E. C. HEAD.

FINAL ADJUSTING DEVICE FOR MACHINE TOOLS.

APPLICATION FILED NOV. 10, 1917.

**1,328,670.** Patented Jan. 20, 1920.

3 SHEETS—SHEET 1.

Fig. 1.

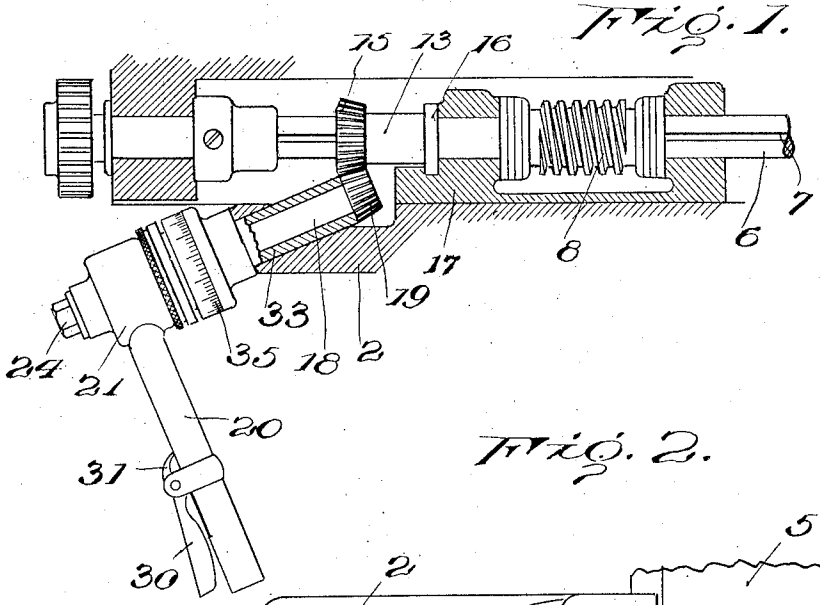
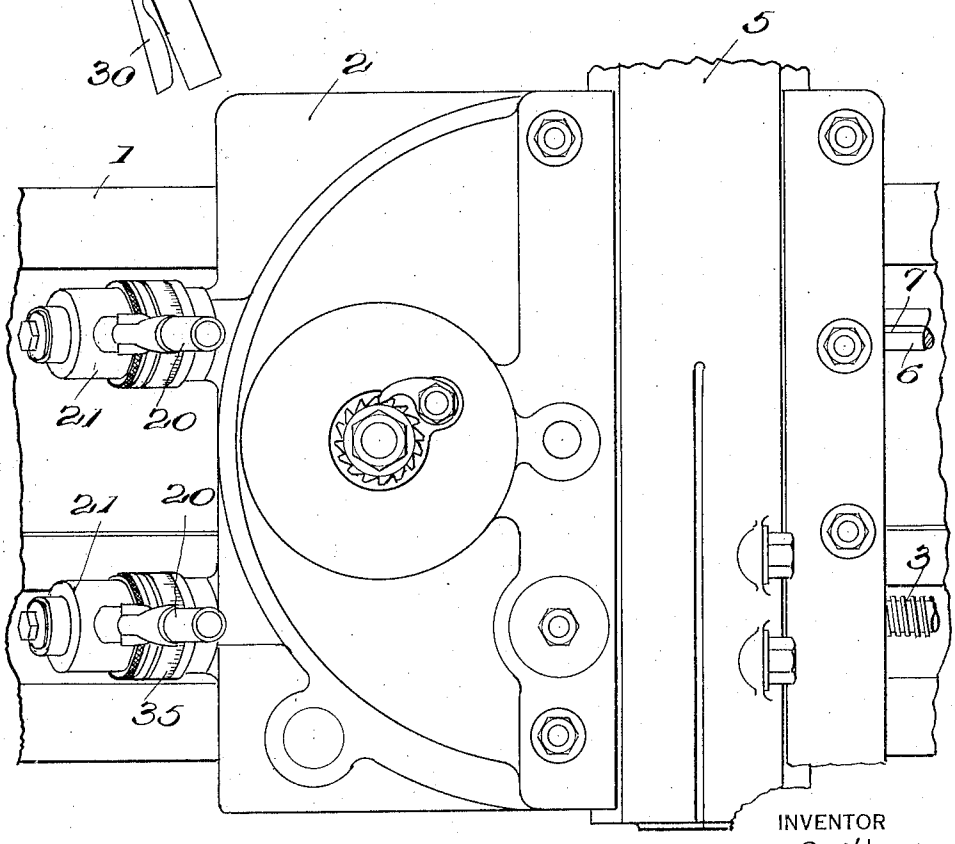



Fig. 2.




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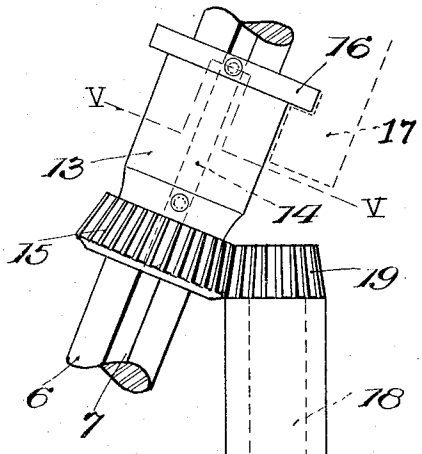
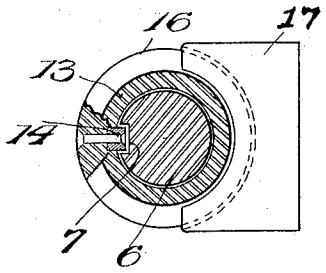



Fig. 3.

Fig. 5.



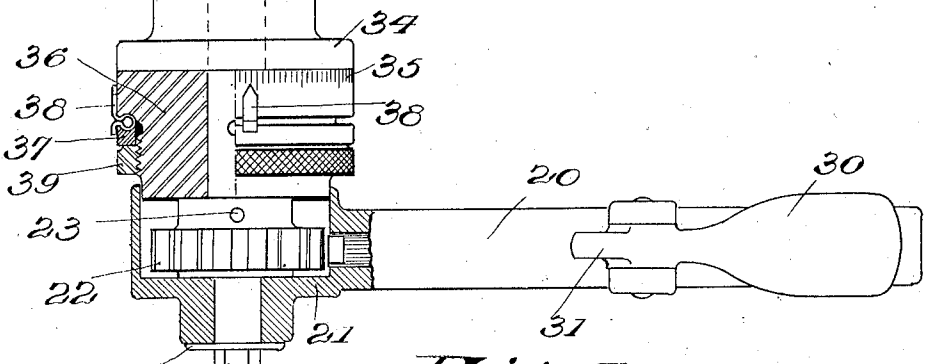
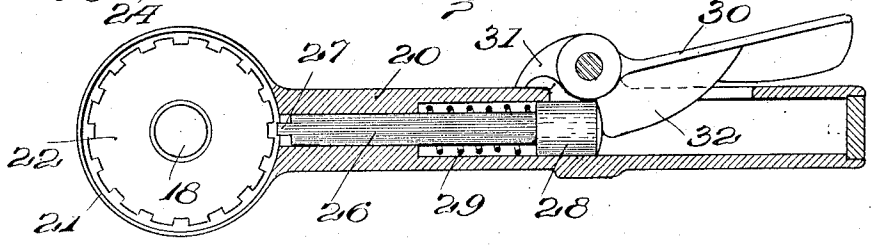




Fig. 4.




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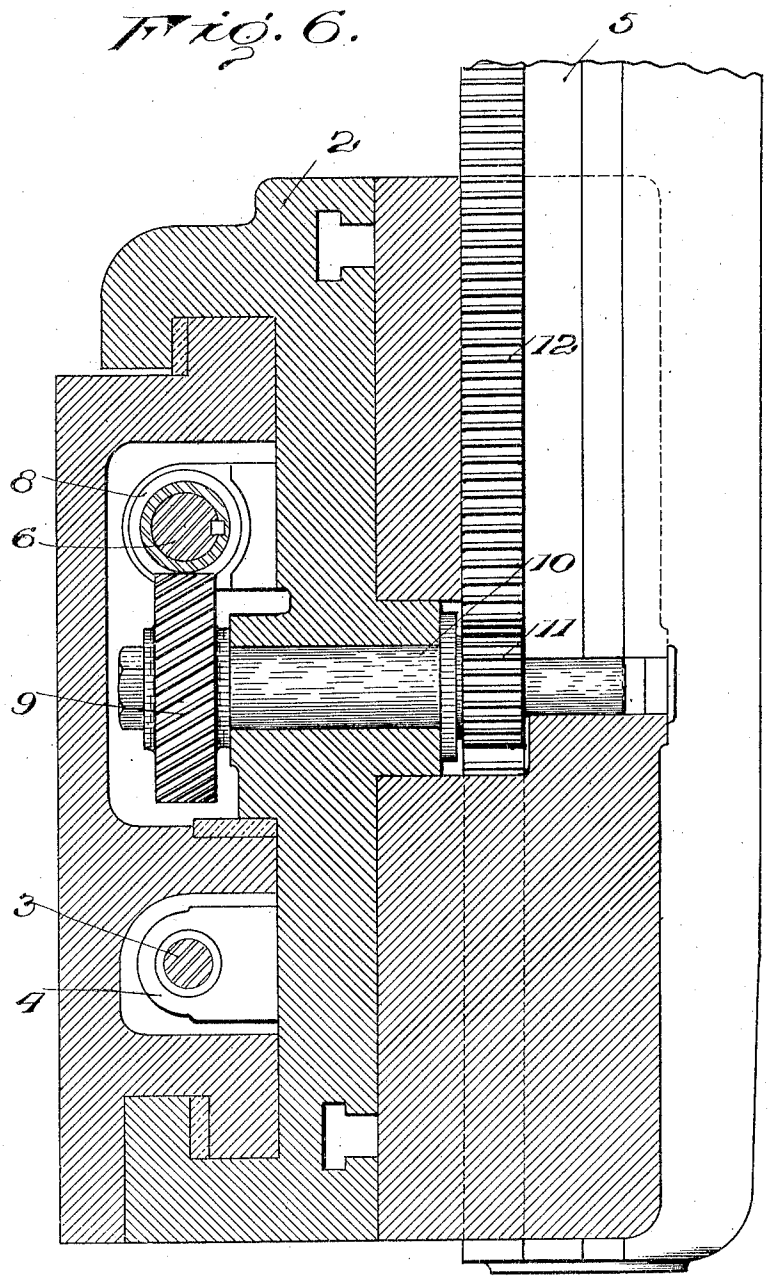
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3 SHEETS—SHEET 3.

Fig. 6.




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# UNITED STATES PATENT OFFICE.

ERNEST C. HEAD, OF VAN WERT, OHIO, ASSIGNOR TO COLBURN MACHINE TOOL COMPANY, OF FRANKLIN, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

## FINAL ADJUSTING DEVICE FOR MACHINE-TOOLS.

1,328,670. Specification of Letters Patent. Patented Jan. 20, 1920.

Application filed November 10, 1917. Serial No. 201,242.

*To all whom it may concern:*

Be it known that I, ERNEST C. HEAD, a citizen of the United States of America, and a resident of Van Wert, Ohio, have invented a new and useful Improvement in Final Adjusting Devices for Machine-Tools, which invention is fully set forth in the following specification.

This invention relates to a manually-operated adjusting device for machine-tools and, while capable of a wide variety of applications, has special utility when employed as a final adjusting device for the tools of vertical boring and turning mills.

In the operation of machine-tools, it is frequently necessary to adjust the tool to the work to one one-hundredth of an inch, a half-hundredth of an inch, or even one one-thousandth of an inch, and it is not feasible, if possible, to set the tool with such accuracy by the use of the main feed devices of the machine. It therefore becomes desirable to provide an adjusting device operating upon the feed element or elements and supplemental thereto for the purpose of accurately adjusting the tool after the same has been roughly positioned by operation of the main feed device or devices. It is an object of this invention to provide a final adjusting device of the type characterized which is simple in construction and accurate and efficient in operation.

The invention has for another object the provision of an improved manually-operated adjusting device for a feed element that is so constructed and mounted as to enable its convenient operation without the workman having to leave his place at the table of the machine-tool.

Yet another object of the invention relates to the provision of an adjusting device of the type characterized with means whereby the extent of adjustment of the feed element may be accurately indicated.

A still further object of the invention relates to the provision of an adjusting device of the type described that is so arranged as to be at all times readily accessible to the workman, while in no way interfering with the operation of the associated parts of the machine-tool, and one that may be operated with a minimum exertion on the part of the workman.

Other objects will appear as the description of the invention proceeds.

Stated briefly, the invention comprises, in combination with a feed element and a gear mounted on the feed element and adapted to rotate the same, a shaft mounted at an angle, preferably an acute angle, to the feed element, a pinion on said shaft for rotating, and preferably in mesh with, said gear, means desirably in the form of ratchet mechanism for manually rotating said shaft, and preferably means to indicate the extent of adjustment of said feed element. Said shaft is preferably mounted in the saddle to travel therewith and, when such is the case, means are provided for causing the gear to also travel with the saddle. To position the manually operated element of the adjusting device conveniently accessible to the workman, the aforesaid shaft is shown as extending in its acute angle to the feed element away from the saddle and preferably in the same horizontal plane with said feed element, and the manually operated member extending at an angle to said shaft toward the front of said saddle.

The invention is capable of receiving a variety of mechanical expressions, one of which is shown in the accompanying drawings, but it is to be expressly understood that such drawings are for the purposes of illustration only and are not to be considered as a definition of the limits of the invention, reference being had to the appended claims for that purpose.

In said drawings—

Figure 1 is a horizontal section through a portion of a saddle and cross-rail of a machine-tool, showing an improved final adjusting device embodying the present invention attached to the feed rod thereof;

Fig. 2 is a front elevation of a saddle, together with the adjacent portions of the cross-rail, and shows both the feed rod and feed screw equipped with the improved adjusting device;

Fig. 3 is a detached view, partly in section, of the main elements of the adjusting device;

Fig. 4 is a vertical section through the ratchet mechanism;

Fig. 5 is a section on the line V—V of Fig. 3; and

Fig. 6 is a vertical section through portions of the cross-rail and saddle of a vertical boring and turning mill to which, for the purposes of illustration, the improved adjusting device is shown applied.

Referring to the drawings in detail, the same characters of reference being used throughout the several figures to designate corresponding parts, the invention is shown as applied to the feed mechanism of a vertical boring and turning mill, but it is to be expressly understood that the same is not to be restricted in its application to any particular form of machine-tool, as the invention is of utility wherever final and accurate adjustment of a tool through a feed element is desirable.

In the form shown, 1 is the cross-rail and 2 the saddle thereon. Traverse of the saddle on the rail is effected through the coaction of feed screw 3 suitably journaled in the rail and nut 4 suitably attached to said saddle. Also carried by the saddle is any suitable form of ram 5 and, to effect the vertical movements thereof, a feed rod 6 suitably journaled on the cross-rail is provided with a key seat 7 in which travels the feather or spline of a worm 8 which moves with the saddle 2. In mesh with the worm 8 is a worm wheel 9 carried by a shaft 10 on which is also the pinion 11 in mesh with a rack 12 on the side of the ram 5.

The final adjusting device of the present invention may be applied to either the feed screw or the feed rod, and preferably is applied to both as shown in Fig. 2. Inasmuch as the construction of the device as applied to either the feed screw or the feed rod is the same, the description of that device which is operatively connected with the feed rod will be understood as equally applying to both. The term "feed element" will hereafter be used, therefore, to designate either the feed screw 3 or the feed rod 6, as well as any other suitable feed element.

Also mounted on the feed rod 6 and adapted to rotate the same is a sleeve 13 provided with a key or gib 14 designed to occupy the key seat 7. One end of said sleeve 13 is provided, in the form shown, with a bevel gear 15 and the opposite end of said sleeve with a flange 16 engaged by any suitable engaging device 17 carried by the saddle 2 and adapted to cause said sleeve to move with said saddle as the same is fed horizontally by the screw 3. Also mounted in the saddle 2 and shown as extending at an acute angle to the feed element away from the saddle, and preferably in the same horizontal plane with said feed element, is a shaft 18 carrying on its inner end the pinion 19 in mesh with the aforesaid bevel gear 15. Freely rotatable upon the outer end of the shaft 18 in the form shown is a ratchet lever 20 hollowed out at its hub to constitute a housing 21 for the ratchet wheel 22 suitably secured on the shaft 18 as by a pin 23. Ratchet lever 20 is suitably secured on the shaft 18 as by a nut 24 and washer 25, and is hollowed out at its core to receive the sliding plunger 26 provided at its inner end with a tooth 27 for engagement with the teeth of the ratchet wheel 22 and provided at its outer end with an enlarged head 28 between which and the body of said lever is a coiled spring 29 which normally retains the tooth 27 out of engagement with the ratchet wheel 22. Pivotally mounted on the lever 20 is a latch lever 30 provided with a stop lug 31 and a contact lug 32 which engages the head 28 of the plunger 26.

Suitable means are preferably provided to measure or indicate the amount of adjustment of the feed element by the operation of the adjusting device heretofore described and, for this purpose, shaft 18 may be provided with a stop index system for boring mills of the type disclosed in the patent to Frederick F. Clarke, No. 1,180,043, granted June 20, 1916, to which patent reference is made for a full description of the construction and operation thereof. Briefly, said construction comprises a stationary sleeve or bearing 33 which may be provided on the periphery of its flange 34 with a suitable indicating mark for coaction with the graduations 35 on the periphery of the sleeve 36 mounted to rotate with shaft 18. Said sleeve 36 carries the clamping ring 37 between which and the sleeve 36 is maintained one or more index points 38, said camping ring being adjusted by operation of the knurled clamping nut 39 in screw-threaded relation to the hub of sleeve 36. Any other suitable indicating means, however, may be employed if desired.

In the preferred arrangement of the adjusting device, shaft 18 extends outwardly and away from the saddle at an acute angle to the feed element, such angle being preferably less than 45°. Thereby the ratchet lever 20, which is shown as extending at a right angle to the axis of said shaft 18, projects toward the front of the saddle to a position where it is conveniently accessible to the operator. At the same time the position of the lever 20 is such as not to interfere with any other of the associated mechanism on the saddle 2 or ram 5 (or the turret when the machine is equipped with one).

When it is desired to move the tool to final adjustment from the position to which it has been moved by the power feed, ratchet lever 20 and latch lever 30 are grasped in the hand. The latch lever is moved about its pivot and, through the coaction of lug 32

and head 28, forces the plunger 20 against the tension of its spring 29 to engage its tooth 27 with the teeth of the ratchet wheel 22. Ratchet lever 20 is thereby locked with said wheel 22 and movement of the former produces a rotation of the latter which is transmitted through shaft 18, pinion 19 and bevel gear 15 to the feed element 6 (or 3, as the case may be). The extent of adjustment will be indicated by the relative movement of the sleeve 36 to the sleeve 33 and may be accurately gaged by the movement of graduations 35 or index point or points 38 with respect to a stationary mark on the flange 34 of sleeve 33.

It will therefore be seen that a manual adjusting device has been provided which is simple in construction, accurate and efficient in operation, and one which is adapted to produce a most convenient, accessible equipment which does not in any way interfere with or encumber the associated devices of the machine-tool, and which, by its angular relation to the feed element, projects to a position where it may be operated by the workman without moving from his position at the table of the machine-tool.

While the illustrated embodiment of the invention has been described with considerable particularity, it is to be expressly understood that the invention is not to be restricted to such embodiment for it is capable of receiving a variety of mechanical expressions, some of which will readily suggest themselves to those skilled in the art. Reference is therefore to be had to the claims hereto appended for a definition of the limits of the invention.

What is claimed is:—

1. A manually-operated adjusting device for machine-tools comprising, in combination with a rotatable feed element and the saddle, a gear mounted on said feed element and adapted to rotate the same, means to cause said gear to travel with said saddle, a pinion carried by said saddle in mesh with said gear, a shaft operable to rotate said pinion, and manually-operated means to rotate said shaft.

2. A manually-operated adjusting device for machine-tools comprising, in combination with a rotatable feed element and the saddle, a gear mounted on said feed element and adapted to rotate the same, means to cause said gear to travel with said saddle, a pinion carried by said saddle in mesh with said gear, a shaft operable to rotate said pinion, means to rotate said shaft, and means to indicate the extent of adjustment of said feed element.

3. A manually-operated adjusting device for machine-tools comprising, in combination with a rotatable feed element and the saddle, a gear mounted on said feed element and adapted to rotate the same, means to cause said gear to travel with said saddle, a pinion carried by said saddle in mesh with said gear, a shaft operable to rotate said pinion, a ratchet wheel carried by said shaft, and ratchet mechanism to rotate said ratchet wheel and shaft.

4. A manually-operated adjusting device for machine-tools comprising, in combination with a rotatable feed element and the saddle, a gear mounted on said feed element and adapted to rotate the same, means to cause said gear to travel with said saddle, a pinion carried by said saddle in mesh with said gear, a shaft operable to rotate said pinion, a ratchet wheel carried by said shaft, ratchet mechanism to rotate said ratchet wheel and shaft, and means to indicate the extent of rotation of said shaft.

5. A manually-operated adjusting device for machine-tools comprising, in combination with a rotatable feed element and the saddle, a gear mounted on said feed element and adapted to rotate the same, means to cause said gear to travel with said saddle, a shaft carried by said saddle and extending at an acute angle to said feed element, a pinion carried by said shaft in mesh with said gear, and means to rotate said shaft.

6. A manually-operated adjusting device for machine-tools comprising, in combination with a rotatable feed element and the saddle, a gear mounted on said feed element and adapted to rotate the same, means to cause said gear to travel with said saddle, a shaft carried by said saddle and extending at an acute angle to said feed element in the same horizontal plane therewith, a pinion carried by said shaft in mesh with said gear, and means to rotate said shaft.

7. A manually-operated adjusting device for machine-tools comprising, in combination with a rotatable feed element and the saddle, a gear mounted on said feed element and adapted to rotate the same, means to cause said gear to travel with said saddle, a shaft carried by said saddle and extending at an acute angle to said feed element, a pinion carried by said shaft in mesh with said gear, means to rotate said shaft, and means to indicate the extent of adjustment of said feed element.

8. A manually-operated adjusting device for machine-tools comprising, in combination with a rotatable feed element and the saddle, a gear mounted on said feed element and adapted to rotate the same, means to cause said gear to travel with said saddle, a shaft carried by said saddle and extending at an acute angle to said feed element, a pinion carried by said shaft in mesh with said gear, a ratchet wheel carried by said shaft, and ratchet mechanism to rotate said ratchet wheel and shaft.

9. A manually-operated adjusting device for machine-tools comprising, in combina-

tion with a rotatable feed element, a gear mounted on said feed element and adapted to rotate the same, a shaft extending at an acute angle to said feed element, a pinion carried by said shaft in mesh with said gear, and means to rotate said shaft.

10. A manually-operated adjusting device for machine-tools comprising, in combination with a rotatable feed element, a gear mounted on said feed element and adapted to rotate the same, a shaft extending at an acute angle to said feed element in the same horizontal plane therewith, a pinion carried by said shaft in mesh with said gear, and means to rotate said shaft.

11. A manually-operated adjusting device for machine-tools comprising, in combination with a rotatable feed element, a gear mounted on said feed element and adapted to rotate the same, a shaft extending at an acute angle to said feed element, a pinion carried by said shaft in mesh with said gear, means to rotate said shaft, and means to indicate the extent of adjustment of said feed element.

12. A manually-operated adjusting device for machine-tools comprising, in combination with a rotatable feed element, a gear mounted on said feed element and adapted to rotate the same, a shaft extending at an acute angle to said feed element, a pinion carried by said shaft in mesh with said gear, a ratchet wheel on said shaft, and ratchet mechanism to rotate said ratchet wheel and shaft.

13. A manually-operated adjusting device for machine-tools comprising, in combination with a rotatable feed element, a gear mounted on said feed element and adapted to rotate the same, a shaft extending at an acute angle to said feed element, a pinion carried by said shaft in mesh with said gear, a ratchet wheel on said shaft, an arm freely rotatable on said shaft, and manually-operable means to lock said arm with said ratchet wheel whereby movement of said arm may rotate said shaft.

14. A manually-operated adjusting device for machine-tools comprising, in combination with a rotatable feed element and the saddle, a gear mounted on said feed element and adapted to rotate the same, means to cause said gear to travel with said saddle, a shaft carried by said saddle and extending at an acute angle to said feed element away from said saddle, a pinion carried by said shaft in mesh with said gear, and means extending at an angle to said shaft toward the front of said saddle to rotate said shaft.

15. A manually-operated adjusting device for machine-tools comprising, in combination with a rotatable feed element and the saddle, a gear mounted on said feed element and adapted to rotate the same, means to cause said gear to travel with said saddle, a shaft carried by said saddle and extending at an acute angle to said feed element away from said saddle, a pinion carried by said shaft in mesh with said gear, an operating arm extending at an angle to said shaft toward the front of said saddle, and ratchet mechanism intermediate said arm and shaft whereby movement of said arm may rotate said shaft.

16. A manually-operated adjusting device for machine tools comprising in combination with a rotatable feed element, a gear mounted on said feed element and adapted to rotate the same, a shaft extending at an acute angle to said feed element, a pinion carried by said shaft for rotating said gear, and manually-operated means to rotate said shaft.

In testimony whereof I have signed this specification.

ERNEST C. HEAD.