Jan. 29, 1935. C. C. CRALEY 1,989,227

BORING TOOL

Filed April 10, 1931 3 Sheets-Sheet 1

Fig. 12.

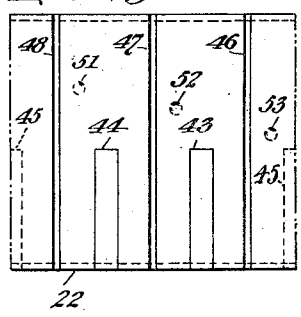
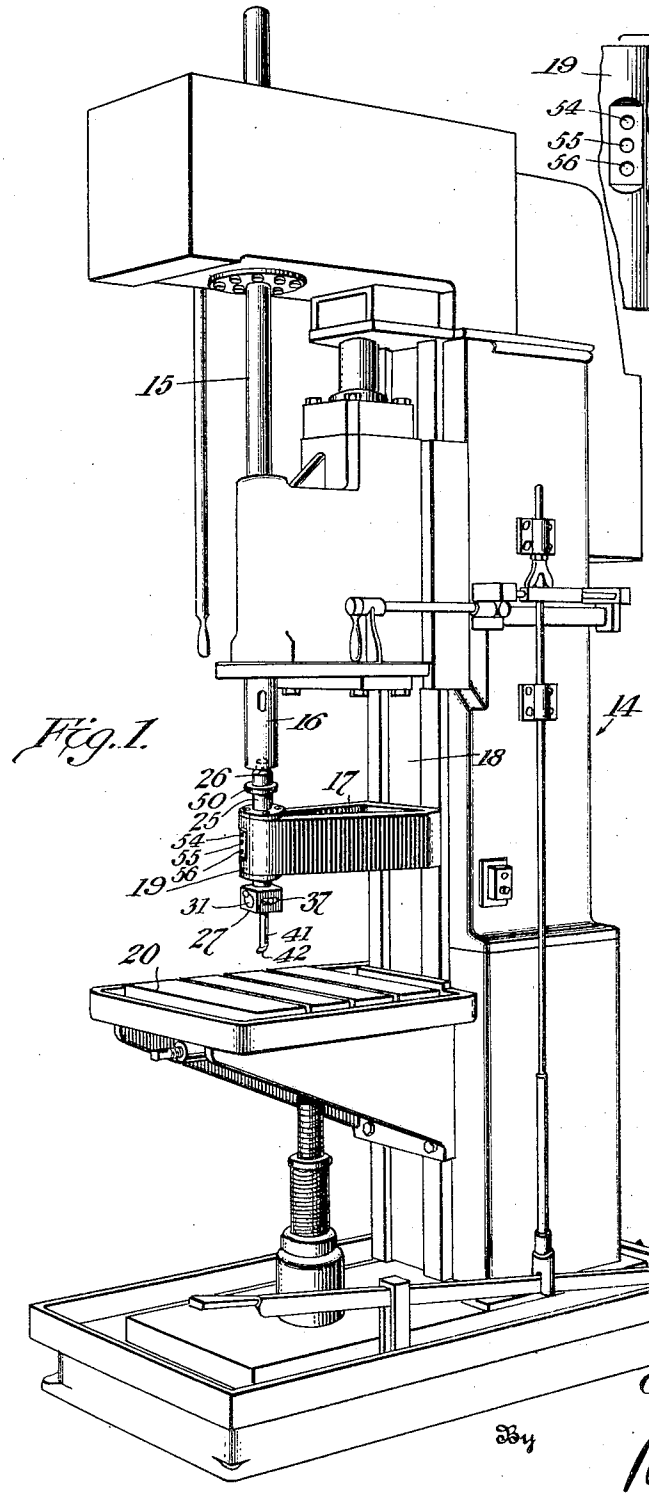


Fig. 1.



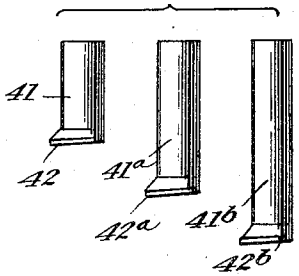


Fig. 13.

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Jan. 29, 1935. C. C. CRALEY 1,989,227

BORING TOOL

Filed April 10, 1931 3 Sheets-Sheet 2

Fig. 2.

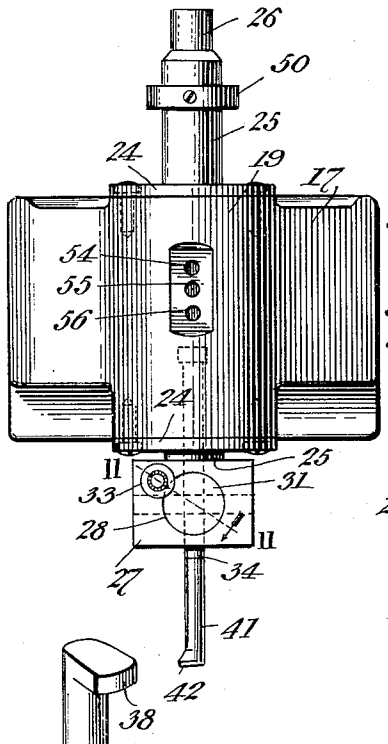
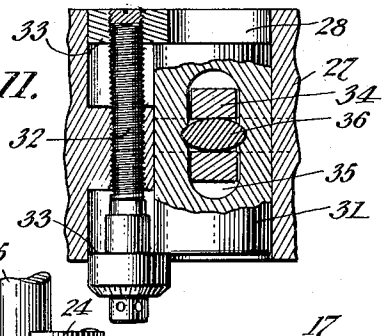


Fig. 11.



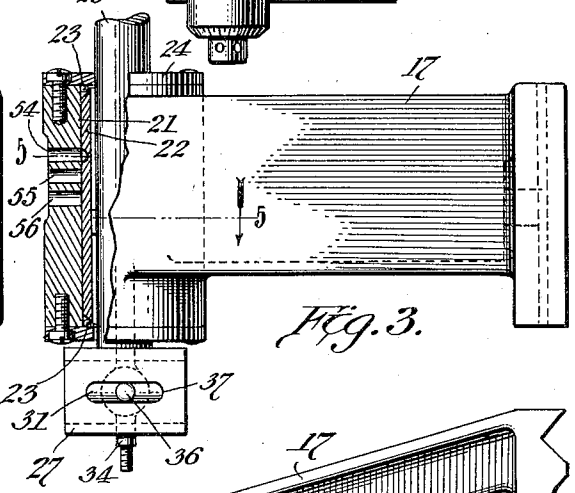


Fig. 3.

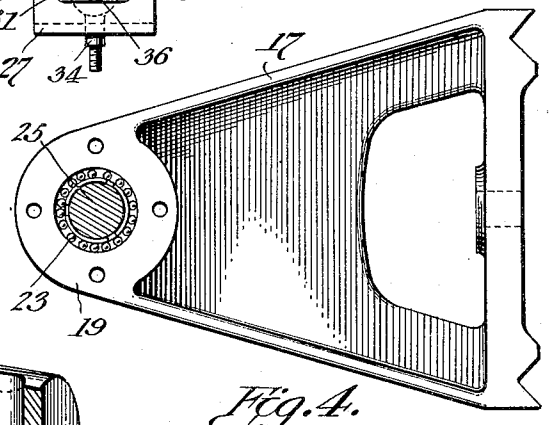


Fig. 4.

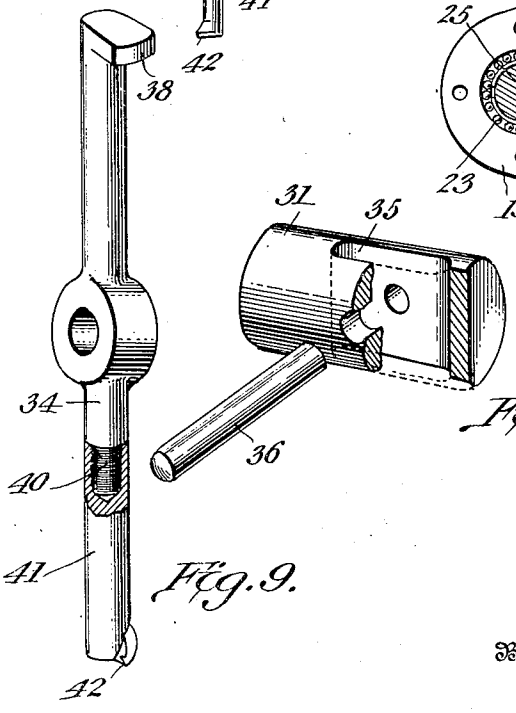


Fig. 10.

Fig. 9.

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Jan. 29, 1935. C. C. CRALEY 1,989,227

BORING TOOL

Filed April 10, 1931 3 Sheets-Sheet 3

Fig. 6.

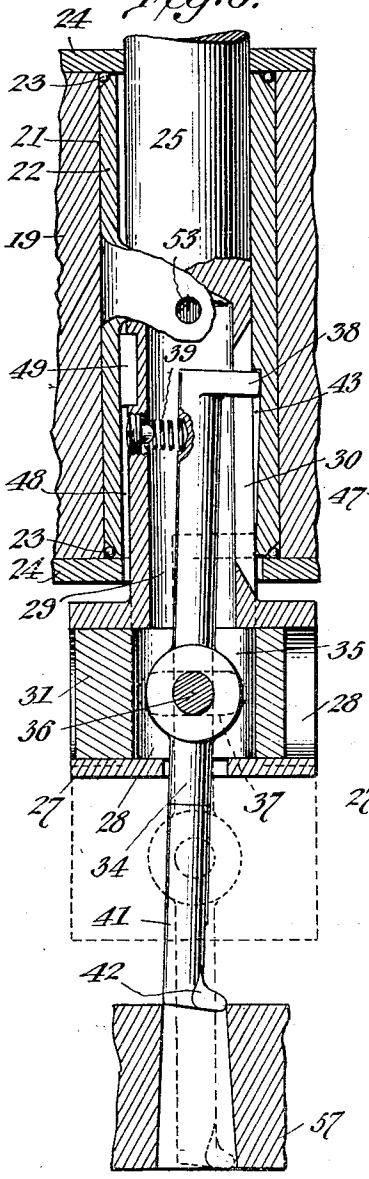


Fig. 7.

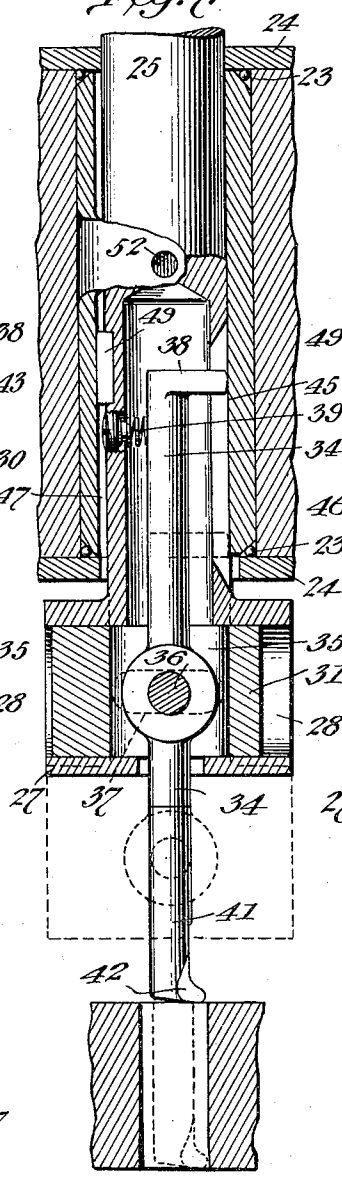
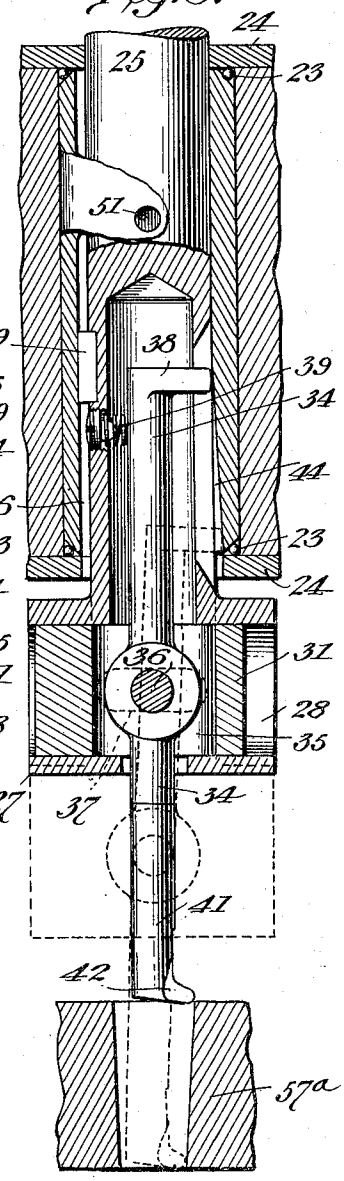


Fig. 8.



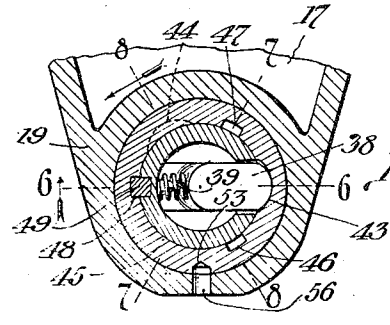


Fig. 5.

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UNITED STATES PATENT OFFICE

1,989,227

BORING TOOL

Clarence C. Craley, Shillington, Pa.

Application April 10, 1931, Serial No. 529,225

16 Claims. (Cl. 77—4)

The object of the present invention is to provide a tool that will bore a hole of variable diameter, means being provided by which holes of different contours can be readily produced.

A further object is to provide a simple mechanism of this character that will constitute a complete article of manufacture and may be in the form of an attachment to an ordinary metal working machine, as a drill.

An embodiment of the invention that is at present considered the preferable one is illustrated in the accompanying drawings, wherein;

Figure 1 is a perspective view of one type of a metal drill, showing the invention in place thereon ready for use.

Figure 2 is a front elevation of the tool per se.

Figure 3 is a side elevation of the same partially in section.

Figure 4 is a plan view with the cover plate removed and the spindle in section.

Figure 5 is a detail sectional view on an enlarged scale and taken on the line 5—5 of Figure 3.

Figures 6, 7 and 8 are longitudinal sectional views taken respectively on the lines 6—6, 7—7 and 8—8 of Figure 5.

Figure 9 is a detail perspective view of the tool including its spindle.

Figure 10 is a detail perspective view partially in section of the tool carriage.

Figure 11 is a detail sectional view on an enlarged scale taken on the line 11—11 of Figure 2.

Figure 12 is a lay-out of the sleeve in order to illustrate the different positioning sockets thereof and associated with the positioning holes in the bearing box.

Figure 13 is a view in elevation of three tool bits of different lengths.

In order to illustrate one adaptability of the present invention, the same is illustrated in Figure 1 on a known type of drill press, designated generally by the reference numeral 14, and including a vertical drive shaft 15 having a suitable tool holder 16 that is ordinarily employed to hold a drill, all of which is well-known to those skilled in the art.

In the present structure, the device is driven by engagement with the tool holder 16 of the drill press. A suitable mounting is employed, consisting of a frame 17 that may be suitably secured on the guideways 18 of the drill press, and this frame terminates at its outer end in a bearing box 19 that alines with the chuck 16, and overlies the bed 20 of the drill press. It will be understood that the bed may be equipped with any suitable means for accurately locating or positioning the work to be bored.

This box is provided with a vertical bore 21 in which is journaled a sleeve 22. The sleeve is freely rotatable, but is held against longitudinal movement in the bearing box, being preferably provided with ball bearings 23 held in place by upper and lower cap plates 24. Mounted to slide longitudinally in the sleeve 22 is a spindle 25 having a suitable shank 26 at its upper end that is adapted to enter and be secured in the chuck 16 of the press. This spindle 25 extends below the bearing box 19 and is provided with an enlarged head 27. The head has a transverse bore 28, from which opens a vertical chamber 29 extending longitudinally within the portion of the spindle that is in the bearing box and sleeve 22. This spindle has a longitudinal slot 30 in one side that opens into the chamber.

Slidable in the bore and thus movable transversely of the spindle 25, is a carriage 31, which, as shown in Figure 11, is adapted to be adjusted by a micrometer screw 32. This screw is threaded in the head 27 and has shoulders 33 that cause the longitudinal adjustment of the carriage when the screw is turned. A tool stem 34 passes through a slot 35 in the carriage 31, and a pivot pin 36, extending through the stem, is engaged in the carriage and preferably has its ends extended into slots 37 formed in the head 27. This tool stem 34 has a laterally projecting lug 38 on its upper end that passes through the slot 30 and bears against the inner face of the sleeve 22. A spring 39, bearing against the rear side of the upper end of the stem, insures a sliding contact with the sleeve. The lower end of the stem 34 has a reduced threaded terminal 40, on which is adapted to be screwed the stem 41 of a cutting bit 42. As shown in Figure 13 bits with stems of different lengths 41, 41*a* and 41*b* may be employed, the same being interchangeable and thus locating the cutting bit 42, 42*a* and 42*b* at different distances from the pivot axis of the stem 34, thus increasing or diminishing the angle of the taper of the hole being bored.

The sleeve 22 is provided with internal longitudinal trackways of different configurations. Thus there is a downwardly and inwardly inclined trackway 43 (see Figure 6), a second downwardly and outwardly inclined trackway 44 (see Figure 8), and a portion 45 that is parallel with the longitudinal axis of the spindle (see Figure 7). Means are provided for permitting the relative rotation of the spindle 25 and the sleeve 22, so that any one of these trackways

may be presented to the lug 38 of the spindle 34, so that said lug will longitudinally follow the trackway. To this end the interior wall of the sleeve 22 is provided with three longitudinal keyways 46, 47 and 48, each of which is opposite to one of said trackways, and the spindle is provided with a key 49 adapted to be engaged in any one of said keyways. It will be evident that when the key 49 is in one of the keyways, as 48, the opposite trackway, as 43, will be presented to the lug 38. By relatively rotating the sleeve and spindle, the other trackways may be brought into cooperative relation with the lug. This can be readily accomplished by dropping the spindle down in the sleeve until the key is out of a keyway and then relatively rotating the spindle and sleeve. The downward movement of the spindle is preferably limited by a collar 50 mounted thereon (see Figure 2), and in order to position the sleeve properly and permit the spindle to be rotated to different adjusted relations with respect thereto, the sleeve is preferably provided in its external face with three sockets 51, 52 and 53 located at different elevations and alined with the keyways 46, 47 and 48. The outer side of the bearing box is also provided with openings 54, 55 and 56, with which the sockets 51, 52 and 53 can be respectively alined.

The operation of the tool is substantially as follows: When mounted on a drill press or other driving mechanism, if a downwardly flared hole is to be bored, as for instance shown in Figure 6, the trackway 43 is brought into association with the lug 38 of the tool. A straight hole, having been first drilled through the work, indicated at 57, said work is located beneath the tool and the tool is given the usual rotary movement. At the same time the spindle 25 is pressed downwardly. It will be noted that the spindle 25 and sleeve 22 will rotate together because of the key connection 49, but the sleeve is held against longitudinal movement while the spindle is permitted such longitudinal movement. Therefore as the spindle moves downwardly in the sleeve, the lug 38 will be directed by the trackway 43 so that a downwardly flared hole will be bored, as shown.

If it is desired to alter the tool to bore, for example, a downwardly tapered hole, the spindle is turned with respect to the sleeve until the trackway 44 is presented to the lug 38. To do this, a pin is passed through the top hole 54, and the parts are turned until the top socket 51 of the sleeve is engaged by said pin, so that the sleeve is then locked against rotation. The spindle is then dropped until the key 49 is disengaged from the slot 48 after which the spindle is turned until the key alines with the slot 46, thereupon the spindle is raised and the sleeve and spindle are again interlocked. The parts are then in the position shown in Figure 8, and a downwardly tapered hole can then be bored in the work 57*a*. If an enlarged hole of the same diameter throughout is to be produced, the third relation shown in Figure 7 is secured, in which the inner surface of the sleeve constitutes a parallel trackway that does not effect any lateral movement of the tool.

Holes of different diameters may be bored by merely shifting the carriage 31, thereby changing the relation of the pivot axis 36 to the axis of rotation of the tool. A greater or less angle of taper in the hole bored can be secured by using a longer or shorter cutting bit. This is due to the cutting edge being placed closer to or farther from the pivot axis 36 without changing the distance between the pivot axis 36 and the bearing 38.

It will be clear that trackways of different configurations and angularity may be employed, so that a wide range of formations can be secured in the holes that are bored. The tool may be made as a unit of a drill press or other machine, or it may be in the form of an attachment such as shown in Figure 1, and is adapted for a large variety of apparatuses.

It will be observed that the lateral strain occasioned by the cutting edge against the work is received by the trackways which are abutted by the lug 38, so that there is no possibility of the tool swinging backwardly. The spring 39 simply maintains the bearing of the lug 38 against the trackway when the tool is idle.

From the foregoing, it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art without further description, and it will be understood that various changes in the size, shape, proportion and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

What I claim, is:

1. In an apparatus for boring holes of varying configuration, the combination with a rotatable and longitudinally movable spindle having means for connection with a rotatable driving means, of a tool rotatable therewith and laterally movable with respect thereto, and a rotatable sleeve rotated by the spindle and through which the spindle slidably passes, said sleeve having a trackway that directs the tool in its lateral movement.

2. In an apparatus for boring holes of varying configuration, the combination with a rotatable and longitudinally movable spindle, of a tool rotatable therewith and laterally movable with respect thereto, a sleeve through which the spindle slidably passes, said spindle having its upper end projecting above the sleeve and provided with means for engagement in a driving chuck, said sleeve having a trackway that directs the tool in its lateral movement, and a sliding interlocking connection between the spindle and sleeve to cause them to rotate together.

3. In an apparatus for boring holes of varying configuration, the combination with a bearing box, of a spindle rotatably and longitudinally movable therein, a tool pivotally mounted on and outside the spindle and rotated by the spindle, and means rotatable with the said spindle for causing the pivotal movement of the tool on the longitudinal movement of the spindle.

4. In an apparatus for boring holes of varying configuration, the combination with a bearing box, of a spindle rotatably and longitudinally movable therein and provided at its upper end above the box with means for engagement with a driving member, a tool pivotally mounted on and rotatable with the spindle, and a rotatable sleeve in the box and having a trackway along which the tool travels on the longitudinal movement of the spindle to govern the pivotal movement of the tool.

5. In an apparatus for boring holes of varying configuration, the combination with a bearing box, of a spindle rotatably and longitudinally movable therein and projecting above the same, said projecting end having a chuck engaging shank, said spindle also having a chamber, a sleeve surrounding the spindle and rotatable

therewith, said sleeve having an internal track alongside the spindle, and a tool pivoted to the spindle and having a stem in the chamber and guided by the track to govern the swinging movement of the tool.

6. In an apparatus for boring holes of varying configuration, the combination with a bearing box, of a sleeve rotatably mounted therein and held against material longitudinal movement, said sleeve having an internal trackway, a spindle slidably mounted in the sleeve and interlocked therewith to cause its rotation, said spindle having a chamber and an opening in one side, a tool stem pivoted to the spindle and extending into the chamber, said stem having a head extending through the side opening and bearing against the sleeve trackway, and means for insuring the bearing thereagainst.

7. In an apparatus for boring holes of varying configuration, the combination with a bearing box, of a spindle rotatably and longitudinally movable in the box, a laterally movable tool, a pivot for the tool that has a laterally adjustable mounting on the spindle, and means for causing the pivotal movement of the tool as the spindle is rotatably and longitudinally moved.

8. In an apparatus for boring holes of varying configuration, the combination with a bearing box, of a spindle rotatably and longitudinally movable in the box, a laterally movable carriage mounted in the spindle, a tool pivoted on the carriage, and means for causing the pivotal movement of the tool as the spindle is rotatably and longitudinally moved.

9. In an apparatus for boring holes of varying configuration, the combination with a bearing box, of a spindle rotatably and longitudinally movable in the box and having a head provided with a guideway, a carriage movable in the guideway, means for adjusting and holding the carriage, a tool pivoted on the carriage, and means for causing the pivotal movement of the tool as the spindle is rotatably and longitudinally moved.

10. In an apparatus for boring holes of varying configuration, the combination with a bearing box, of a sleeve journaled therein and having a longitudinal trackway, a rotatable spindle slidably mounted in the sleeve and keyed thereto to cause the rotation of the sleeve, said spindle having a head provided with a transverse guideway, a carriage movable in the guideway, means for adjusting and holding the carriage, a tool pivoted on the carriage, and means for causing the pivotal movement of the tool as the spindle is rotatably and longitudinally moved.

11. In an apparatus for boring holes of varying configuration, the combination with a rotatable boring tool movable longitudinally and laterally, of means for causing the tool to move longitudinally as it rotates, trackways of different configurations along which the tool is adjusted to travel and by which it is laterally moved as it rotatably progresses in a longitudinal direction, and means for presenting the different tracks to a position to be travelled by the tool.

12. In an apparatus for boring holes of varying configuration, the combination with a bearing box, of a sleeve rotatable therein and having longitudinal tracks of different configurations, a rotatable spindle slidable in the sleeve, a laterally movable tool rotatable with the spindle and adapted to be laterally moved by the tracks, and means for relatively adjusting the spindle and sleeve to present the different tracks to the tool to be laterally controlled thereby.

13. In an apparatus for boring holes of varying configuration, the combination with a bearing box, of a sleeve rotatably mounted therein, and having a plurality of internal tracks of different configurations, a rotatable spindle longitudinally slidable in the sleeve, a tool pivoted on the spindle and having a cutting element at one end and a bearing portion at its other end that is adapted to ride a track of the sleeve, said spindle and sleeve being relatively rotatable to position the different tracks in coaction with the bearing portion of the tool, and means for locking the spindle and sleeve against relative rotation while permitting the spindle to slide.

14. In an apparatus for boring holes of varying configuration, the combination with a bearing box, of a sleeve rotatably mounted in the box and having an internal longitudinally disposed track, a rotatable spindle slidably mounted in the sleeve and keyed thereto to cause the two to rotate together, said spindle projecting at one end beyond the sleeve and box and having means for engagement with a reciprocatory and rotatable driving member, and a tool pivoted to the spindle and projecting beyond the other end of the box and spindle, said tool having means for engagement with the track and being guided thereby on the sliding movement of the spindle.

15. In an apparatus for boring holes of varying configuration, the combination with a bearing box, of a sleeve rotatably mounted therein and having internal longitudinal tracks of different configurations, a rotatable spindle slidable in the sleeve, means connecting the spindle and sleeve to normally insure their corresponding rotation, and a laterally movable tool mounted to rotate with the spindle and having means that engages and is guided by one of the tracks, said connecting means being adapted to free the spindle and sleeve and permit their relative rotation to permit the said track guided means to be engaged with the different tracks.

16. In an apparatus for boring holes of varying configuration, the combination with a bearing box, of a sleeve rotatably mounted therein and having internal longitudinal tracks of different configurations, a rotatable spindle slidable in the sleeve, means connecting the spindle and sleeve to normally insure their corresponding rotation, a laterally movable tool mounted to rotate with the spindle and having means that engages and is guided by one of the tracks, said connecting means being adapted to free the spindle and sleeve and permit their relative rotation to permit the said track guided means to be engaged with the different tracks, and means for differently positioning the sleeve and spindle to determine the track with which said means is engaged.

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