A. E. BENNETT & H. THOMPSON.

FEED MECHANISM OF TURNING MILLS, LATHES, OR LIKE MACHINES.

APPLICATION FILED MAR. 29, 1911.

1,039,484.

Patented Sept. 24, 1912.

4 SHEETS—SHEET 1.

Fig 1.

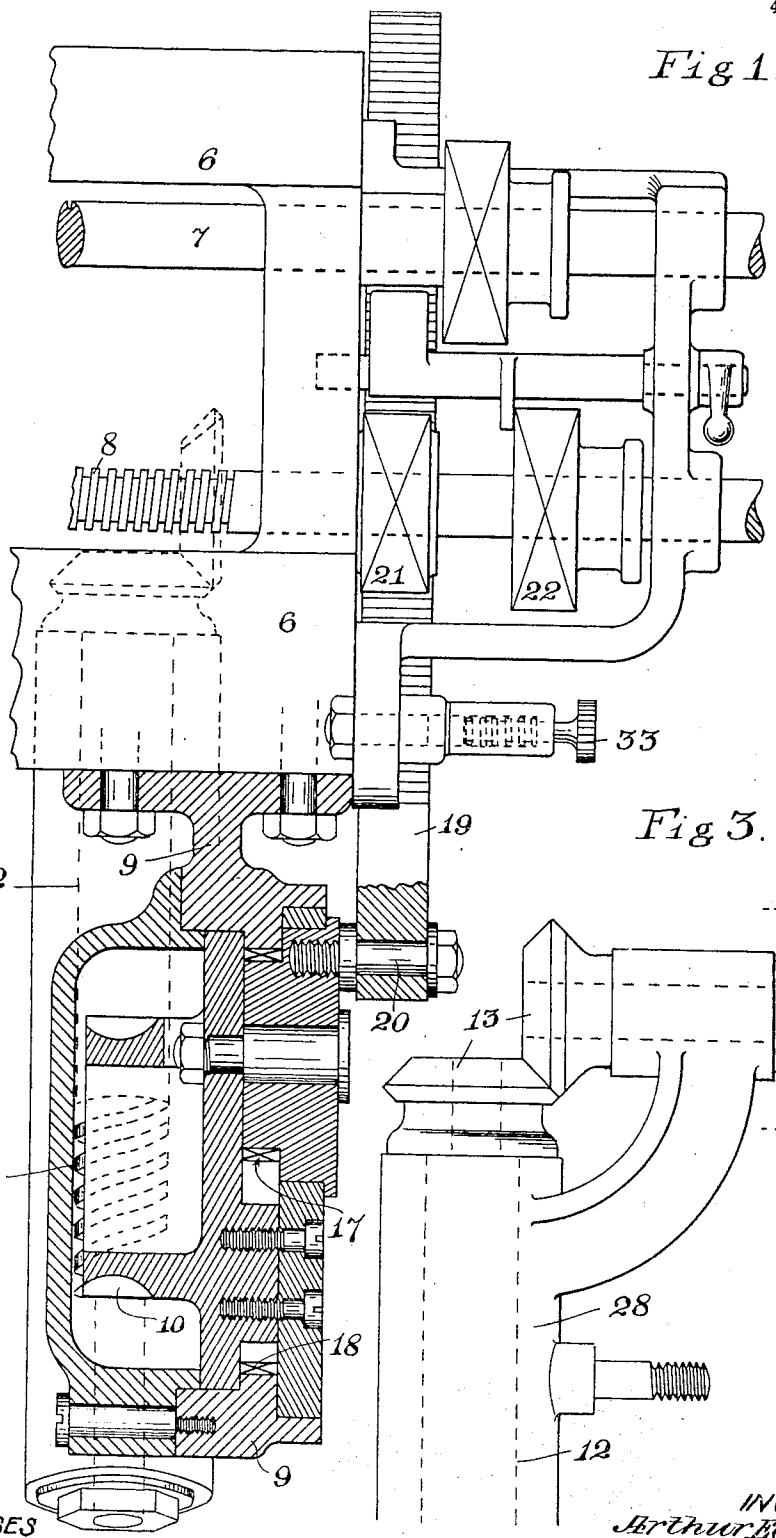

Fig 3.

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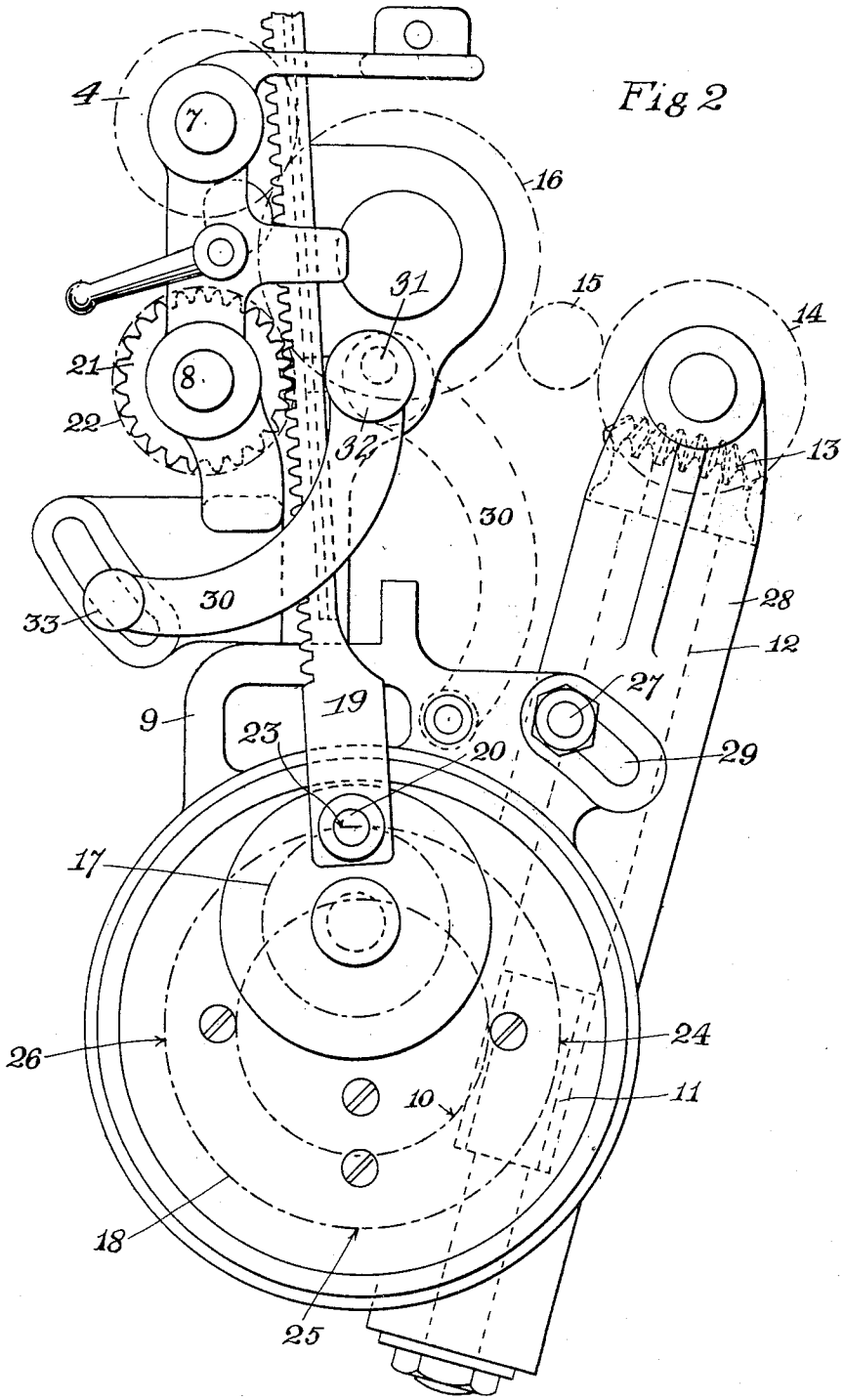
4 SHEETS—SHEET 2.

Fig 2



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4 SHEETS—SHEET 3.

Fig. 4.

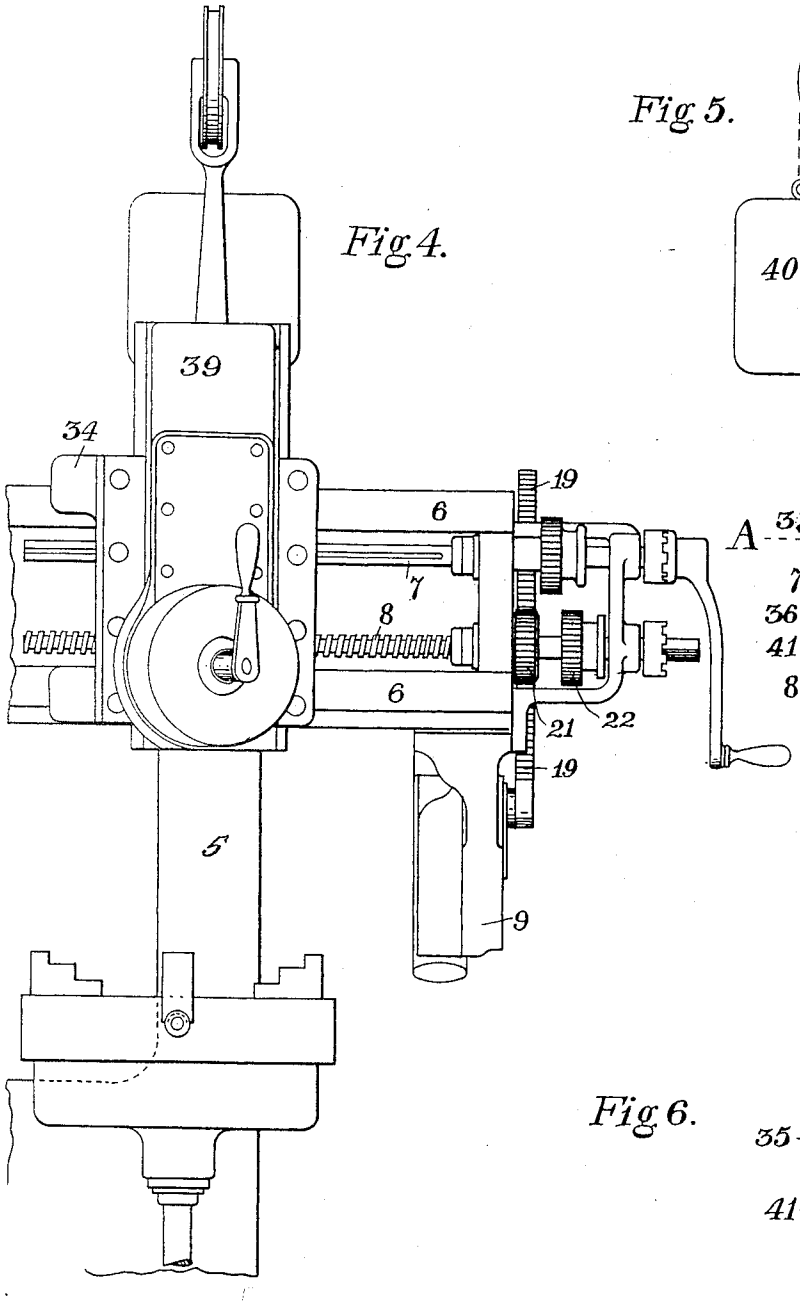


Fig. 5.

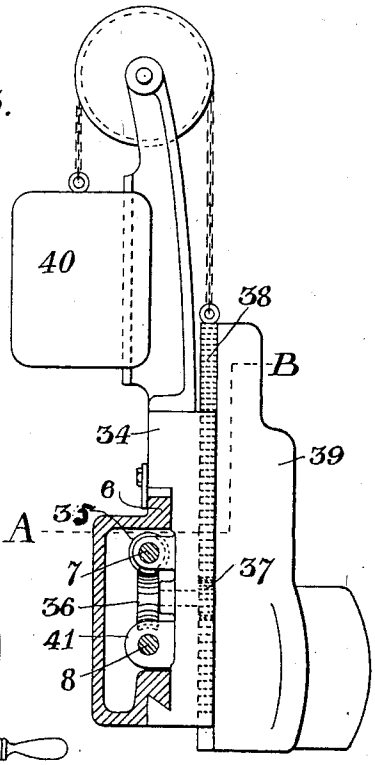
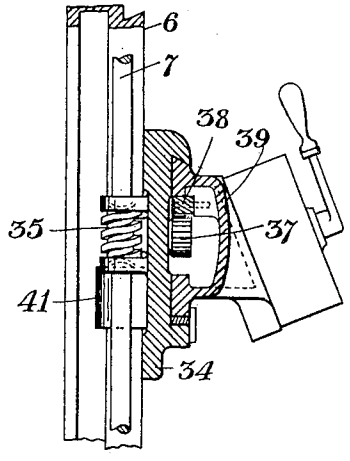


Fig. 6.



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4 SHEETS—SHEET 4.

Fig 7.

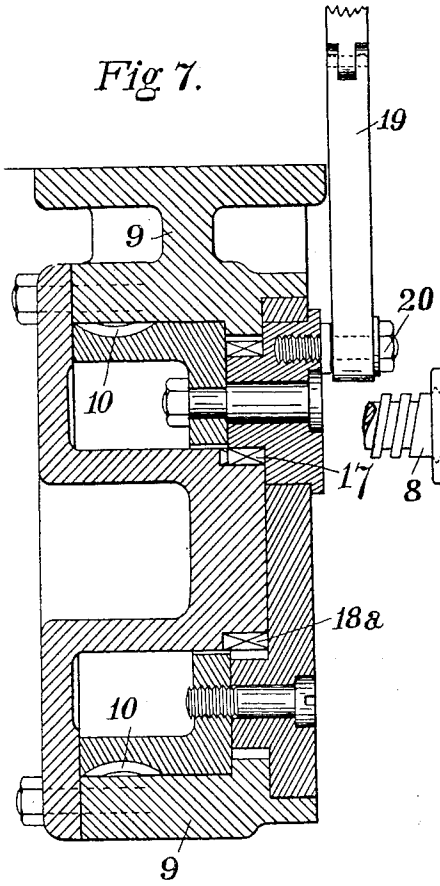


Fig 8.

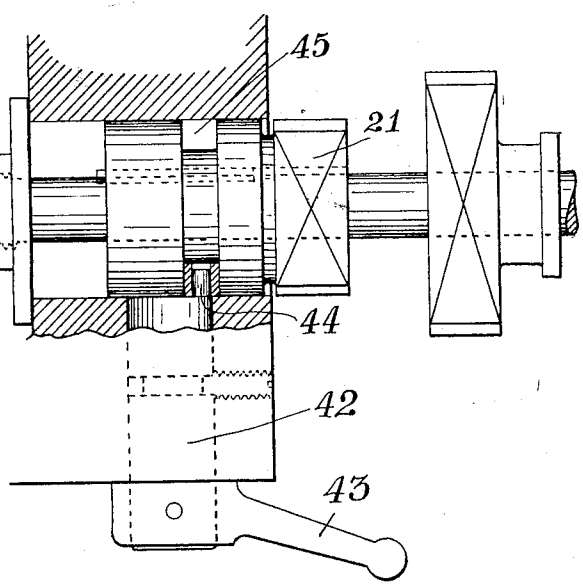
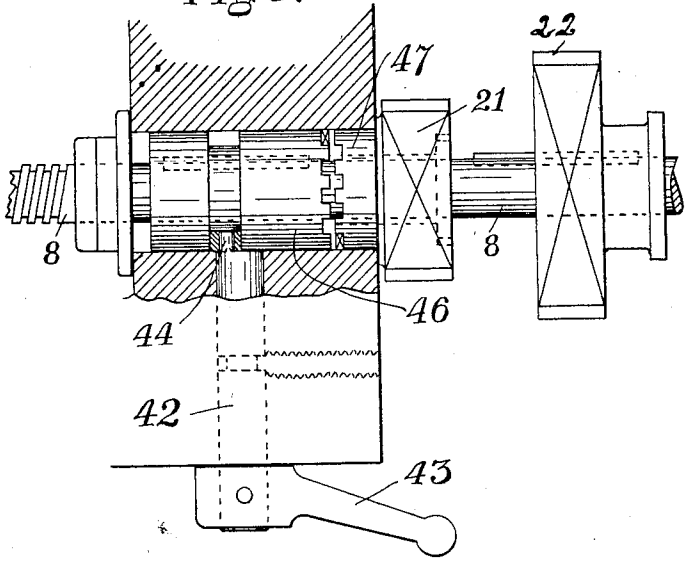


Fig 9.



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UNITED STATES PATENT OFFICE.

ARTHUR EDWARD BENNETT AND HARRY THOMPSON, OF COVENTRY, ENGLAND.

FEED MECHANISM OF TURNING MILLS, LATHES, OR LIKE MACHINES.

1,039,484. Specification of Letters Patent. Patented Sept. 24, 1912.

Application filed March 29, 1911. Serial No. 617,657.

To all whom it may concern:

Be it known that we, ARTHUR EDWARD BENNETT and HARRY THOMPSON, subjects of the King of Great Britain, residing at Atlas Works, West Orchard, Coventry, Warwickshire, England, and 37 Kensington road, Coventry, Warwickshire, England, have invented certain new and useful Improvements in or Connected with the Feed Mechanism of Turning Mills, Lathes, or the Like Machines, of which the following is a specification.

This invention relates to improvements in or connected with the feed mechanism of turning mills, lathes or the like machines, and has reference to the automatic production of certain curved surfaces, such as are desired for instance upon the peripheries of belt pulleys, or upon the face of buffer plungers, or the like, and frequently known as "crown" surfaces, and the object of our invention is to provide automatic mechanism for imparting a variable feed movement in one direction simultaneously with a uniform movement in a direction transverse thereto.

Our invention is primarily intended for turning machines, and particularly adapted to suit what are now known as boring and turning mills, which are of the lathe type placed in a vertical direction, but may also be adapted to an ordinary lathe or similar machine having two directions of feed, the one at or about right angles to the other.

In order to more clearly explain this our invention we have appended hereunto illustrative sheets of drawings, upon which are figures and numbers of reference, similar numbers referring throughout the several views to the same thing or part, and in which—

Figure 1 is a part sectional front view of this our invention, shown as applied to a vertical machine; Fig. 2 is an end view of the invention. Fig. 3 is a view showing the bevel wheel connection between the usual feed gearing upon the machine and the mechanism comprising this our invention. Fig. 4 is a front view of part of a turning and boring mill with the invention applied and showing a tool head in position. Fig. 5 is an end view and Fig. 6 a sectional plan view on line A—B of the tool head on the slideway showing more particularly the means for effecting the vertical and horizontal movement of the same. Fig. 7 is a sectional view of a modified form of the invention showing the rolling pinion gearing with external teeth on the fixed wheel. Fig. 8 is a part sectional view showing the rack operated pinion adapted to be slid out of engagement with the rack, and Fig. 9 is a similar view showing the rack operated pinion engaging the spindle through a clutch.

As already intimated the illustrative drawings show our invention as applied to a turning mill or lathe of the vertical type, in which 5 is the main standard carrying the slideway 6 upon which is carried the slide tool rest 34. The said slide rest is operated ordinarily after the usual manner, that is to say, a vertical feed movement is obtained by the usual gearing through the spindle 7, which operates a worm 35 or other gearing which drives a pinion 37 through the worm wheel 36 connected to the horizontal slide of the tool rest. The pinion 37 gears with a rack 38 on the vertical slide 39 of the tool rest to impart a vertical motion to the tool after the well known manner. Usually the vertical slide 39 is connected to a counterbalance weight 40. The usual horizontal feed movement of the tool rest as a whole is transmitted by the usual gearing through the screwed spindle 8 engaging with the nut 41 secured to the horizontal slide after the well known manner, but according to the present invention this feed is adapted to vary in relation to the uniform vertical feed as hereinafter described.

A wheel 16 (shown only in Fig. 2) is revolved by any convenient gearing from the main driving shaft. Such wheel 16 is always in gear with the wheel 4 which is fast on the shaft 7. The wheel 22 is also adapted to be thrown into gear with the wheel 16 by sliding it into the plane thereof. When using the machine to carry out this invention the spindle 7 is driven continuously and uniformly as usual, but the wheel 22 is moved out of gear with the wheel 16 and the horizontal spindle 8 is driven as follows:—In a suitable casing 9, carried from the slideway or other framing of the machine we provide a worm wheel 10, which is driven by the worm 11, which by the spindle 12, bevel gearing 13, and spur wheel 14, is connected up to the usual speed gear wheel 15; or other arrangement of gearing may be adopted. Eccentric (or crankwise) upon the worm wheel is pivotally carried the rolling pinion wheel 17,

which gears into the internal teeth of the fixed wheel 18, which is formed integral with the casing 9. Crankwise connected to this rolling pinion is the rack rod 19 by means of the pin 20. In the example shown the wheel 17 is one half of the diameter of the internal wheel 18 whereby the pin 20 moves along a straight line. The teeth of the rack rod gear with the wheel 21 which is keyed to the spindle 8. When the rack 19 is connected with the wheel 21, the usual driving wheel 22 is thrown out of driving connection with the spindle 8. To effect this it may be drawn to one side out of its usual gearing as above described, or otherwise disconnected, such as for instance, the wheel 21 may be disconnected from the spindle 8 by means of a clutch or other similar means. Thus, as the usual vertical feed is taking place, there is also a horizontal feed of a varying velocity due to the variable velocity of the pin 20 which is in turn due to the epicyclic gear. If the wheel 17 traveled in a complete circle about the center of the wheel 18 the vertical movement of the pin 20 would commence from the point 23 very slowly but would increase and assume its maximum speed as it passed the point 24, when it would again gradually slow down, until it stopped as the wheel 17 passed the point 25, and of course in its further travel the maximum would again be reached in the opposite direction as the point 26 is passed. Thus the desired varying speed is given to the tool but in practice the whole of the motion of the wheel 17 as just described would not be employed. For example in crowning a pulley arranged to rotate on a vertical axis the tool would be moved vertically at a uniform velocity in engagement with the surface to be cut and simultaneously at a variable velocity which gradually decreases till the tool arrives at the center of the pulley surface and then gradually increases in a reverse direction. To effect this, the portion of the travel of the wheel 17 taken advantage of might commence between the points 26 and 23 (so that the first half of the horizontal feed movement would be one of a gradually decreasing velocity) and terminate at a corresponding point between the points 23 and 24 so that the second half of the horizontal feed would be one of a gradually increasing velocity in the reverse direction.

When desired for ordinary purposes, the rack 19 is thrown out of gear with the wheel 21, and the wheel 22 is again put into its usual gear. This change of gear of the wheel 21 with the rack 19 may be done in several ways, one of such being indicated on the drawings, in which the lever 30,—which is pivoted at 31—has an eccentric boss 32 or its like, which in the position shown retains the rack in gearing. By withdrawing the spring fastening 33 the lever may be removed into the position shown in dotted lines, by which movement, the eccentric has been sufficiently turned around so as to permit or to effect the disengagement of the rack teeth. Such disengagement may be retained by any suitable means.

Referring to the bevel gearing 13 and spur wheel 14, it will be seen that this may be readily thrown out of gear with the wheel 15, by slackening the screw 27 which binds the part rotative member 28 to the casing 9, and moving it outward along the slot 29.

The mechanism may be varied in detail without departure from its nature, as for instance, the rolling pinion 17 may be made to act upon an outer circle of fixed teeth 18^a as seen in Fig. 7 wherein corresponding parts are similarly lettered to the form shown in Fig. 1. Also the gearing may be varied in detail. For instance, spur gearing may be substituted for the worm gearing, in connection with the epicyclic gearing. By substituting for the wheel 14, a wheel with more or less teeth, or by means of any of the usual speed changing devices, between the usual speed gearing of the machine and the variable speed gearing, a different curve may be imparted to the cut surface of the work. Also the lever 30 may be dispensed with, and the wheel 21 made to slide out of gear with the rack 19, as shown in Fig. 8 in which a spindle 42 operated by means of a handle 43 from the exterior of the machine carries a crank pin 44 which engages with a groove 45 formed in an extension of the wheel 21 to withdraw the latter into the main casing and clear of the rack when the handle 43 is operated. If desired, instead of the wheel 21 having a sliding movement the sliding movement as above described may be imparted to a clutch 46 having teeth which engage complemental teeth upon an extension 47 of the wheel 21 as seen in Fig. 9. The arrangement of the aforesaid variable speed movement may of course be applied either to the longitudinal or the transverse motions.

What we claim as our invention and desire to secure by Letters Patent is:—

1. In feed mechanism for machines of the character described, mechanism for simultaneously and automatically imparting two motions to the cutting tool viz: a uniform velocity in one direction and a variable velocity in a transverse direction, said tool acting upon the revolving work for the purposes set forth.

2. In feed mechanism for machines of the character described, mechanism for imparting a uniform velocity to a cutting tool in one direction, and mechanism for simultaneously and automatically imparting a variable velocity to said tool in a direction transverse to said direction com-

prising, a pin mounted eccentrically on a rolling pinion, and means for transmitting the variable motion of said pin to the cutting tool in said transverse direction, for the purposes set forth.

3. In feed mechanism for machines of the character described mechanism for imparting a uniform velocity to a cutting tool in one direction, and mechanism for simultaneously and automatically imparting a variable velocity to said tool in a direction transverse to said direction comprising, a pin mounted eccentrically on a pinion, a stationary wheel upon the interior of which said pinion rolls, and means for transmitting the variable motion of said pin to the cutting tool in said transverse direction, for the purposes set forth.

4. In feed mechanism for machines of the character described, mechanism for imparting a uniform velocity to a cutting tool in one direction, and mechanism for simultaneously and automatically imparting a variable velocity to said tool in a direction transverse to said direction comprising, a pin mounted eccentrically on a pinion, a stationary wheel upon the interior surface of which said pinion rolls and having said surface of twice the diameter of the pinion, and means for transmitting the variable motion of said pin to the cutting tool in said transverse direction, for the purposes set forth.

5. In feed mechanism for machines of the character described, mechanism for imparting a uniform velocity to a cutting tool in one direction, and mechanism for simultaneously and automatically imparting a variable velocity to said tool in a direction transverse to said direction comprising, a pin mounted eccentrically on a rolling pinion, a screw shaft for operating the tool, a pinion on said screw shaft, and a rack connected to said pin and engaging the pinion on said screw shaft, for the purposes set forth.

6. In feed mechanism for machines of the character described, mechanism for imparting a uniform velocity to a cutting tool in one direction, mechanisms for simultaneously and automatically imparting variable velocity to said tool in a transverse direction, and manually operable means for throwing the latter mechanism out of operation so that the movement of the tool in said transverse direction may also be made uniform and the machine thereby used as an ordinary machine having the tool movable with two uniform motions in transverse directions.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

ARTHUR EDWARD BENNETT.
HARRY THOMPSON.

Witnesses:
H. R. KERSLAKE,
J. B. HAYWARD.