July 29, 1941. W. F. GROENE ET AL 2,250,633

TAPER ATTACHMENT

Filed April 11, 1940 5 Sheets-Sheet 1

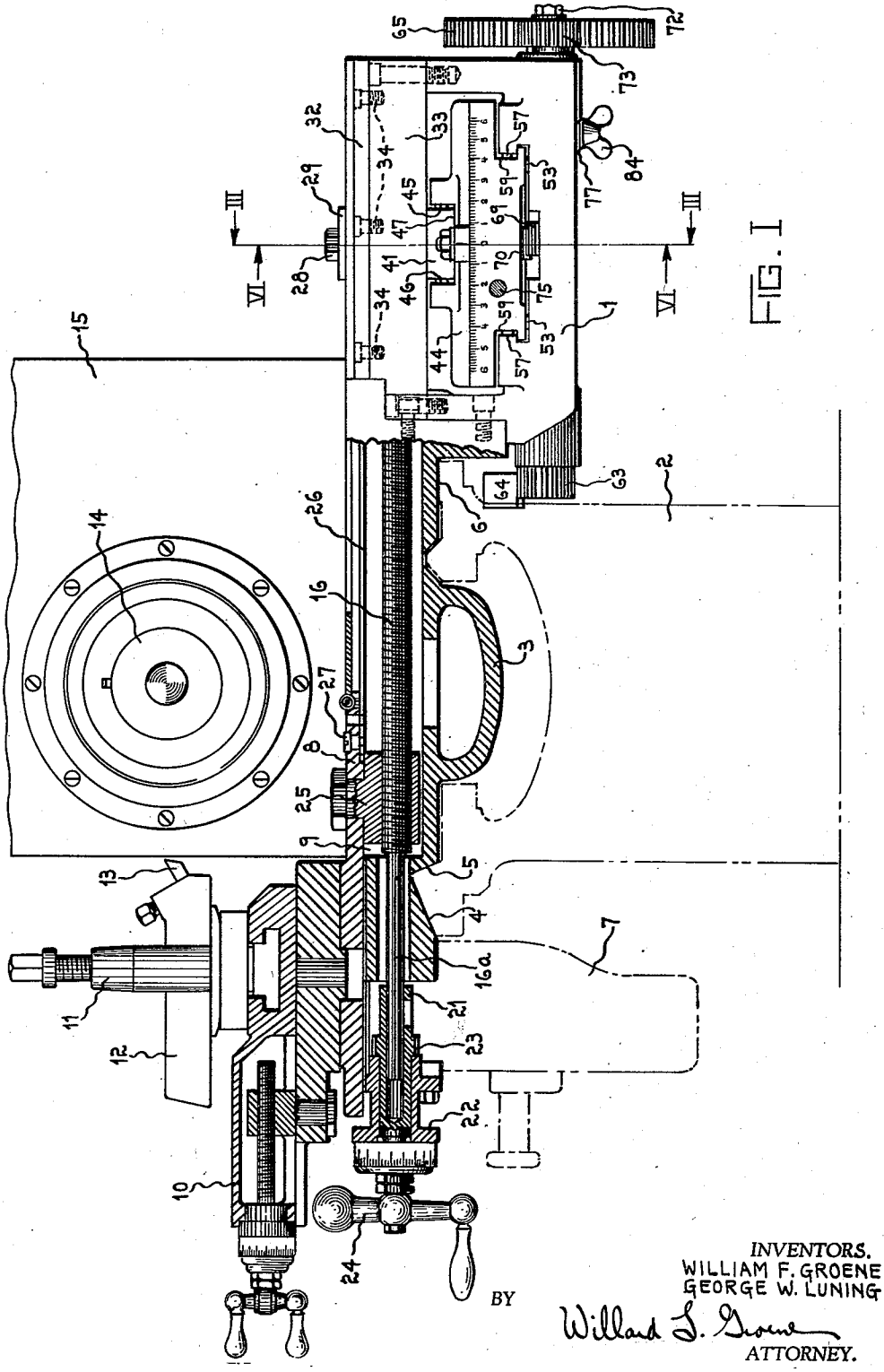


FIG. I

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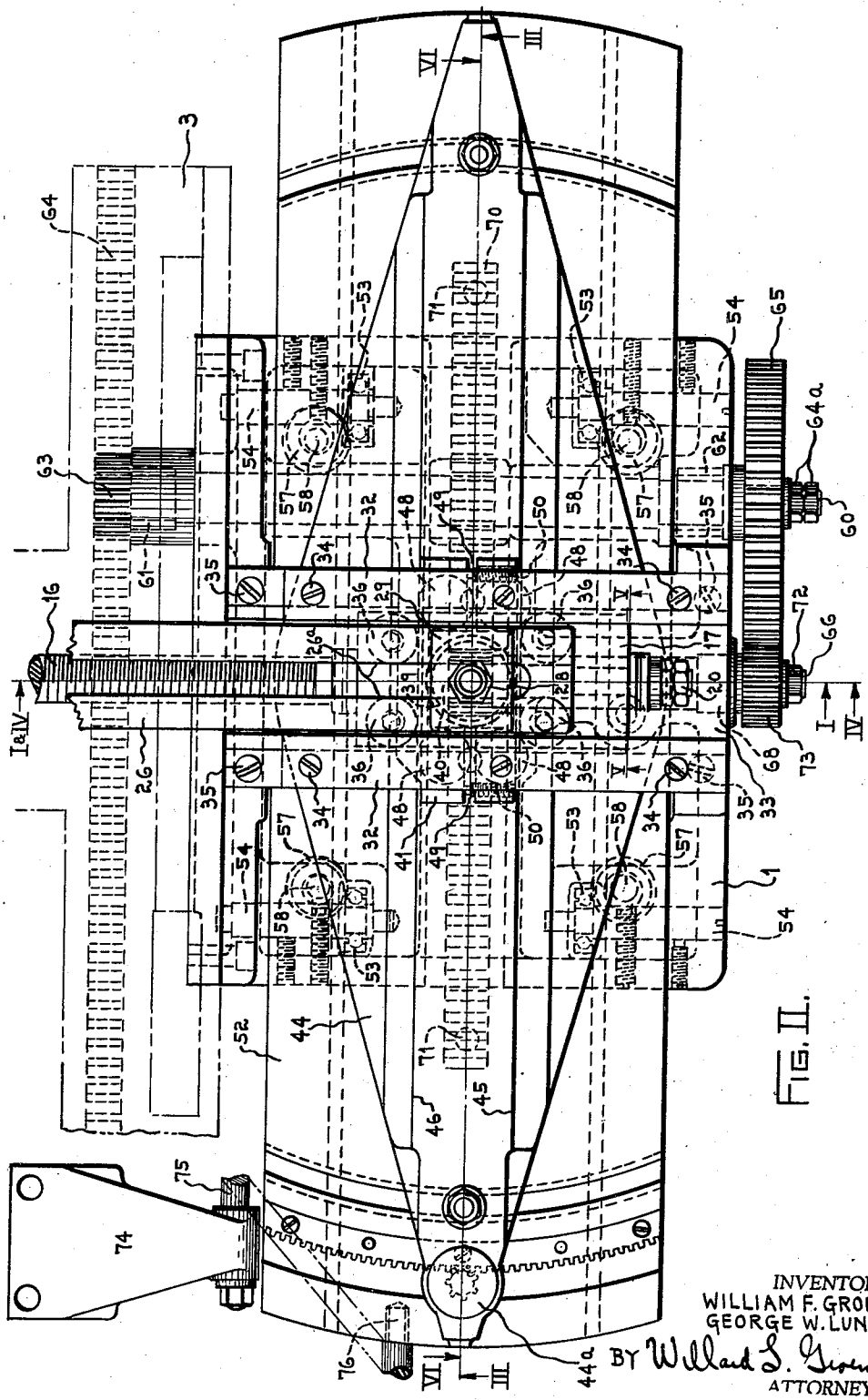


FIG. II.

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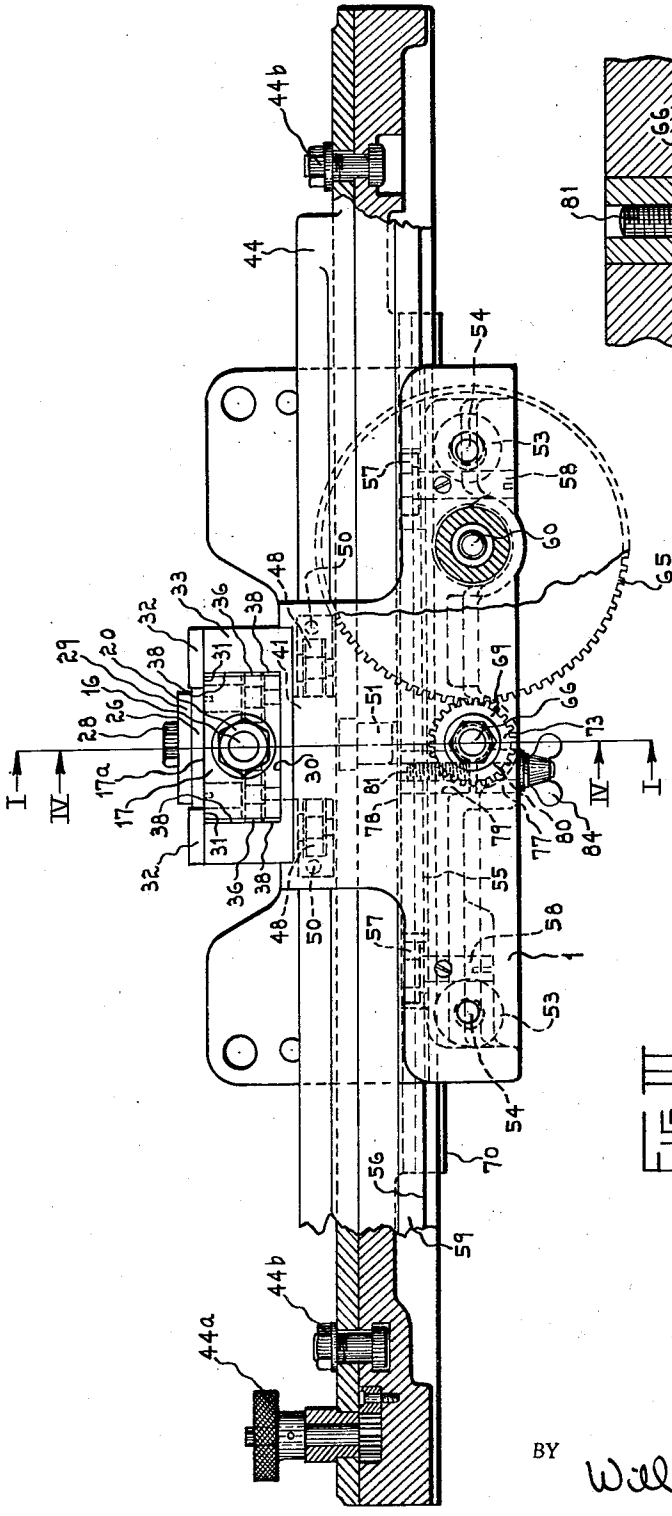


FIG. III.

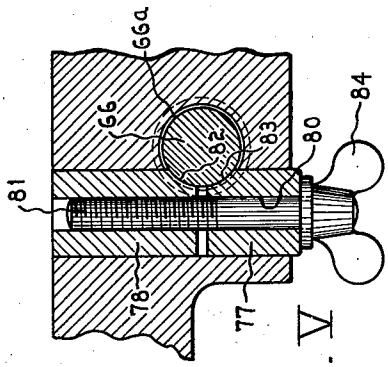


FIG. V

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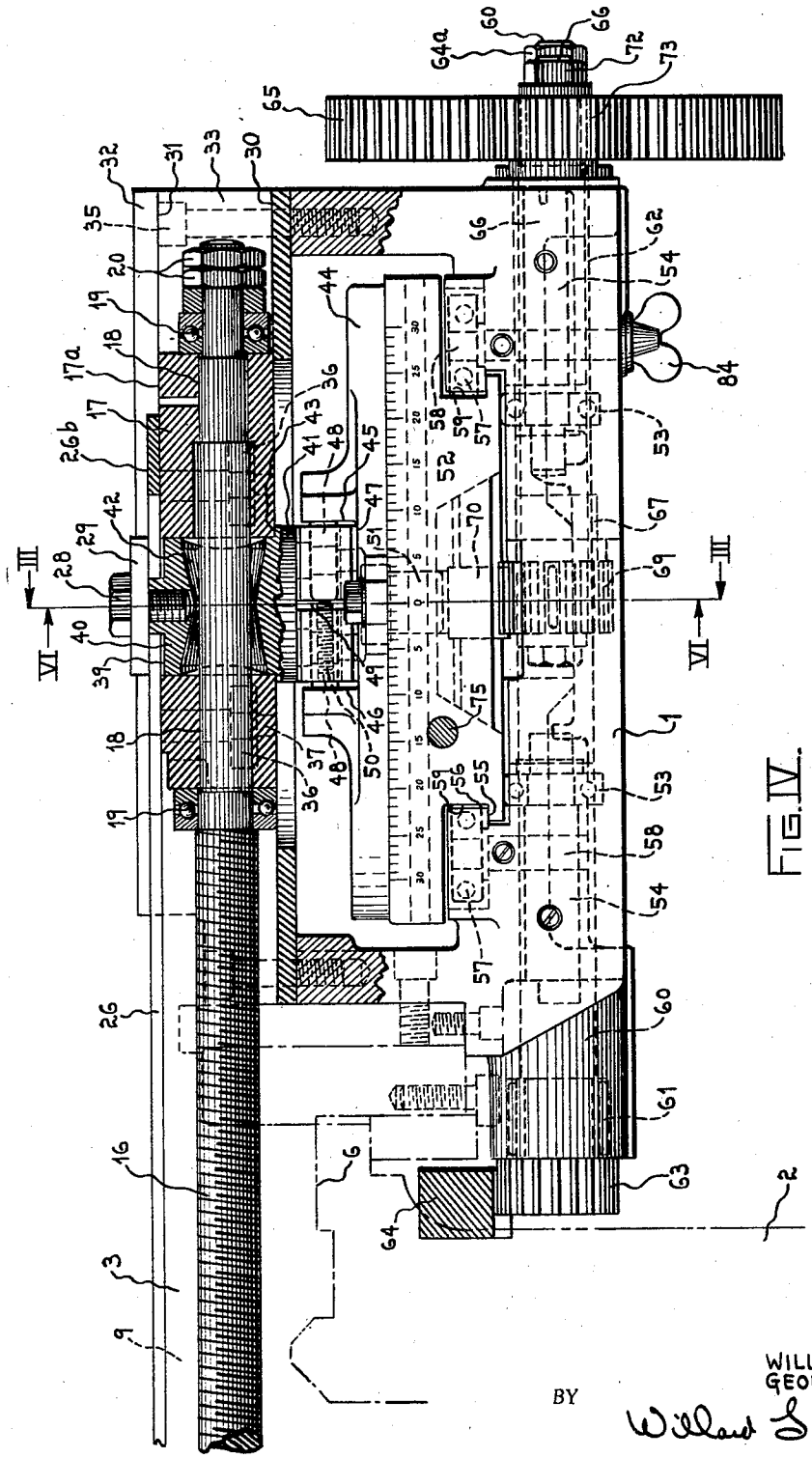


FIG. IV.

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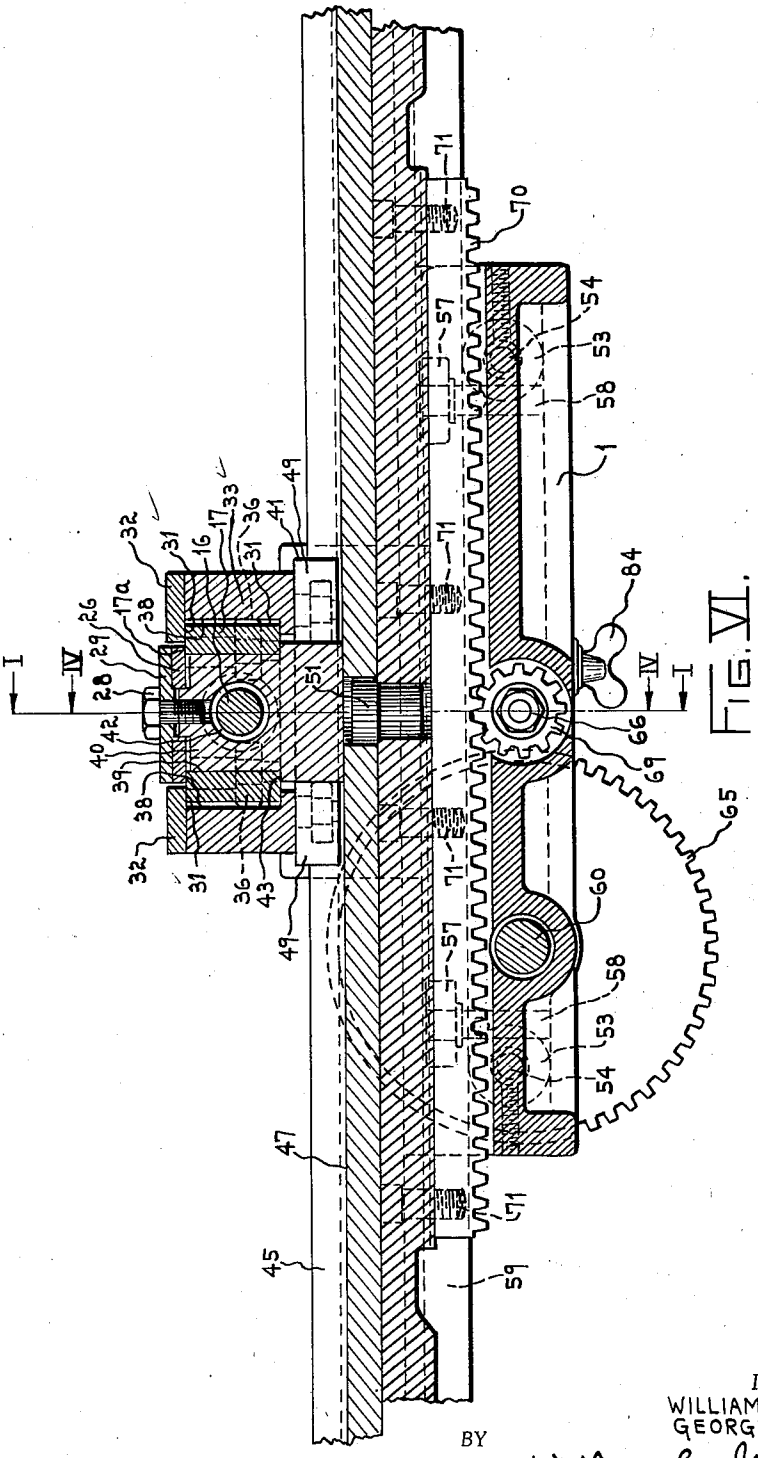


FIG. VI.

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UNITED STATES PATENT OFFICE

2,250,633

TAPER ATTACHMENT

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Application April 11, 1940, Serial No. 329,131

6 Claims. (Cl. 82—17)

This invention pertains to taper attachments for engine and tool room lathes, which are adapted to turn tapered surfaces on work held in such lathes. Further, this invention pertains specifically to taper attachments for such lathes for actuating the carriage and cross slide in such a manner that tapered surfaces may be machined on the work pieces in the lathe.

This invention pertains to certain improvements in differentially operated taper attachments of a type as set forth in co-pending application Serial #228,279, filed September 3, 1938. It is one of the objects in this invention to arrange such a differential taper attachment with a relatively long guide bar so as to increase the efficiency of the differential operating mechanism in that the guide bar slide may be moved relatively more rapidly and a greater distance while at the same time using a lesser angle of setting for the guide bar to thereby cut down the relative strain and side thrust on the lathe carriage mechanism during the cutting of relatively steep tapers.

It is also an object of this invention to provide a differentially operated taper attachment with a relatively long guide bar, while at the same time providing mechanism whereby the guide bar may be utilized in direct connection with bed of the lathe, independent of the differential operating mechanism, when turning relatively small tapers so as to gain the full length and efficiency of the long taper bar during such relatively small taper turning.

Further features and advantages of this invention will be set forth in a brief description of the drawings in which:

Figure I is a transverse fragmentary section through a lathe carriage and cross slide mechanism on the line I—I of Figures II, III, and VI, incorporating the taper attachment arrangement of this invention.

Figure II is a plan view of the taper attachment shown attached to the rear of the carriage of the lathe arrangement shown in Figure I.

Figure III is a rear elevation of the taper attachment shown partly in section on the line III—III of Figures I, II, and IV.

Figure IV is an enlarged end view of the taper attachment partly in section on the line IV—IV of Figures II, III, and VI.

Figure V is an enlarged detailed view of the clamping mechanism for locking the slide rack pinion shaft against rotation on the frame of the taper attachment.

Figure VI is a section through the taper attachment on the line VI—VI of Figures I, II, and IV.

Referring particularly to Figure I, the taper attachment 1 of this invention is shown applied to a typical engine lathe comprising the bed 2 upon which is slidably mounted the carriage 3 on the usual ways 4, 5, and 6 for longitudinal movement along the bed 2. On the carriage 3 is mounted a suitable apron 7 for effecting movement of the carriage and cross slide 8 (when not turning tapers) slidably mounted on the usual dove tail ways 9 of the carriage. The usual compound rest 10 the tool post 11 and the tool holder 12 and cutting tool 13 are provided on the cross slide to operate on work rotated by the work spindle 14 of the headstock 15.

The cross feed screw 16 is journaled against axial movement in the slidable block 17, Figure IV, on the bearing portions 18 and the thrust bearing 19, nice adjustment being maintained between this cross feed screw 16 and this block 17 by means of the lock nuts 20. The other end of the cross feed screw 16 is provided with a splined end 16a, Figure I, which telescopically slides in and is driven by the pinion sleeve 21 journaled in the lathe carriage in a suitable bracket 22. This sleeve 21 has a pinion 23 which may be driven by power from the mechanism in the apron 7 when doing ordinary facing or cross cutting operations in the lathe. The sleeve 21 may also be rotated manually by means of the ball crank handle 24, fixed on the outer end of this sleeve 21. The cross slide has the nut 25 fixed thereto and operatively engaging around the cross feed screw 16. The cross slide 8 and cross feed screw 16, when the screw is not being rotated, can thus be bodily moved independent of the driving sleeve 21. This bodily movement of the cross slide 8 and cross feed screw 16 may be effected by axially moving the cross feed screw 16, but this is not wholly satisfactory because of the inherent back lash between the nut 25 and the cross feed screw 16 permitting shake and relatively axial movements of the screw relative to the cross slide in reversing the axial movement of this screw. In order to overcome this defect a draw bar 26, Figures I and IV is provided which is secured to the cross slide by suitable screws 27 and projects rearwardly and lies on the top surface 17a of the block 17, having a slotted portion 26a extending each side the clamping bolt 28, which carries a clamping plate 29 resting on the top surface 26b of the draw bar 26 whereby the clamping bolt 28 may be locked down to bring the plate 29 tightly against the draw bar

26 locking it in firm engagement with the block 17 so that no relative movement may be effected between this block 17 and therefore the cross feed screw 16 and the carriage and the cross slide of the lathe.

During ordinary turning or cross feeding work the locking screw 28 is released so as to permit free sliding movement of the draw bar 26 relative to the block 17 when the cross feed screw 16 is being rotated either by power through the pinion 23 or by the ball crank handle 24 in a manual operation. However when taper turning this screw 28 is locked firmly so as to bind the block 17 through the draw bar firmly to the cross slide of the lathe in order that movements effected in this block 17 by the taper attachment mechanism to be described will effect similar and positive motion in the cross slide of the lathe independent of the cross feed screw 16. The cross feed screw 16 performing no function during the taper turning in this apparatus.

The block 17 is guided between the surfaces 30 and 31 formed by the guide plates 32 fixed on the block 33 by suitable screws 34. The block 33 is fixed to the bracket 1 of the taper attachment by suitable screws 35. Sidewise thrust on the block 17 is taken care of by the anti-friction ball bearing rollers 36 suitably mounted on eccentric studs 37 carried in the block 17 and rolling against the surfaces 38, Figures III and VI, of the block 33.

To the middle of the block 17 is provided a bore 39 in which is rotatively mounted the upwardly projecting portion 40 of the guide bar shoe 41, and has a clearance bore 42 through which passes the cross feed screw 16. In the upper end of this projection 40 is mounted the clamping screw 28 for locking the draw bar 26 to the member 17 as described. Upward movement of the portion 40 under the action of tightening the screw 28 is prevented by engagement of the surface 43 of the guide bar shoe 41 against the under surface of the block 17. The tapered conical hole 42 is provided so as to permit full rotative movements of the guide bar shoe 41 by rotation in the bore 39 for the complete range of setting of the guide bar 44 having the slot formed by the faces 45, 46, and 47. Between these faces 45 and 46 is snugly mounted the guide bar shoe 41 having the four rollers 48 mounted on the bifurcated end of this guide bar shoe 41. In order to provide firm and snug engagement of these rollers 48 with the sides 45 and 46 of the guide bar 44, the ends of this guide bar shoe are provided with slots 49 and one end of these bifurcated ends is provided with a set screw 50, threaded through one of the ends and to engage the other end in the slots 49 so that by tightening the set screws 50 these ends will be spread apart and thereby force the respective rollers 48 into snug and firm engagement with these sides 45 and 46 of the guide bar 44. Thus with this arrangement no shake or back lash can enter the mechanism between the guide bar 44 and the draw bar 26 of the taper attachment when doing taper turning. Also when the taper attachment bar is set parallel with the lathe bed as shown in Figure II, no shake will result in the member 17 carrying the cross feed screw, so that when the tightening screw 28 is released for the ordinary operation of the lathe, there will be no axial float in the cross feed screw to disturb the proper action of this member in actuating the cross slide.

The guide bar 44 is pivotally mounted on a suitable pin 51, Figures III and VI fixed in the taper attachment slide member 52. The usual set over mechanism 44a and clamping mechanism 44b is provided for the guide bar 44. The slide 52 is carried on the anti-friction roller bearings 53 appropriately mounted on eccentric studs 54 carried in the bracket 1 of the taper attachment. The slide 52 is held in proper engagement with the rollers and against any upward lifting movement by engagement of the surfaces 55 formed on the bracket 1 with the surfaces 56 formed on the slide 52, so that when the rollers 53 are properly adjusted by means of the eccentric studs 54 in the taper attachment bracket 1 accurate guiding of the slide 52 in vertical relationship is provided without any lifting chattering or other distortion of this motion in the slide 52.

Horizontal displacement of the slide is taken care of by engagement of the anti-friction rollers 57 provided on suitable eccentric studs 58 which engage the surfaces 59 of the slide 52 these rollers being carefully adjusted to engage these surfaces so as to take care of all sidewise or horizontal thrust caused by the angular setting of the guide bar 44.

The taper attachment slide 52 may be actuated in differential movement that is movement at a predetermined but different rate than the relative rate of movement of the carriage to the lathe bed, during taper turning or may be held stationary relative to the bed so as to have the same relative movement to the lathe carriage that the carriage has to the lathe bed. The differential relative movement is affected by means of the bed rack pinion shaft 60 suitably journaled in bearings 61 and 62 in the bracket 1 of the taper attachment and has a pinion 63 fixed on its inner end and operatively engaging the rack 64 fixed on the bed. The other end of this shaft 60 extends outwardly and has change gear arrangement comprising the nuts 64a appropriately mounted on its end whereby suitable change gearing 65 may be inserted or removed from the end of this shaft.

Also journaled in the bracket 1 of the taper attachment is the taper attachment slide rack pinion shaft 66, mounted on appropriate bearings 67 and 68 in this bracket 1 and has a rack pinion 69 fixed on its inner end engaging the rack 70 fixed to the underside of the slide 52 by suitable screws 71. The outer end of this shaft 66 is also provided with a change gear arrangement by means of the nut connecting means 72 on which may be selectively mounted change gearing 73 in proper engagement with the change gearing 65 on the shaft 60.

The pinions 63 and 69 are so arranged that a simple selection of change gearing between the shafts 60 and 66 may result in definite pre-determined relative movement of the slide 52 with respect to the lathe bed when the carriage is moved longitudinally thereof causing the rack 64 on the bed to drive the pinion 63 and the gear 65 to drive the gear 73 and thus the pinion 69 to drive the slide 52 during the longitudinal movement of the carriage along the bed. By use of the relatively long taper attachment guide bar 44, in conjunction with this differential mechanism, a relatively high rate of travel may be effected in the slide 52 with relation to the bed and also a relatively slight angle may be set on the guide bar so as to effect taper cutting for relatively long distances with a high degree of efficiency since none of the parts are over-

stressed because of this greater relative movement of the taper bar with respect to the guide bar shoe 41, which may be effected by this construction.

When it is desired to cut relatively slim long tapers this arrangement is provided with a bracket 74 which may be appropriately bound to the bed way 6, as is usual in apparatus of this kind, and which bracket carries a bar 75 extending parallel with the lathe bed and fixed in the end of the slide 52 by suitable threaded connections 76. When it is desired to operate the taper attachment independent of the differential mechanism, the bracket 74 is locked to the bed so that it cannot move longitudinally of the way 6 to thereby hold the slide 52 in fixed relation with regard to the bed of the lathe during the operation of the carriage longitudinally thereof. In order to disconnect the differential mechanism from operative effect on this slide 52, it is merely necessary to pick off one of the change gears 65 or 73, so as to allow the shaft 60 free rotation without driving the shaft 66 as the carriage moves along the bed. When it is desired to utilize the lathe for ordinary turning the differential change gears 65 and 73 are again disconnected by removing one or the other of these gears so that the shaft 60, while it rotates during longitudinal movement of the carriage along the bed, will have no effect in moving the slide 52.

In order that the slide 52 may not be moved during the normal turning operations on the lathe, means is provided for locking the shaft 66 against rotation in the bracket 1 of the taper attachment. This arrangement is best shown in Figure V and comprises a pair of bushings 77 and 78, carried in a suitable bore 79 in the taper attachment bracket 1. A wing screw passing through a bore 80, in the bushing 77 is threaded into the bore 81 of the bushing 78 and each of the bushings have arcuate surfaces 82 and 83 engaging the diameter portion 66a of the shaft 66, so that when the wing screw 84 is tightened to draw the bushings 77 and 78 toward each other, their respective arcuate surfaces 82 and 83 will be bound against the diameter portion 83 of the shaft 66 so as to prevent rotation of this shaft when the change gearing between shafts 60 and 66 is disconnected. In this way the slide 52 is prevented from movement along the rollers 53 and 57.

Having thus fully set forth and described our invention what we claim as new and designed to secure by United States Letters Patent, is:

1. In a lathe, a bed, a carriage movable longitudinally on said bed, a taper attachment mounted on the carriage comprising a bracket, a guide bar slide carried by said bracket and movable relative to the carriage longitudinally of the bed, an angularly adjustable guide bar on said slide for actuating the cross slide on said carriage, a shaft journaled in said bracket, a pinion fixed on said shaft engaging a rack fixed on said bed, a second shaft journaled in said bracket, a pinion fixed on said second shaft engaging a rack fixed on said slide, gearing in said taper attachment interconnecting said shafts, means independent of said shafts for locking said slide to said bed, and means for disconnecting said gearing when said slide is locked to said bed.

2. In a lathe, a bed, a carriage movable longitudinally on said bed, a taper attachment mounted on the carriage comprising a bracket, a guide bar slide carried by said bracket and movable relative to the carriage longitudinally of the bed, an angularly adjustable guide bar on said slide for actuating the cross slide on said carriage, a shaft journaled in said bracket, a pinion fixed on said shaft engaging a rack fixed on said bed, a second shaft journaled in said bracket a pinion fixed on said second shaft engaging a rack fixed on said slide, gearing in said taper attachment interconnecting said shafts, means independent of said shafts for locking said slide to said bed, means in said taper attachment for locking said second shaft against rotation in said bracket to prevent movement of said slide when said gearing is disconnected.

3. In a lathe, a bed, a carriage movable longitudinally on said bed, a taper attachment mounted on the carriage comprising a bracket, a guide bar slide carried by said bracket and movable relative to the carriage longitudinally of the bed, an angularly adjustable guide bar on said slide for actuating the cross slide on said carriage, a shaft journaled in said bracket, a pinion fixed on said shaft engaging a rack fixed on said bed, a second shaft journaled in said bracket a pinion fixed on said second shaft engaging a rack fixed on said slide, gearing in said taper attachment interconnecting said shafts, means independent of said shafts for locking said slide to said bed, means for disconnecting said gearing when said slide is locked to said bed, and means in said taper attachment for locking said second shaft against rotation in said bracket to prevent movement of said slide when said gearing is disconnected and said slide is disconnected from said bed.

4. In a lathe, a bed, a carriage movable longitudinally on said bed, a taper attachment mounted on the carriage comprising a bracket, a guide bar slide carried by said bracket and movable relative to the carriage longitudinally of the bed, an angularly adjustable guide bar on said slide, a block slidably mounted in said bracket for movement cross wise of said carriage, a guide bar shoe operating in said guide bar pivotally mounted on said block for sliding said block by movement of said slide, a cross feed screw journaled against axial movement in said block and operating in a nut fixed on the cross slide of said lathe, a draw bar fixed to said cross slide and associated with said block, means for locking said draw bar to said block, means for rotating said cross feed screw when said draw bar is disconnected from said block, a shaft journaled in said bracket, a pinion fixed on said shaft engaging a rack fixed on said bed, a second shaft journaled in said bracket, a pinion fixed on said second shaft engaging a rack fixed on said slide, gearing in said taper attachment interconnecting said shafts, means independent of said shafts for locking said slide to said bed, and means in said taper attachment for disconnecting said gearing when said slide is locked to said bed.

5. In a lathe, a bed, a carriage movable longitudinally on said bed, a taper attachment mounted on the carriage comprising a bracket, a guide bar slide carried by said bracket and movable relative to the carriage longitudinally of the bed, an angularly adjustable guide bar on said slide, a block slidably mounted in said bracket for movement cross wise of said carriage, a guide bar shoe operating in said guide bar pivotally mounted on said block for sliding said block by movement of said slide, a cross feed screw journaled against axial movement in said block and operating in a nut fixed on the cross slide of said lathe, a draw bar fixed to said cross slide and

associated with said block, means for locking said draw bar to said block, means for rotating said cross feed screw when said draw bar is disconnected from said block, a shaft journaled in said bracket, a pinion fixed on said shaft engaging a rack fixed on said bed, a second shaft journaled in said bracket, a pinion fixed on said second shaft engaging a rack fixed on said slide, gearing in said taper attachment interconnecting said shafts, means independent of said shafts for locking said slide to said bed, means for locking said second shaft against rotation in said bracket to prevent movement of said slide when said gearing is disconnected.

6. In a lathe, a bed, a carriage movable longitudinally on said bed, a taper attachment mounted on the carriage comprising a bracket, a guide bar slide carried by said bracket and movable relative to the carriage longitudinally of the bed, an angularly adjustable guide bar on said slide, a block slidably mounted in said bracket for movement cross wise of said carriage, a guide bar shoe operating in said guide bar pivotally mounted on said block for sliding said block by movement of said slide, a cross feed screw journaled against axial movement in said block and operating in a nut fixed on the cross slide of said lathe, a draw bar fixed to said cross slide and associated with said block, means for locking said draw bar to said block, means for rotating said cross feed screw when said draw bar is disconnected from said block, a shaft journaled in said bracket, a pinion fixed on said shaft engaging a rack fixed on said bed, a second shaft journaled in said bracket, a pinion fixed on said second shaft engaging a rack fixed on said slide, gearing in said taper attachment interconnecting said shafts, means independent of said shafts for locking said slide to said bed, means for disconnecting said gearing when said slide is locked to said bed, and means in said taper attachment for locking said second shaft against rotation in said bracket to prevent movement of said slide when said gearing is disconnected and said slide is disconnected from said bed.

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