mentioned carriage moving means and clutch, to operate the latter.

6. In a feed mechanism, the combination of a traversable carriage, means for moving the same during one part of its traverse, comprising a series of successively acting cams, separate means arranged to be effective to move said carriage during another part of its traverse, a clutch for controlling the operation of said separate means, and a connection between said series of cams, and the clutch to operate the latter.

7. In a feed mechanism, the combination of a traversable carriage, a series of successively acting cams for moving the carriage during one part of its traverse, a shaft geared to the carriage for moving it during another part of its traverse, a reversing gear for driving the shaft, and a clutch for controlling the connection of said shaft with the reversing gear.

8. In a feed mechanism for feeding a tool relative to its work, the combination of a traversable slide, means for moving the same during a part of its traverse, separate means for moving it during another part of its traverse, and means controlled by said slide for starting, maintaining and stopping the operation of said separate means.

9. In a feed mechanism, the combination of a slide, a reciprocating bar, connections between the slide and bar, a cam device acting on the bar to move the slide to a limited extent, mechanism also acting on the bar to

move the slide beyond the limit to which the cam device moves it, cam paths in said bar, a clutch for said mechanism controlled by said cam paths and a connection between the cam paths and the clutch for controlling the latter.

10. In a feed mechanism, the combination of a traversable carriage, means arranged to be effective to move said carriage back and forth during a part of its traverse, separate means arranged to be effective upon said carriage to move it back and forth during another portion of the traverse, starting and stopping mechanism for said separate means, and a connection between said first-mentioned carriage-moving means and said mechanism.

11. In a feed mechanism, the combination of a traversable carriage, means arranged to be effective to move said carriage back and forth during a part of its traverse, separate means arranged to be effective upon said carriage to move it back and forth during another portion of the traverse, starting, stopping and reversing mechanism for said separate means, and a connection between said mechanism and said first-mentioned carriage moving means.

In testimony that I claim the foregoing I have hereunto set my hand.

JAMES C. POTTER.

Witnesses:

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CHAS. H. W. ROBERTS.