(No Model.)

5 Sheets—Sheet 1.

C. L. LIBBY.

ATTACHMENT FOR BORING MILLS.

No. 511,736. Patented Dec. 26, 1893.

Fig. 1.

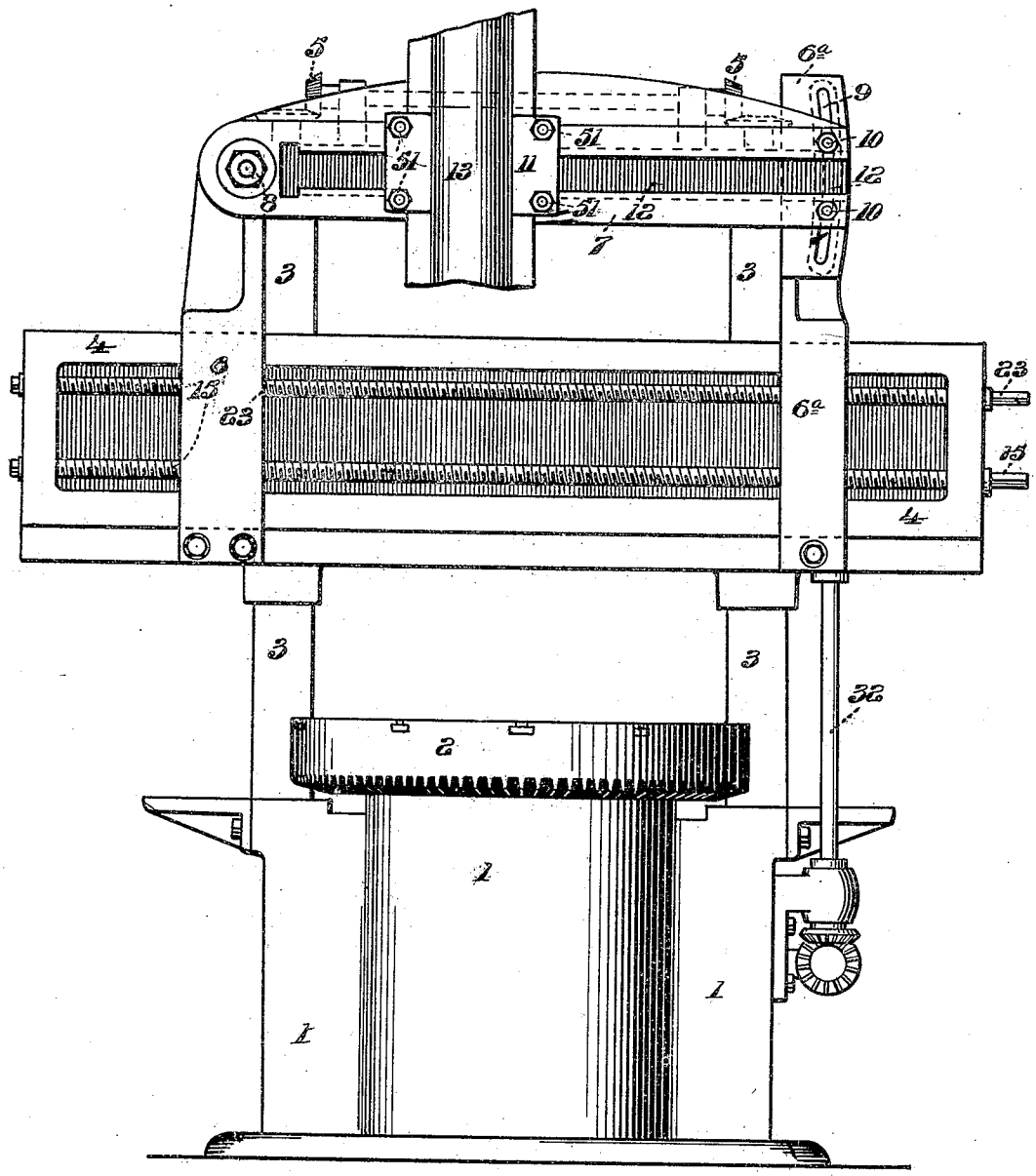

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Fig. 2.

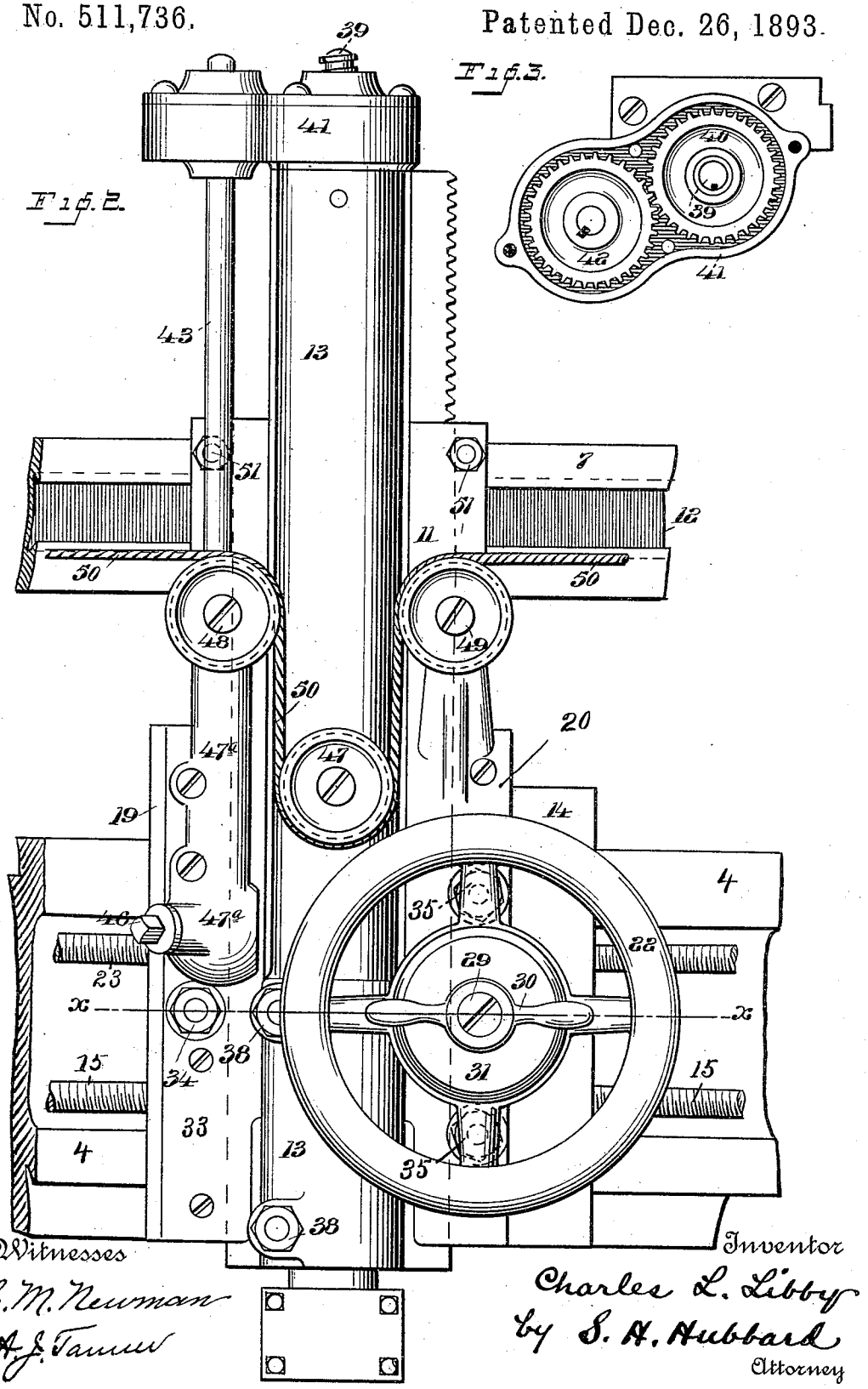

Fig. 3.

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Fig. 4.

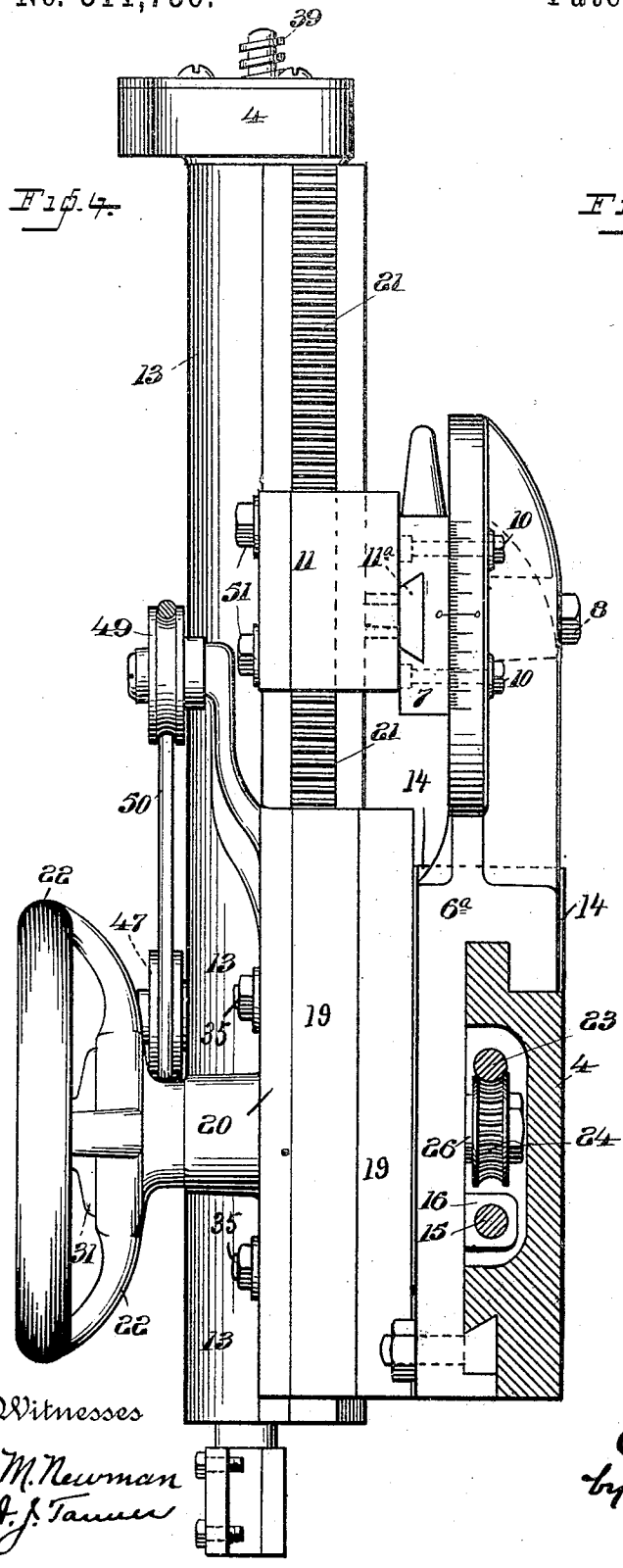
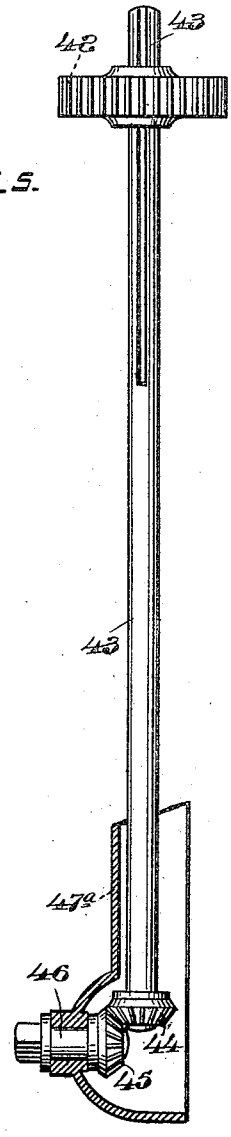


Fig. 5.



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ATTACHMENT FOR BORING MILLS.

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Fig. 6.

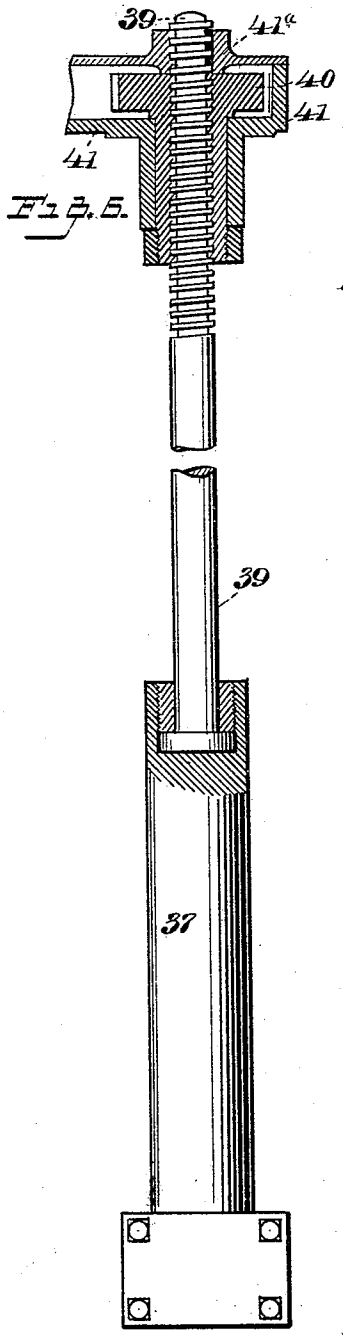
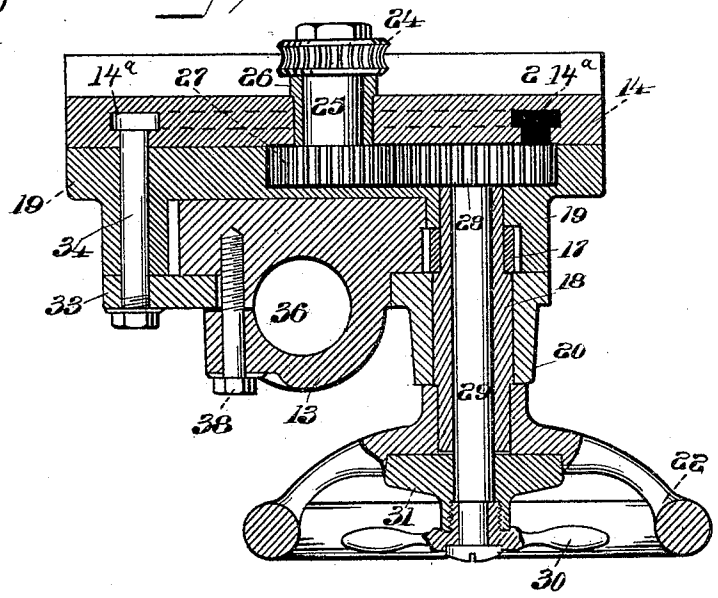


Fig. 7.



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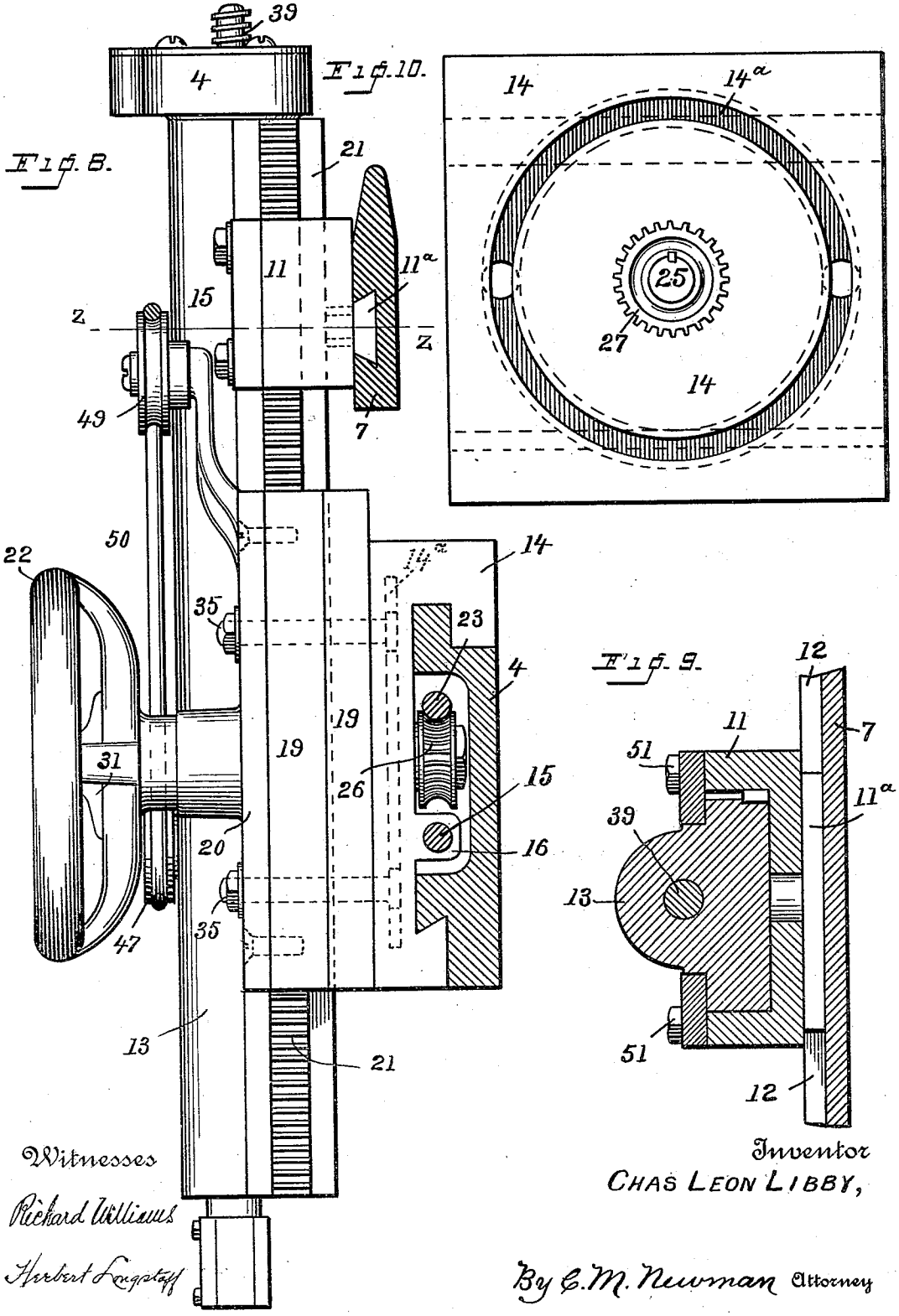

Fig. 8.

Fig. 10.

Fig. 9.

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UNITED STATES PATENT OFFICE.

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ATTACHMENT FOR BORING-MILLS.

SPECIFICATION forming part of Letters Patent No. 511,736, dated December 26, 1893.

Application filed December 5, 1892. Serial No. 454,122. (No model.)

To all whom it may concern:

Be it known that I, CHARLES LEON LIBBY, a citizen of the United States, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Attachments for Boring-Mills; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to boring mills, and resides essentially in a taper attachment connected therewith, together with other novel and useful improvements in the tool-feeding mechanism, all of which improvements will be described in the following specification, and such characteristic features as I believe to be new particularly pointed out in the claims to follow.

To enable others skilled in the art to which this invention appertains to fully understand my said invention, reference is had to the accompanying drawings and to the figures of reference marked thereon, in which—

Figure 1, represents a front elevation of a boring mill with a taper attachment connected therewith, and a broken section of the down slide mounted thereon. Fig. 2, is an enlarged front elevation of the down slide operatively mounted upon a broken section of the taper attachment slide. Fig. 3, is a plan of the upper end of the tool down-slide shown in Fig. 2, exposing to view the gears for operating the tool-holder independent of its carriage. Fig. 4, is an enlarged side elevation, looking from the right of the tool-holder, tool down-slide and slide support, said down-slide and support operatively mounted upon the taper attachment slide, and a sectional view of the cross-rail, its slide, and taper attachment supports mounted thereon. Fig. 5, is an enlarged detail elevation of the feed rod for operating the tool-holder, with the gears for receiving and transmitting motion mounted thereon, also a section of the housing for two of said gears. Fig. 6, is an enlarged detail elevation partly in section of the tool-holder, its spindle, the operating gear mounted upon the threaded end of said spindle, and broken view of the housing for said gear. Fig. 7, is an enlarged detail section of the mechanism for operating the tool down-slide on the line x—x of Fig. 2. Fig. 8, is an enlarged side elevation looking from the right,—see Fig. 2—of the cross rail slide, tool down slide and its support, showing the cross rail in section, also the attachment slide. The tool down slide in this figure is lowered from that shown in Fig. 3. Fig. 9, is a cross section on line z—z of Fig. 8, showing the construction of the connection of the tool slide with the taper attachment slide. Fig. 10, is a detached front elevation of the cross rail slide 14.

The construction and operation of my improved machine are as follows:

Referring to Fig. 1, 1 represents the bed; 2 a rotatable table mounted thereon. The mechanism for operating said table being too well known to require special description, it is, therefore, omitted. 3 are uprights attached to the bed and supporting the cross-rail 4 which is vertically adjustable thereon by the old and well known means of the gears 5 engaging vertically arranged screws (not shown) connected to the cross-rail 4. 6, 6^a are longitudinally adjustable uprights mounted upon the cross-rail. The taper attachment guide rail 7 is pivotally supported at one end to the bolt 8 of the upright 6, while the other end is arranged to be secured in any position within the limit of the radial slot 9 of the support 6^a, by means of the screws 10.

Referring to Fig. 4, 11 is a support pivotally mounted upon a forwardly projecting stud of the sliding block 11^a, which block is arranged to be operated longitudinally in slot 12 of the attachment guide rail 7. 13 is the tool down-slide mounted in the support 11 and when required is vertically operated therein, as well as in the cross-rail slide 14, see Figs. 4 and 5, which slide in turn is longitudinally movable on the cross rail 4, either automatically or by hand, which movement is effected by means of the threaded shaft 15 journaled in said cross-rail and engages with the lug 16 of the said cross-rail slide. See Fig. 8.

Referring now to Fig. 7 for a detail description of the mechanism for operating the tool down-slide 13, 17 is a pinion mounted upon the bushing 18, which bushing is journaled in

frame 19 and cap 20. This pinion engages with the rack 21 (see also Fig. 4) of said down-slide 13, and operates the same by hand through the medium of the hand wheel 22 rigidly mounted upon the projecting end of the bushing 18. Said slide 13 is also operated automatically by means of the threaded shaft 23 (see also Figs. 1 and 4) journaled in the cross-rail 4. The worm gear 24 engaging with this shaft, is attached to the stud 25 journaled in the bushing 26 of the cross-rail slide 14. The gear 27 mounted on the opposite end of stud 25 registers with gear 28 on the spindle 29, so that the pinion 17 is brought under the influence of the above-mentioned feed gears by means of the handle 30, which, when tightened against the friction 31 and that in turn against the hand wheel 22, will tighten the bushing 18 sufficiently to bring it under their control.

The mechanism consisting of the necessary gearing and other elements of which the driving shaft 32 (see also Fig. 1) is a part, for imparting motion other than by hand to the threaded shafts 15 and 23, is not shown, and forms no part of this invention. The tool down-slide 13 (see Fig. 7) is maintained in proper position upon the frame 19 by the caps 20 and 33 and the bolts 34 and 35, the heads of which bolts are anchored in a circular slot 14^a formed in the face of the cross-rail slide 14.

It will be seen from the above that the circular slots will permit the setting of the frame 19 and the parts carried thereon at any desired angle to the cross rail 4, while the tool down slide will be free to move up or down within the bearings of said frame 19 as the slide 14 is fed across the rail 4, and will be guided in such movement by its connections with the guide rail 7.

The bore 36 receives the shank 37 (Fig. 6) of the tool-holder and is firmly connected therewith by means of the clamp screws 38 and the partly severed lower end portion of carrier 13. The spindle 39 attached to the tool-holder shank 37 is threaded at its upper end to receive the gear 40 in the housing 41. (See also Figs. 2 and 3.) Said gear registers with gear 42 on the splined rod 43 whose lower end, as seen in Fig. 5, carries the bevel gear 44 which registers with the bevel gear 45 on the short shaft 46 journaled in the housing 47^a attached to the frame. To prevent the turning of spindle 39 it is also splined to the hub 41^a of the housing 41, as seen at Fig. 6.

The outer squared end of gear shaft 46 is adapted to receive a wrench by means of which the tool-holder is given a vertical adjustment independent of its carrier. Pulleys 47, 48 and 49 are positioned respectively on the frame 14 and carrier 13 to assist, in connection with a cord 50 and a counterbalance (not shown), to relieve the rack pinion of the weight of the carrier. As this feature forms no part of my present invention no further description of it need be given here.

When operating in straight holes or upon parallel surfaces the guide rail 7 is arranged parallel with the cross rail 4, and the tool operated either horizontally or vertically. In giving an angular feed or movement to the tool the guide rail 7 is set at the proper angle, which angle is obtained from the scale shown on the support 6^a seen at Fig. 4, and the tool down-slide 13, by reason of its pivotal support on the stud of the sliding block 11^a above referred to, will still retain its vertical position. Therefore, when the cross-rail slide 14 is moved along its support, the tool down-slide 13 will be raised or lowered in conformity with the angular position of the taper attachment slide.

The advantage given to machines of this class by reason of the taper attachment, and especially where the holder or slide carrying the tool is always maintained in a vertical position, will perform more accurate work, especially in finishing slight angular surfaces, than has heretofore been accomplished. In some cases it may be desirable to finish irregular or wavy surfaces, and to do this I propose to employ a taper attachment slide, or a slide similarly placed, whose slot or channel will be shaped to conform to the required surface to be finished, and this irregular feature could be employed either horizontally or at an angle.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a boringmill or machine of like character, the combination with a properly supported cross rail, of uprights arranged upon either end, a taper attachment guide pivotally supported above said cross rail at one end to one of said uprights, while the other is made adjustable so as to be secured to the other of said uprights in an angular position with respect to the cross rail as desired, substantially as shown.

2. The combination in a boring mill or machine of like character, a properly supported cross rail, a cross rail slide horizontally movable thereon, of a taper attachment guide placed above and adjacent to said cross rail and arranged to be placed parallel or at an angle therewith, a sliding block arranged to operate in a slot in said taper attachment guide, and the tool carrying mechanism supported on the cross rail slide as shown and also in said sliding block substantially as specified.

3. In a boring mill or machine of like character, the combination with a properly supported cross rail, and a cross rail slide operatively mounted thereon, of a taper-attachment guide, a support for the same, mounted upon said cross rail, a sliding block in said taper attachment guide arranged to operate substantially as shown, a tool-down-slide, a tool-holder therein, a frame adjustably attached to the cross rail slide, substantially as shown, said down slide supported in said frame and in the support pivotally mounted on the sliding block of the taper-attachment

guide, and arranged to have a vertical movement in one or both by means substantially as shown.

4. In a boring mill or machine of like character, the combination with a bed, a rotatable work-supporting table mounted thereon, and means for operating said table, a cross-rail carrying a slide supported on said bed, of a properly supported taper-attachment guide carrying a sliding block pivotally connected with a support, the tool-holding mechanism mounted on said sliding block and in a frame attached to the cross rail slide and arranged to operate in one or both as may be desired, substantially as shown.

5. In a boring mill or machine of like character, the combination with a properly supported cross rail carrying a slide, a frame adjustably attached to said cross rail slide, a taper attachment guide carrying a movable block, said guide situated adjacent to said cross rail, and arranged to be placed at an angle therewith, tool-holding mechanism mounted in the frame attached to the cross rail slide, a support pivotally mounted on said movable block, so that in case of an angular feed said tool-holding mechanism is maintained in a vertical position and arranged to be firmly clamped in such position, so that by reason of the taper attachment guide and the engagement of the tool holding mechanism therewith the tool will move in an angular path under the influence of the horizontal movement of the cross-rail slide, substantially as set forth.

6. In a taper attachment for boring mills, the combination with a cross rail carrying a slide, and a frame 19 swiveled thereto, and supporting the tool down-slide, of a guide adjustably mounted upon suitable uprights upon the cross rail, and adapted to be set at an angle to that of the cross rail, and mechanism connected therewith as shown, whereby said tool is caused to feed down as the slide traverses the rail, substantially as shown and described.

7. The combination in a boring mill or machine of like character, of a tool-holder, its down-slide, supports for the same, said slide arranged to move therein, rotatable gears mounted at the upper end thereof, the threaded end of the tool-holder engaging with the threaded hub of one of the said gears, the other operatively mounted on a rod adjacent thereto, whereby said rod is operated, so that by means of such mechanism the tool-holder is caused to move independent of its carrier, and means substantially as shown whereby said holder is firmly clamped to its carrier and operated therewith.

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

CHARLES LEON LIBBY.

Witnesses:

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A. J. TANNER.