

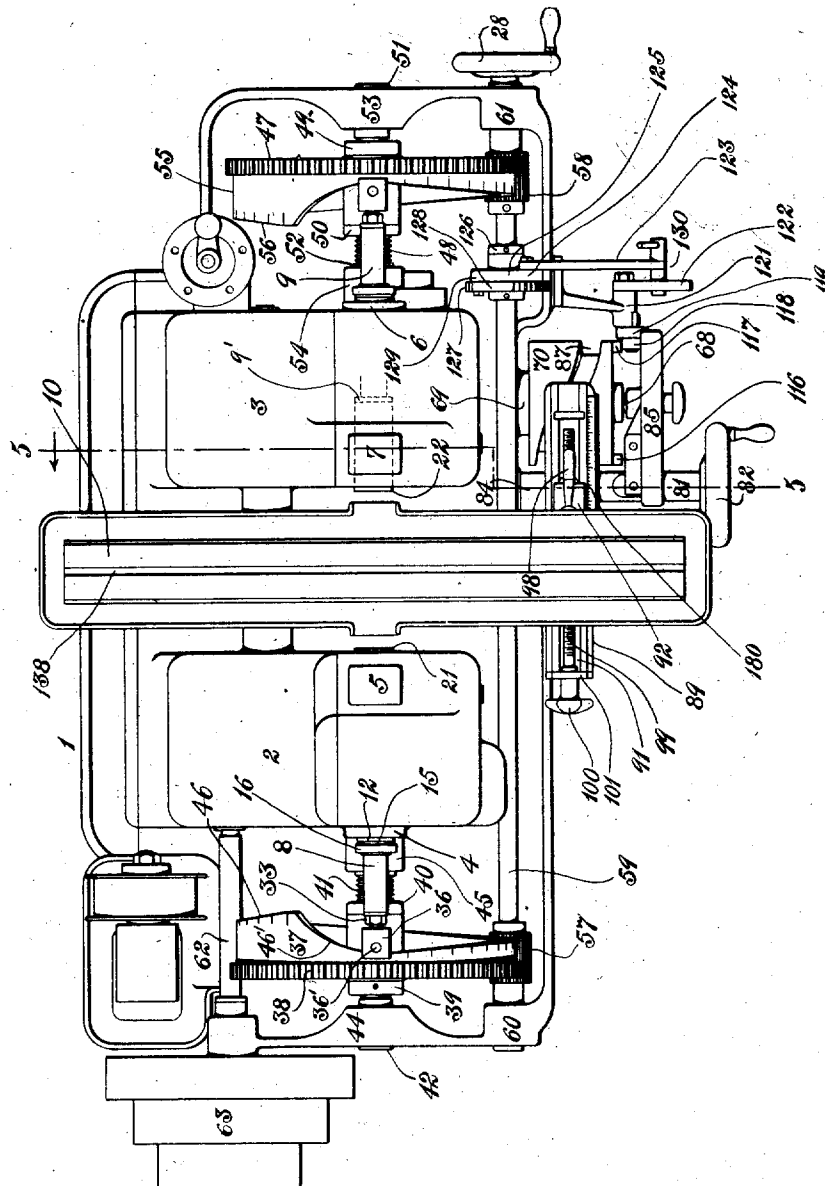
B. M. W. HANSON.
METAL WORKING MACHINE.
APPLICATION FILED FEB. 24, 1908.

974,056.

Patented Oct. 25, 1910.

5 SHEETS—SHEET 1.

Fig. 1.



Witnesses:

F. E. Anderson.
E. L. C. ...

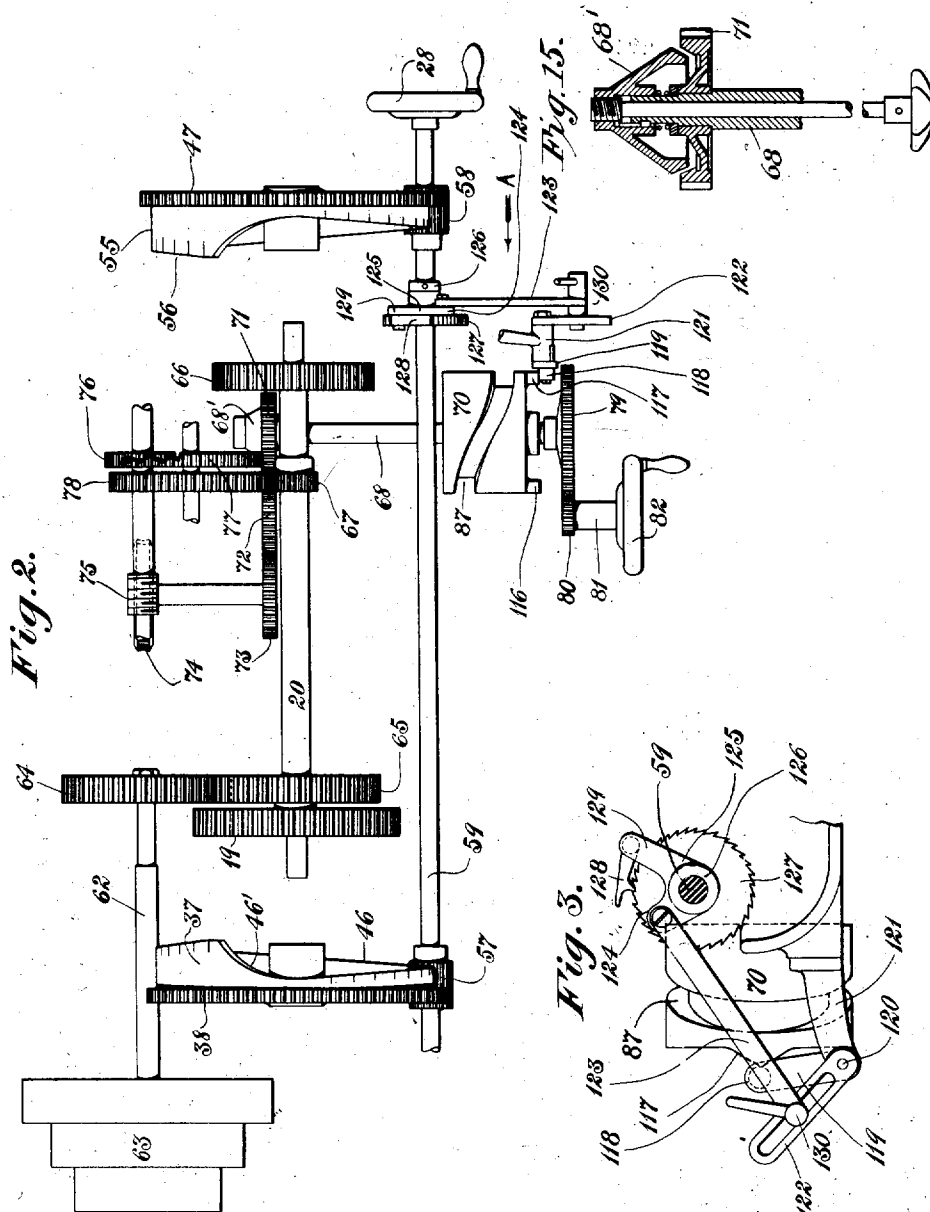
Inventor:
B. M. W. Hanson
By his Attorney,
Wm. H. Blodgett.

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5 SHEETS—SHEET 2.



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974,056.

Patented Oct. 25, 1910.

5 SHEETS—SHEET 3.

Fig. 4.

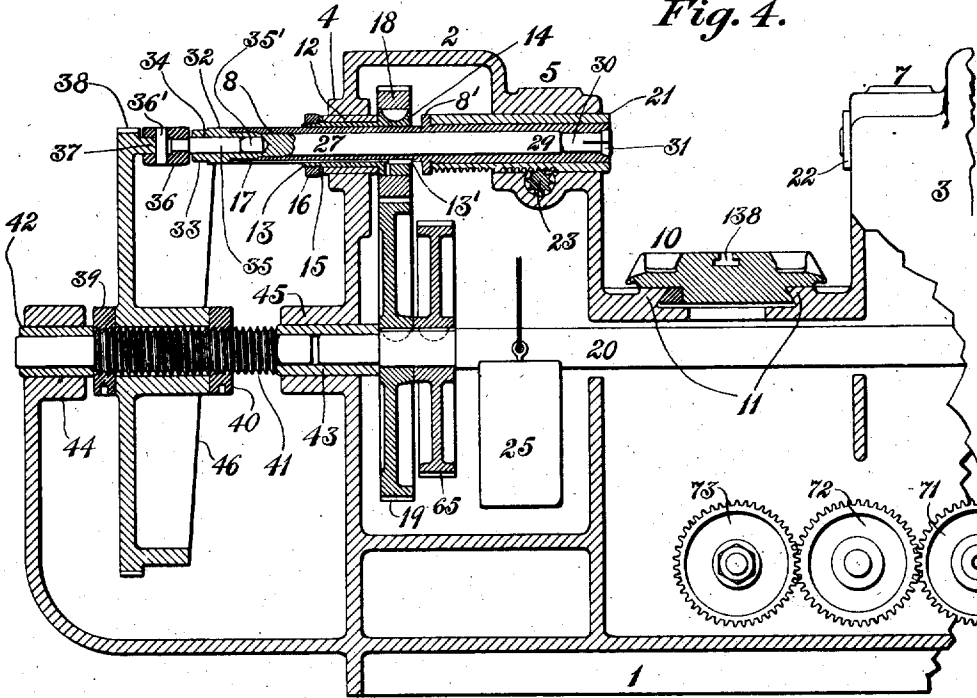
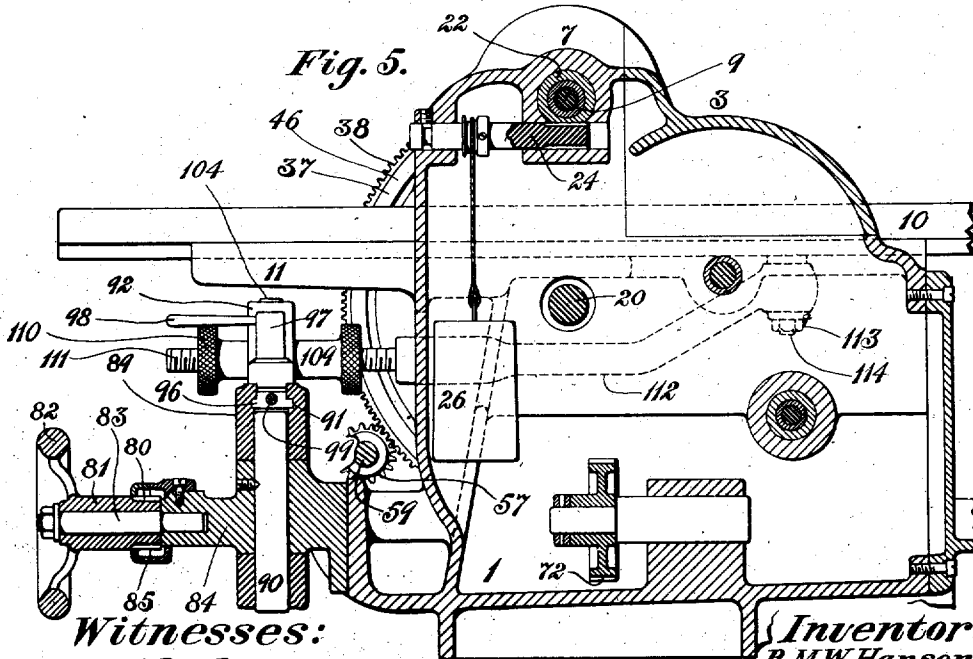


Fig. 5.



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5 SHEETS—SHEET 5.

Fig. 8.

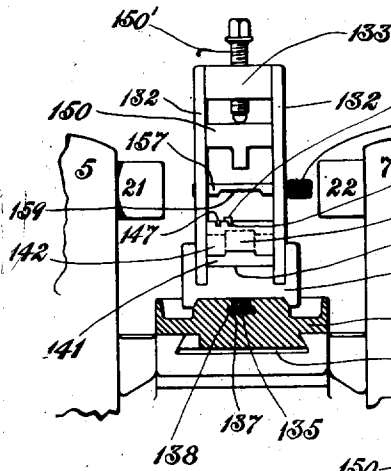


Fig. 9.

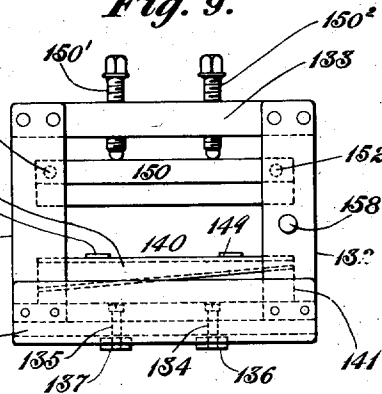


Fig. 10.

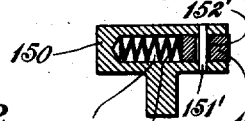


Fig. 11.

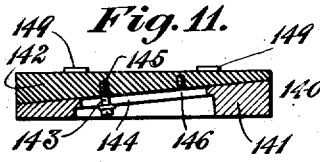


Fig. 12.

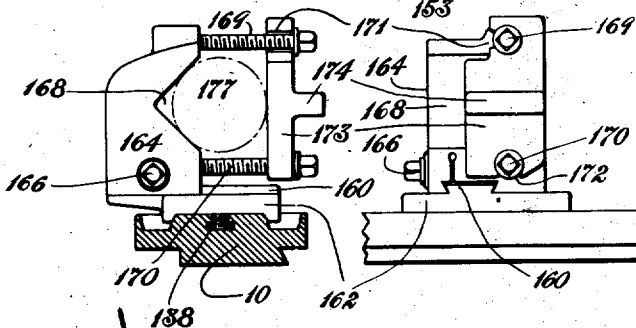


Fig. 13.

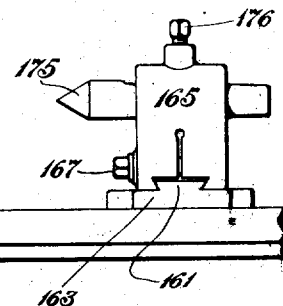
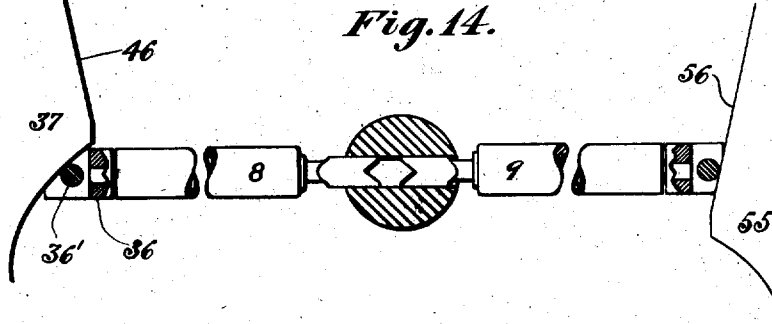


Fig. 14.



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UNITED STATES PATENT OFFICE.

BENGT M. W. HANSON, OF HARTFORD, CONNECTICUT, ASSIGNOR TO PRATT & WHITNEY COMPANY, OF HARTFORD, CONNECTICUT, A CORPORATION OF NEW JERSEY.

METAL-WORKING MACHINE.

974,056.

Specification of Letters Patent.

Patented Oct. 25, 1910.

Application filed February 24, 1908. Serial No. 417,558.

To all whom it may concern:

Be it known that I, BENGT M. W. HANSON, a subject of the King of Sweden, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Metal-Working Machines, of which the following is a specification.

This invention relates to milling machines especially adapted for forming slots or splines, and has for its object the provision of a machine having two oppositely disposed spindles carrying tools which may be caused to operate simultaneously on opposite sides of stock which is secured to a carriage suitably mounted for reciprocation between said spindles.

A further object of the invention is the provision of means for readily positioning certain elements of the machine so that the work to be done thereon may be accurately and completely accomplished without further attention of the operator.

Other objects of the invention will be hereinafter set forth.

In the accompanying drawings, Figure 1 is a plan view of a milling machine constructed in accordance with my invention. Fig. 2 is a plan view of the power transmission mechanism. Fig. 3 is a detail view of a part of the spindle feed mechanism looking in the direction of the arrow A in Fig. 2. Fig. 4 is a longitudinal sectional view on a vertical plane passing through the spindles, parts being shown in elevation. Fig. 5 is a transverse sectional view on line 5-5 of Fig. 1. Fig. 6 is a detail plan view of a portion of the carriage actuating mechanism. Fig. 7 is a sectional view on line 7-7 of Fig. 6. Figs. 8, 9, 10 and 11 are detail views of a vise suitable for holding square stock in position upon the carriage. Figs. 12 and 13 are detail views of a vise suitable for holding round stock in position upon the carriage. Fig. 14 is a detail view hereinafter described, and, Fig. 15 is a detail view in section of a clutch hereinafter more particularly described.

Like numerals designate similar parts throughout the several views.

Referring to the drawings the numeral 1 designates the frame of the machine, numerals 2 and 3 elevated hollow portions thereof provided with bearings 4 and 5, and 6 and 7 respectively for the reception of

tubular spindles 8 and 9. Disposed between said elevated portions is a carriage 10 mounted on ways 11 extending transversely of the machine.

Within the bearing 4 is fitted a bushing 12 through which extends a sleeve 13 having a head 14 at one end and provided with a nut 15 and a washer 16 at the other end. A key 13' secured within the head of sleeve 13 engages a spline 17 in spindle 8 while surrounding said head and keyed thereto is a gear 18 in mesh with a larger gear 19 rigid with a shaft 20 which will hereinafter be more fully described.

It is obvious from the foregoing description that spindle 8 may be fed longitudinally while receiving rotation from shaft 20 through gears 18 and 19. A similar arrangement of gears (but one of which is shown) exists between shaft 20 and spindle 9 except that an idler is interposed between the gears corresponding to gears 18 and 19 so that spindle 9 will be rotated in a direction opposite to that of spindle 8.

Fitted within bearings 5 and 7, surrounding spindles 8 and 9, and bearing against collars 8' and 9' respectively are sleeves 21 and 22 having rack teeth on their under sides in engagement respectively with pinions 23 and 24. Each of these pinions is formed integral with a shaft which is mounted transversely to spindles 8 and 9 and prevented from longitudinal displacement by a screw point entering a groove therein and each shaft is provided with a pulley, cord and weight all as shown in Fig. 5. Said weights which tend to rotate the pinions 23 and 24 in a direction that will withdraw the spindles 8 and 9 from their work are designated respectively by 25 and 26.

In the bore of spindle 8 is a rod 27 having a hollow end 29 into which is threaded a collet 30 provided with a beveled head 31 conforming to a taper in the bore at the end of said spindle. At 32 rod 27 is slightly enlarged thereby forming a shoulder which bears against the outer end of spindle 8 and at 33 said rod is provided with a hexagonal part for the reception of a wrench. By turning this rod the collet 30 may be made to grasp or release a tool shank as desired. Inserted in a bore 34 of rod 27 is a shaft 35 rigid with a head 36 which is slotted to engage the edge of a rib 37 projecting from

the side of a gear 38 said rib being concentric with the hub of gear 38, which is secured between adjusting nuts 39 and 40 upon a threaded portion of a shaft 41 the ends of which are journaled in bushings 42 and 43 carried respectively in bearings 44 and 45 of the machine frame. The rib 37 has a cam face 46 which bears against a hardened pin 36' inserted transversely through the slotted head 36. From its lowest point this cam face has a gradual rise extending about 9/10 of the way around the rib after which it has a comparatively sudden return to its lowest point. This conformation causes the spindle affected thereby to be advanced at a desired uniform feed, its quick return at 46' being accomplished by means of the weight driven pinion in connection therewith. To receive the thrust of shaft 35 a hardened pin 35' is placed in bore 34.

At the opposite end of the machine frame from gear 38 is a similar gear 47 mounted upon the threaded portion of a shaft 48 between adjusting nuts 49 and 50, the ends of said shaft being journaled in bushings 51 and 52 carried in bearings 53 and 54 respectively. A rib 55 projecting from gear 47 and concentric with the hub thereof is provided with a cam face 56 which performs the same function for spindle 9 that cam face 46 does for spindle 8 therefore it is not necessary to describe at length the intervening details of construction as their counterpart has already been described in connection with spindle 8.

In mesh with gears 38 and 47 are pinions 57 and 58 respectively which are rigid with a shaft 59 extending throughout the length of the machine frame and mounted in bearings 60 and 61 thereof. To the end of shaft 59 which extends through bearing 61 is keyed a hand wheel 28.

Referring to Fig. 2 the numeral 62 designates a power shaft provided at its outer end with a step pulley 63 and at its inner end with a gear 64 which meshes with a gear 65 rigid with shaft 20 which is journaled at its ends in bushings 43 and 52 before mentioned.

Designated by 66 is one of the gears which are interposed between shaft 20 and spindle 9 and by 67 a small gear keyed upon shaft 20 intermediate gears 19 and 66.

Mounted transversely of the machine below the horizontal planes of shafts 20 and 59 is a shaft 68 extending through its outer bearing 69 where it has keyed thereon a cam 70. At the inner extremity of this shaft is a clutch member 68' which by any desirable means (not shown) may be caused to clutch or release a gear 71 adjacently and loosely mounted upon said shaft. A train of gearing comprising spur gears 72 and 73, worm wheel 74, worm 75, change gears 76 and 77

and spur gear 78 is interposed between gears 71 and 67. Keyed to the outer end of shaft 68 is a gear 79 meshing with a pinion 80 which is formed integral with the hub 81 of a hand-wheel 82, said hand-wheel being supported on a stud 83 secured in a bracket 84 which also serves as a support for a guard 85 surrounding gears 79 and 80. When gear 71 is released by clutch member 68' it is obvious from the above description that shaft 68 may be rotated manually by means of hand-wheel 82 and that when said gear is made rigid with the clutch member 68' the shaft will be driven by power transmitted from shaft 62 through gears 64 and 65, shaft 20, gear 67 and so on through the gearing interposed between said last mentioned gear and said shaft.

In engagement with the cam groove 87 of cam 70 is a roller stud 88 depending from one end of an arm 89 which is pivoted near its center on a vertical stud-shaft 90 secured in the bracket 84. Slidably mounted in a T-slot 91 formed in the upper side of arm 89 is a standard 92 through a perforation 93 in the base of which projects the stem 95 of a T-bolt 96 which is threaded to receive a clamping nut 97 having a handle 98. An adjusting screw 99 provided with a manipulating knob 100 is supported by a plate 101 secured to the free end of arm 89, said screw being threaded through the head of T-bolt 96. Fitted in a vertical bore 102 of an overhanging arm 103 of the standard 92 is the stem 104 of a swivel block 105, said stem being grooved at 106 to receive the point of a screw 107 which prevents it from vertical displacement. Passing through a bore 108 in the swivel block 105 and provided with knurled adjusting nuts 109 and 110 on either side thereof, is the reduced threaded end 111 of an arm 112 the other end of which is pivotally secured by a nut 113 on a stud 114 projecting from the under side of the carriage 10. As the roller stud 88 follows the conformation of cam-groove 87 an oscillation of arm 89 about the stud shaft 90 is produced which results in a reciprocatory motion being transmitted to the carriage 10 through arm 112. By adjusting standard 92 along arm 89 thereby varying the magnitude of the arc through which it travels the scope of the reciprocatory motion of the carriage may be varied and by adjusting the knurled nuts 109 and 110 the effective length of arm 112 may be varied thus changing the relative position of the carriage upon ways 11. Graduations at 180 make it possible to accurately adjust standard 92 so as to produce the length of carriage travel desired.

On the outer edge of cam 70 are two projections 116 and 117 in the path of which is a roller 118 secured to the free end of an arm 119 which is rigid with a rock-shaft 130

120 mounted in bracket 121. Rigid with the other end of said rock-shaft is an arm 122 connected by a link 123 to one arm 124 of a bell-crank lever 125 which is loosely mounted on shaft 59 between a collar 126 and a ratchet disk 127 which are rigid with said shaft, the ratchet-disk being adapted to be engaged by a ratchet-pawl 128 mounted on the other arm 129 of said bell-crank lever 125. As the cam 70 rotates, rock-shaft 120 and the arms rigid therewith are caused to oscillate, said oscillation being transmitted through link 123 to bell-crank lever 125 which through the pawl-and-ratchet connection causes an intermittent rotation of shaft 59 suitable for rotating gears 38 and 47 so as to cause the cam faces 46 and 56 respectively thereon to produce the proper longitudinal feed of the spindles 8 and 9. An adjustable connection 130 is provided between arm 122 and link 123 thereby affording means for varying the throw of ratchet-pawl 128, thus obviously changing the amount of feed produced upon the spindles at each stroke of said ratchet-pawl. The projections 116 and 117 are formed opposite the extreme horizontal limits of the cam-groove 87 so that the feed of the spindles will occur when the carriage reaches the end of its travel in each direction.

Illustrated by Figs. 8, 9, 10 and 11 is a vise suitable for holding rectangular stock in place upon the carriage and comprising a base 131, four uprights 132 and a top-plate 133 all of which are securely pinned together as shown in Fig. 9. The base 131 is secured upon the carriage 10 by bolts 134 and 135 threaded respectively into nuts 136 and 137 in T-slot 138. In a channel 139 between the uprights 133 is an adjusting plate 140 composed of two wedges 141 and 142 adapted to be clamped together by a screw 143 passing through a counter-sunk slot 144 in the lower wedge into either of the threaded holes 145 and 146 in the upper wedge. The horizontal surface of the upper wedge is provided with grooves 147 and 148 for the reception of alining blocks 149. Above plate 140 and equal in length thereto is a clamping piece 150 backed by clamping screws 150' and 150'' which are threaded in the top-plate 133. This clamping piece is of T-shape in cross section and is provided with sockets 151 in the ends thereof for the reception of plungers 152 backed by springs 153, said plungers bearing against the uprights 132 with sufficient pressure to sustain the clamping piece, but still allowing it to be readily placed as desired. Pins 151' passing through elongated slots 152' in plungers 152 prevent the loss of the latter upon the withdrawal of the clamping piece from between the uprights 132. Inserted through holes in uprights 132

at one end of the vise is a pin 157 having a knurled head 158. The center of this pin is in the same horizontal plane as the center of the spindles and said pin may be conveniently used as a gage in locating the stock to be operated upon as a portion of it is cut away on a plane through its center as shown at 159.

A device for supporting round stock is illustrated in Figs. 12 and 13. Slidably mounted upon ways 160 and 161 of bases 162 and 163 respectively are a clamp support 164 and a center support 165. The bases 162 and 163 are secured upon the carriage by the usual T-slot nuts and bolts and the supports 164 and 165 are split and provided with bolts 166 and 167 respectively by which they are clamped to their respective ways. Threaded into the clamp support 164 on either side of a V-shaped groove 168 are bolts 169 and 170. Slotted at 171 and 172 in order that it may be readily placed upon bolts 169 and 170 is a clamp 173 adapted to engage stock 177 and provided on one side with a rib 174 which makes it possible by reversing said clamp from the position shown in Fig. 12 to secure stock having a diameter much less than the depth of the V-groove. A center 175 secured in support 165 by screw 176 supports one end of stock 177 which is prevented from longitudinal displacement away from said center by the clamping member.

In the operation of the machine if hollow stock is to be worked the gears 38 and 47 may be positioned so that the corresponding high and low parts of cam faces 46 and 56 will be directly opposite each other, but if the stock is solid as shown in Fig. 14 it will be necessary to position one of the cam faces (46) slightly in advance of the other (47) so that the tool actuated by the former will begin to retract before the one actuated by the latter reaches its extreme depth of feed. The concentric ribs 37 and 55 are graduated adjacent their respective cam faces so that they may be set to produce any desired precisionized depth of feed within the existing limits.

After the stock to be worked has been secured upon the carriage, approximately in its required longitudinal position it may be accurately positioned with respect to the tool-spindles by adjusting the effective length of arm 112 by means of knurled nuts 109 and 110, and furthermore the necessary scope of reciprocation for the carriage to produce the required length of slot or spline may be exactly obtained by setting the adjustable standard 92 to register with the graduation mark on scale 180 which corresponds to said required length of slot or spline. When clutch member 68' is released the reciprocation of the carriage may be tested manually by rotating hand-wheel 82.

Similarly the feed of the spindles may be tested by rotating hand-wheel 28.

This invention is not limited to the exact disposition of elements illustrated and described, for changes may be made therein without departure from said invention.

Having thus described my invention what I claim is,—

1. The combination of a reciprocatory carriage, a pair of rotary, endwise movable spindles at opposite sides of said carriage, a ratchet-wheel, a pawl for operating the ratchet-wheel, means for causing the pawl to operate the ratchet wheel at the ends of the strokes of the carriage, and means for transferring the effect of said ratchet-wheel to both spindles to advance the same.

2. The combination of a reciprocatory carriage, a pair of rotary, endwise movable spindles at opposite sides of said carriage, a pair of devices to impart an endwise thrust to said spindles to advance the same, a shaft, means for transferring the effect of said shaft to both said devices, a ratchet-wheel fastened to said shaft, a pawl, and means for causing said pawl to operate said ratchet-wheel at the ends of the carriage strokes.

3. The combination with a machine-frame, a carriage mounted thereon and tool-spindles journaled on opposite sides of said carriage, of means for reciprocating said carriage; cams for producing longitudinal movement of the tool-spindles; means in connection with the carriage reciprocating mechanism for intermittently advancing said cams; and means for varying the amount of the intermittent advance thereof.

4. The combination of a carriage, a pair of rotary, endwise movable tool spindles mounted at opposite sides of said carriage, said carriage being reciprocatory in a direction transverse to the axes of movement of the spindles, mechanism for reciprocating said carriage, independently adjustable cams for varying the amount of movement of the spindles, and means actuated by the carriage reciprocating mechanism for turning said cams to feed the spindles.

5. The combination with a machine-frame, a carriage mounted thereon and tool-spindles journaled on opposite sides of said carriage, of power driven mechanism for reciprocating the carriage; means for manually operating the carriage reciprocating mechanism; mechanism in connection with the carriage reciprocating mechanism for causing the longitudinal movement of the tool-spindles; and means for manually operating a portion of said last mentioned mechanism to cause the longitudinal movement of the tool-spindles independently of the carriage reciprocating mechanism.

6. The combination, with a support, of a tool-spindle journaled therein; a rod in the spindle and having a bore at its rear end;

a shaft fitted in said bore; a plug between the inner end of said shaft and the wall of the bore; a recessed head on the shaft; a pin fitted in perforations of the head; and a rotary device having a cam-flange embraced by the head, and bearing against said pin.

7. The combination, with a work-support, of a pitman pivoted thereto; said pitman having screw-threaded portions; of a pivoted arm; a bracket adjustably mounted on said arm; a perforated swivel block secured to the bracket; means whereby said swivel block may be adjusted longitudinally of the pivoted arm; nuts on each side of the swivel block and engaging the threaded portion of the pitman; and means carried by the pivoted arm whereby the extent of adjustment of the swivel block and bracket may be determined.

8. The combination, with a carriage, of a work-support thereon; a pair of tool-spindles, one on each side of said work-support; gearing for rotating said tool-spindles; cams having graduated rims for actuating the tool-spindles; gears carried by the cams; a shaft; pinions rigid with said shaft and in mesh with the cam gears; and means for intermittently rotating said shaft.

9. In a machine of the class described the combination with a carriage, of a rod or pitman having one end pivoted thereto; a swivel-block secured to the other end of said rod or pitman; means for adjusting the rod or pitman with relation to the swivel-block; an arm pivoted intermediate its ends; a bracket for connecting the swivel-block to said arm; means for adjusting the bracket along said arm; and means for oscillating the arm.

10. In a machine of the class described the combination with a pair of tool-spindles and a carriage mounted between said tool-spindles, of a cam; mechanism actuated by said cam for reciprocating the carriage; a rock-shaft; elements on said cam for actuating the rock-shaft; a pair of gears; mechanism actuated by the rock-shaft for intermittently rotating said gears; and cams rigid with said gears for advancing the tool-spindles.

11. The combination of a carriage, a pair of rotary endwise movable spindles at opposite sides of the carriage the latter being reciprocatory in a direction transverse to the axes of said spindles, a cam, connections between the cam and the carriage for operating the latter, and means also actuated from said cam for advancing said spindles.

12. The combination of a carriage, spindles at opposite sides of said carriage said spindles being rotative and endwise movable and the carriage being reciprocatory in a direction transverse to the axes of said spindles, a rotary cam, connections between said cam and the carriage for reciprocating the

latter, and means associated with said cam for intermittently operating said spindles.

13. The combination of a carriage, rotary spindles mounted at opposite sides of said carriage and movable in the direction of their axes toward and from the carriage the latter being reciprocatory in a direction transverse to said axes; a cam, connections between said cam and the carriage for reciprocating the latter, a movably mounted device, the cam having means to operate said movably mounted device, and means actuated by said movably mounted device for advancing the spindles.

14. The combination of a carriage, rotary spindles mounted at opposite sides of the carriage and movable in the direction of their axes the carriage being reciprocatory in a direction transverse to said axes, a cam mounted for rotation, means operated by said cam for operating the carriage said cam having projections, a lever operative by said projections, and means actuated by said lever for advancing the spindles.

15. The combination of a carriage, rotary spindles mounted at opposite sides of said

carriage and endwise movable the carriage being reciprocatory in a direction transverse to the axes of said spindles, a cam, connections between the cam and the carriage for operating the latter, and means operated by said cam and comprising a pawl and ratchet device, for advancing said spindles.

16. The combination of a carriage, rotary spindles mounted at opposite sides of the carriage and movable in the direction of their axes the carriage being reciprocatory in a direction transverse to said axes, a cam, connections between the cam and the carriage for operating the latter, a ratchet wheel, a pawl cooperative with the ratchet, a lever to which said pawl is operatively connected, the cam having means to operate said lever, and means operative by the ratchet wheel for advancing said spindles.

In testimony whereof I affix my signature in presence of two witnesses.

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Witnesses:

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JOHN D. WOOD.