B. M. W. HANSON.

METAL WORKING MACHINE.

APPLICATION FILED APR. 28, 1910.

1,000,517.

Patented Aug. 15, 1911.

4 SHEETS—SHEET 1.

Fig. 1.

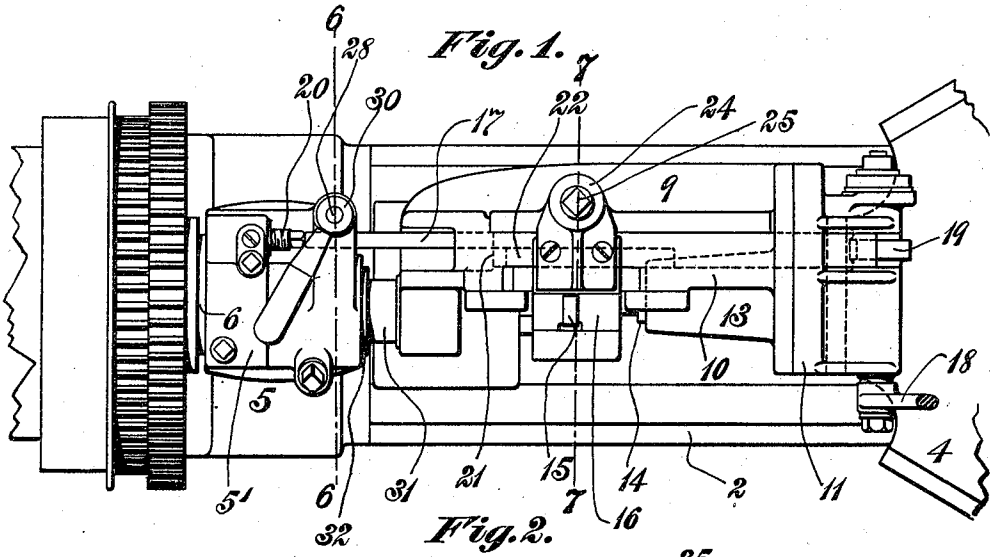
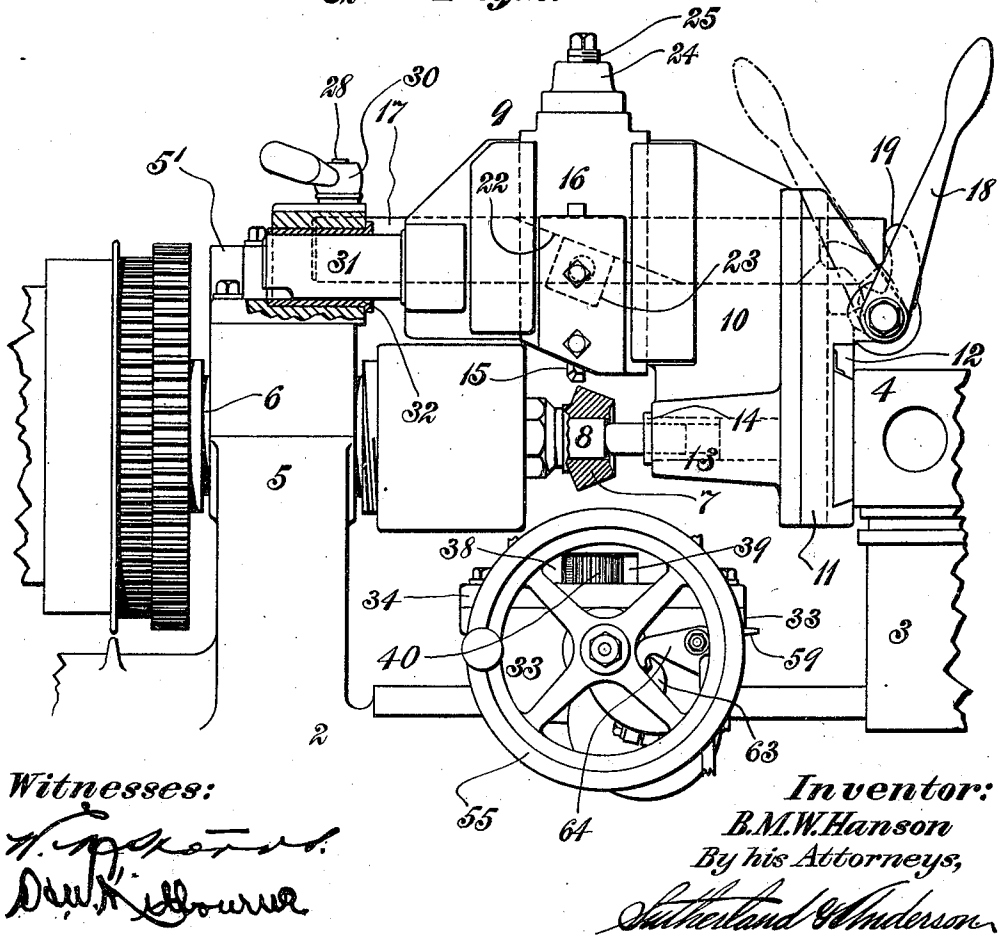


Fig. 2.



Witnesses:

Inventor:

B.M.W.Hanson

By his Attorneys,

Sutherland & Anderson

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4 SHEETS—SHEET 2.

Fig. 3.

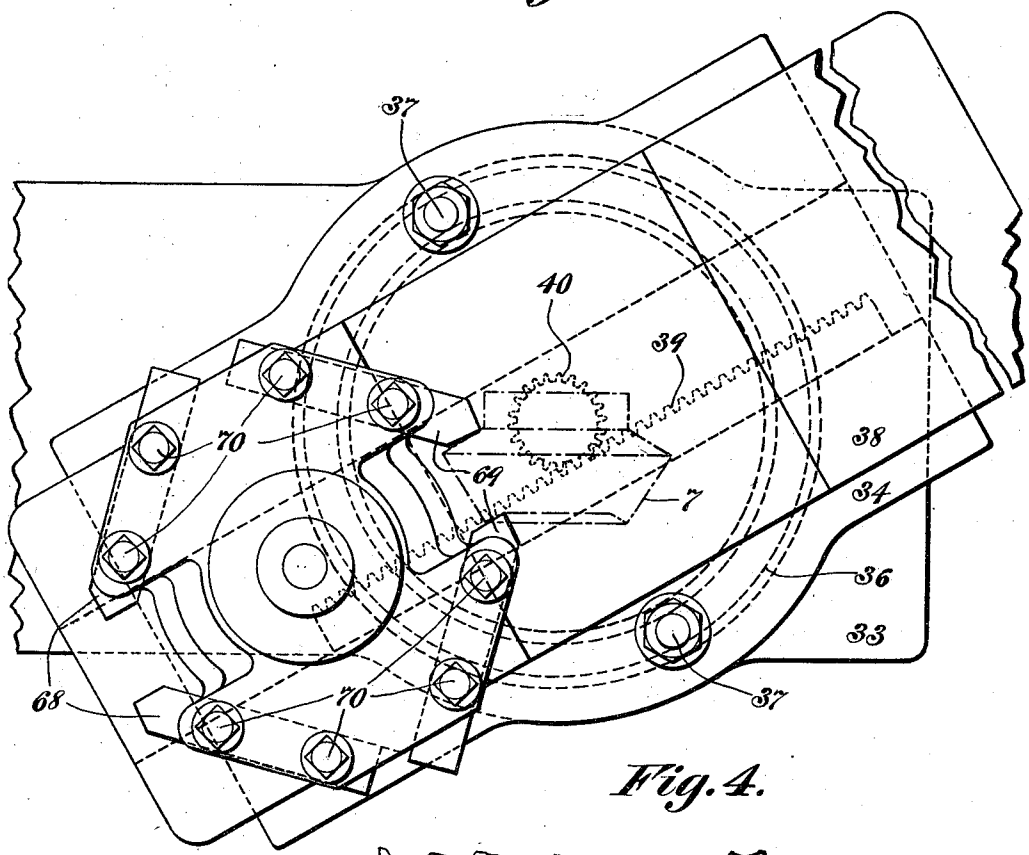
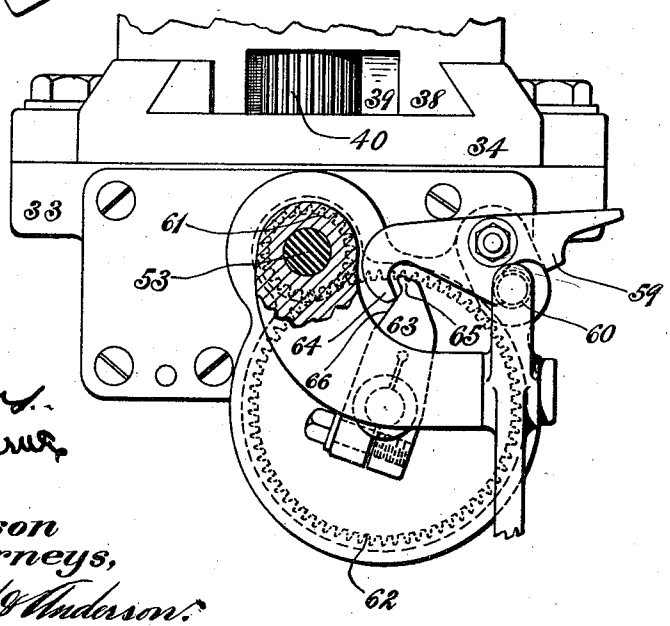


Fig. 4.



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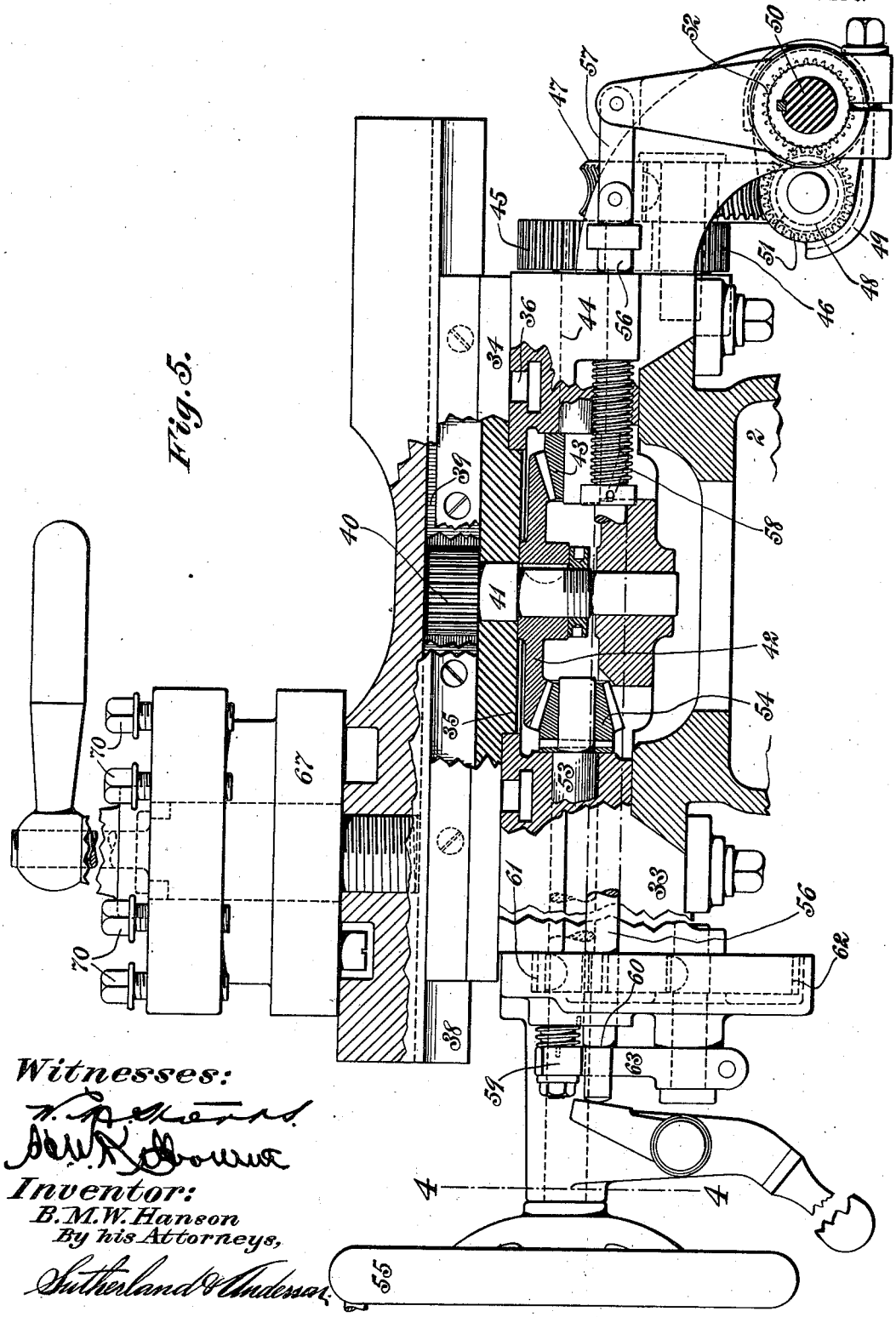
4 SHEETS—SHEET 3.

Fig. 5.



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4 SHEETS—SHEET 4.

Fig. 6.

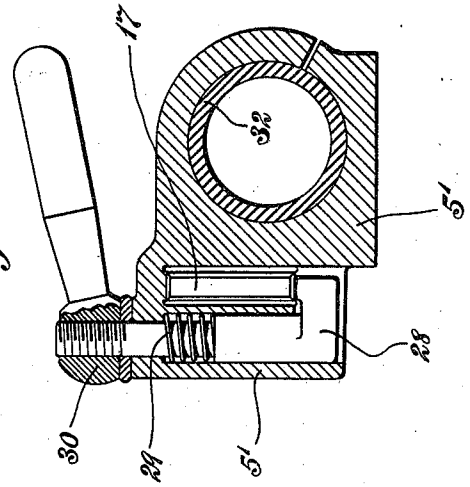
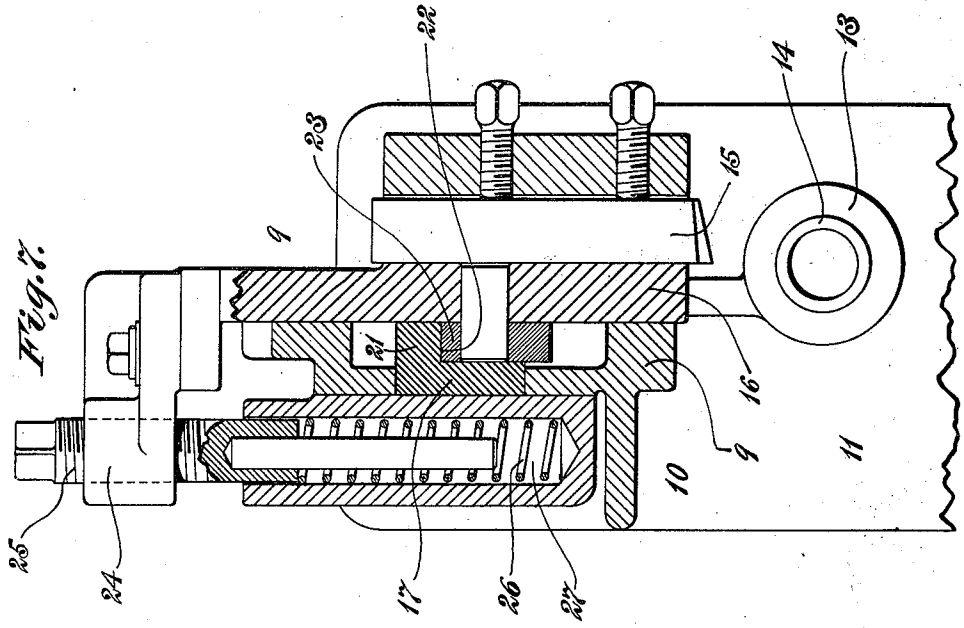


Fig. 7.



Witnesses:

Inventor:
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COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

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.

1,000,517. Specification of Letters Patent. **Patented Aug. 15, 1911.**

Application filed April 28, 1910. Serial No. 558,137.

To all whom it may concern:

Be it known that I, BENGT M. W. HANSON, 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 Metal-Working Machines, of which the following is a specification.

This invention relates to metal working machines and the improvements can be used with advantage in many different connections, for instance, in conjunction with or as part of a turret lathe.

The machine is adapted for performing different kinds of work, although it is organized in the present case for turning gear blanks and one of the primary purposes of the invention is to provide a construction embodying means for supporting a tool wherein said tool will be substantially and solidly held in an effective manner, said tool being adapted in the present case to turn the face or periphery of the blank. The machine also has provision for turning the opposite sides of the blank which in the case of a gear would be the front and rear faces thereof, and in this feature of the invention there are preferably though not necessarily, two sets of tools, one for roughing and the other for finishing, and the parts are so related that these sets of tools can be brought alternately into operative position in a quick and certain manner while the peripheral and two facing tools can also operate simultaneously on the work.

In the drawings accompanying and forming part of the present specification, I represent in detail one simple form of embodiment of the invention which I will hereinafter describe in detail, while the novelty of the invention will be included in the claims succeeding said description. I deem it well at this point to indicate that I do not restrict myself to the disclosure made by said drawings and description, the same being provided primarily to enable those skilled in the art to practice the invention. I may depart radically from the showing made by said description and drawings, within the scope of my invention as expressed in said claims. It is conceivable also that all the features need not be used in any one machine, and as I have already intimated I do not limit myself to the employment of the improvements in any particular kind of machine, although I have found them of especial advantage when employed in a turret lathe.

Referring to said drawings: Figure 1 is a top plan view of a metal working machine involving my invention. Fig. 2 is a front elevation of the same. Fig. 3 is a top plan view of a carriage, cross slide, turn table, face turning tools and certain other parts hereinafter more particularly described. Fig. 4 is a sectional front elevation of the parts shown in the preceding figure, the section being on the line 4—4 of Fig. 5. Fig. 5 is a transverse sectional elevation of the carriage mechanism. Figs. 6 and 7 are sections on the lines 6—6 and 7—7 respectively of Fig. 1.

The figures, as will be evident, are on different scales and throughout the same like characters refer to like parts.

The different parts of the machine may be supported upon any suitable style of framework. That shown includes in its construction a bed 2 such as is common in various kinds of lathes and which is shown supporting for traveling movement the turret slide 3 equipped with the turret 4. The bed 2 is illustrated as surmounted by a head stock 5 having a rotary spindle 6 and all these parts may be as generally employed in lathes. The work or blank 7 which in the present case is a beveled gear is driven onto an arbor 8 rotatively connected with the spindle 6 as is the custom.

The tool which operates upon the periphery of the blank 7 is preferably located over the axis of motion of the spindle 6 and in the present case is sustained by a bridging device such as that denoted in a general way by 9 which is during the work supported both by the head stock 5 and the turret slide 3 so as to eliminate chattering of the tool. This bridging device 9 involves in its construction a body portion as 10 provided at what might be considered its turret end with a pendant arm 11 disposed substantially at right angles to said body portion or bracket 10 and gibbed to the turret 4 by a gib 12. This bridging device 9 in addition to supporting the peripheral operating tool also has means for supporting the work 7 through the arm 11 in the present case. Said arm is represented as equipped with a

socket 13 which slidingly receives the arbor 8 which constitutes in effect a continuation of or a separable part of the work spindle 6. Preferably the arbor does not directly engage the socket 13 but directly enters a hardened bushing 14 fitted in said socket.

The peripheral turning tool is designated by 15 and it is connected with a carrier as 16 which, as illustrated, is supported for vertical sliding movement by the body portion or bracket 10, so that owing to this relation the tool can follow a path conforming to the taper or external shape of the blank whatever said shape may be for, as will be clear, the same need not necessarily be tapered, although this is so in the case of a beveled gear. The movement of the tool carrier 16 is preferably governed by a former or pattern on the bridging device 9 and which is generally held at rest during the motion of said bridging device with the turret slide 3 as will hereinafter appear. The bridging device 9 supports for horizontal sliding movement the bar 17 which, as will be evident, has a motion relatively to the bridging device, said bar being advancable in any suitable manner, for instance, by a hand lever 18 pivoted upon the bridging device 9 and having a curved bar operating portion or cam 19 which when the said lever is swung over from the full line to the dotted line position in Fig. 3 will advance the bar 17 into position where the forming device thereon may coöperate with the tool carrying slide 16 at which time the forward end of the bar abuts against a suitable adjustable stop such, for example, as a screw 20 on the support 5′ on the head stock 5. When the said bar strikes the said stop or screw 20 this will indicate that the forming device is in the desired position, and of course this position may be varied by the adjustment of the screw 20 or any other suitable way. The bar 17 is provided at a suitable place between its ends with the laterally extending offset 21, which constitutes in the present case a suitable former, the inclined face 22 presenting the active part thereof and being upon an angle corresponding with that of the blank. The bar 17 is withdrawable from its channel in the bridging device 9 so that a bar of a different character can be substituted in lieu thereof. The tool carrying slide 16 is provided with a suitable device coöperative with the pattern face 22 and the block or projection 23 thereon serves conveniently in this respect one surface or portion of said block being so related with the pattern face 22 as to engage and then ride along the same on the motion of the bridging device 9 with the turret slide 3, the bar 17 and necessarily the forming device 21 being stationary at this time. The block or guide engaging member 23 is preferably held positively in engagement with the active face of the flange 22, and spring means, as will now appear, serves satisfactorily in this respect. The upper end of the tool carrying slide 16 is furnished with an overhanging head 24 through which I have shown tapped a screw 25, the lower end of which is engageable by a push spring 26 in a vertical socket 27 in the bridge 9, the spring exerting a normally upward thrust to the tool carrying slide 16 so as to secure the function to which I have referred. In view of the fact that the spring 26 bears against the screw 25 simple provision is made for adjusting the tension of the spring. When the forming device or bar 17 is thrust forward into operative position in the manner previously set forth, I prefer to clamp the same in said position so that any tendency that might exist to displace the bar will cause no injury, and a clamping device such as will now be briefly described answers this requirement. The support 5′ on the head stock 5 is shown having a vertical bore to receive the shank of the substantially L-shaped clamping member 28 a spring 29 acting against a shoulder on said shank serving to constantly thrust the clamping member 28 into its ineffective position, separate means being provided to set the clamping member or to bring its active branch against the under side of the bar or forming device 17. The lever nut 30 presents a convenient means for setting said clamping member 28, the hub or nut proper being threaded onto the upper end of the shank of the clamping member 28 for such purpose. The said hub or nut proper finds a bearing against the upper surface of the support 5′. It will be assumed that the clamping member 28 is in its retractive position and in this event the forming device or bar 17 can be freely advanced until it abuts against the stop or screw 20. At this time the lever nut 30 will be operated so as to force the active branch or portion of the clamping member 28 against the leading or front end of said bar 17 to thereby clamp said bar against the head stock and positively prevent any endwise movement of the same. The bar 17 is usually advanced when the turret slide 3 is in its retracted or backward position by means of the lever 18, and when the requisite amount of movement has been given to the turret slide to bring said bar against stop screw 20, it will be clamped in position after which the further advance of the turret slide 3 will cause the desired feed of the tool. That is the bar 17 having been arrested just prior to the time the tool 15 comes in contact with the work, the turret slide 3 and the bridging device 9 continue to advance, thereby permitting the block or guide engaging member 23 as it advances to recede, the compound movement thereof being imparted through the tool slide to the tool the acting

portion of which follows a path corresponding to the active portion of the forming device 17.

To steady the work, the bridging device 9 may be provided at the end thereof farthest from the turret slide 3 with a pilot portion 31 which is shown as being substantially cylindrical and which is adapted to enter and slide in the socket or sleeve 32 rigidly connected with the support 5′ on the head stock 5, the pilot portion 31 entering said socket or sleeve just an instant prior to the time the tool 15 engages the work 7. I have not deemed it necessary to show any of the mechanism for operating the turret slide 3 longitudinally of the bed 2. Upon said bed 2 is supported for longitudinal traveling movement a carriage 33, and as will hereinafter appear, this carriage presents a convenient support for a cross slide with which are associated two sets of tools for operating upon the front and rear faces of the blank 7. Upon the carriage 33 is an oscillatory device 34 which is preferably made in the form of a turn table, said turn table having a depending hub 35 which fits rotatively and somewhat closely a circular opening in the upper side of the carriage 33, the hub constituting practically a pivot for the turn table and by virtue of its mounting preventing lateral movement of said turn table. The carriage 33 is shown having in its upper side an annular groove or channel 36 which receives clamping bolts 37 carried by the turn table, the heads of the bolts in the present case fitting said groove which for the purpose is preferably T-shaped in cross section. By setting the nuts of the bolts against the turn table the latter can be clamped to the carriage 33 and thereby held in a circularly adjusted position.

The turn table 34 has longitudinal ways to slidingly receive the cross slide 38 which, as will hereinafter appear, carries a second turn table or auxiliary turret means of a suitable nature which may be operated either by power or hand being provided to move the cross slide 38 longitudinally so as to cause the tools thereon to turn the work or to withdraw said tools. Rack and pinion means answer satisfactorily for operating the cross slide, the latter having rigidly fastened thereto the rack 39 in mesh with the pinion 40 rigidly fastened to the vertically extending stud shaft 41 preferably concentric with the turn table and extending through and turning in a central perforation therein. Owing to the relation of the parts just described, the cross slide can be properly reciprocated in any of the angular adjustments of the turn table 34. I have shown fastened to the stud shaft 41 a beveled gear 42, in mesh with the beveled pinion 43 rigidly fastened to the shaft 44 rotatively supported by the carriage 33 and having fastened to its outer end the spur gear 45 in mesh with the pinion 46 with which is rotatively connected the worm 47 in mesh with the worm gear 48 carried by the drop box 49 supported for oscillation by the power shaft 50. The shaft of the worm gear 48 rigidly carries a gear 51 in mesh with a gear 52 which is splined to said power shaft 50.

It is not necessary to go into detail in regard to the drop box 49 any more than to state that when the worm 48 is in mesh with the worm gear 47 the shaft 50 through the described part is adapted to apply its effect to the stud shaft 41. The motion of the stud shaft 41 will be arrested when the drop box 49 is swung downward, this action resulting in carrying the worm gear 48 out of mesh with the worm 47. A shaft 53 supported for rotation by the carriage 33 has a beveled pinion 54 fastened at its inner end in mesh with the gear 42 and is provided at its outer end with a hand wheel 55 by which said shaft 53 can be turned at will, whereby through the described parts, the cross slide 38 can be advanced or retracted directly by hand when not geared to the power shaft.

Upon suitable bearings of the carriage 33 is a slidable rod 56 which has a link 57 at one end (shown at the right in Fig. 5) connected with the upstanding portion of the drop box 49, said rod being encircled by a spring 58 acting against a collar thereon and also against the carriage 33, the constant tendency of said spring being to thrust the rod toward the left in Fig. 5 and thereby swing the drop box 49 downward to arrest the motion of the stud shaft 41. A latch or equivalent means, as will hereinafter appear, is provided to engage said rod 56 in such a manner as to maintain the spring 58 under compression, and the worm gear 48 in mesh with the worm gear 47. When this latch is tripped, the relaxing spring becomes effective for advancing said rod so as to unmesh the parts 48 and 47. Upon the carriage 33 is pivoted the spring actuated latch 59, the operative portion of which is adapted to normally engage against a shoulder 60 on the rod 56 so as to normally prevent advance of said rod by the spring 58. The instant that the latch is disengaged from the shoulder or catch portion 60, the rod will be released and the spring 58 performs the functions to which I have already referred.

I have shown fastened to the shaft 53 which in addition to being hand operable is normally turned by power, a pinion 61 in mesh with a spur gear 62 rotatively supported by the carriage 33. To the shaft to which the gear 62 is keyed I have shown as clamped a knock off or trip device 63 which coöperates with the spring actuated latch 59. In view of the fact that the knock off is

clamped to the shaft of the gear 62 I provide for the angular adjustment of said knock off and thereby can regulate the time at which said knock off trips the latch 59. The knock off and latch are of peculiar construction in that after the knock off has tripped the latch to stop the power feed, I can, without obstruction from the latch, advance the knock off or trip device beyond such point and in this way prevent the tools on the cross slide from gouging in to the hub of the gear blank which would probably be the case were the power feed continuous to the end of the cuts. The tail of the latch 59 is curved as at 64 while the knock off or trip 63 has a laterally extending head 65 at one end of the angular face 66 of said knock off device. The angular face 66 will ride against the curved portion 64 and will, before the end of said angular face is reached, trip the latch so as to stop the power feed. The knock off, however, may have a movement beyond this point during which the angular face 66 rides along the curved portion 64 until the lateral head 65 strikes said curved portion, the second period of operation occuring when the cross slide 38 is being fed by hand. The cross slide 38 supports the tool post 67 to which are rigidly fastened, in some suitable manner, the two sets of tools 68 and 69, the tools of the respective sets converging outward; the screws 70 may be provided for holding the several tools 68 and 69 in place. The tools 68 may be used for roughing, while the tools 69 may be employed for finishing, and they are preferably converged to adapt them to better operate upon opposite faces of a beveled gear. When the roughing tools have performed their office, the cross slide will be backed off and the tool post 67 will be turned to bring the secondary or finishing tools 69 into position. The angular relation of the active portions of the two sets of tools 68 and 69 with respect to the work, is secured in the present case by the adjustment of the swiveled slide-support or turn table 34. I desire also to call attention to the fact that either set of facing tools (68 or 69) can operate simultaneously with the peripheral turning tool 15. It might be well also to mention the fact that the disposition of the two sets of facing tools is duplicated; that is to say the active portions of each set of said tools will follow parallel paths similar to each other.

What I claim is:

1. The combination of a head stock having work supporting means, a slide, and a bridging device extending between said slide and the head stock, provided with means for supporting a tool and with means for also supporting the work.

2. The combination of a head stock, a slide, and a bridging device extending between said slide and head stock and provided with tool-supporting means and a spindle receiving socket the head stock having means for supporting said spindle.

3. The combination of a head stock, a slide, and a bridging device rigidly connected with said slide and slidingly connected with said head stock, provided with tool and work supporting means.

4. The combination of a head stock, a slide provided with a turret, and a bridging device having a depending member clamped to said turret and provided with a spindle receiving socket, the body of the bridging device having tool supporting means and being slidingly connected with said head stock.

5. The combination of a head stock having a socket, a slide, a bridging device rigidly connected with said slide and having a pilot portion slidable in said socket said bridging device having separate means for supporting a tool and the work.

6. The combination of a head stock having a socket a slide provided with a turret, and a bridging device, said bridging device having a pilot portion at one end slidable in said socket and having a depending portion at the other end clamped to said turret, said depending portion being provided with a spindle-receiving socket and the body thereof having tool supporting means between its ends.

7. The combination of a head stock having work supporting means, a slide, a bridging device extending between the slide and the head stock, provided with means for supporting a tool, and with means for also supporting the work, and a forming device coöperative with the tool, also supported by said bridging device.

8. The combination of a head stock, a slide, a bridging device extending between the slide and the head stock, a tool carrying member supported by the bridging device, and means including a forming device, supported by said bridging device, for causing a shifting movement of the tool on the movement of said slide.

9. The combination of a head stock, a slide, a bridging device extending between the slide and the head stock, a tool-carrying member supported by said bridging device, a forming device coöperative with the tool-carrying member and also supported by and movable with respect to said bridging device, and means supported independently of the bridging device for clamping said forming device in an adjusted position.

10. The combination of a head stock, a slide, a bridging device extending between the slide and the head stock, a tool carrying member movably supported by said bridging device, a forming device also supported by and movable with respect to said bridging device, said forming device serving to

guide the tool, and means for preventing motion of said forming device with said slide.

11. The combination of a head stock, a slide, a bridging device extending between the slide and the head stock, a tool carrying member supported by the bridging device, a forming device for guiding the tool, and means for preventing motion of the forming device on the movement of said slide.

12. The combination of a head stock, a slide, a forming device, a supporting member for said forming device, the forming device being movable relatively to the supporting member, and a tool-carrying member supported by said supporting member and coöperative with said forming device.

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

BENGT M. W. HANSON.

Witnesses:
W. M. STORRS,
H. W. KILBOURNE.