

A. R. LOCKE.
BORING APPARATUS.
APPLICATION FILED SEPT. 18. 1915.

1,204,673.

Patented Nov. 14, 1916.
3 SHEETS—SHEET 1.

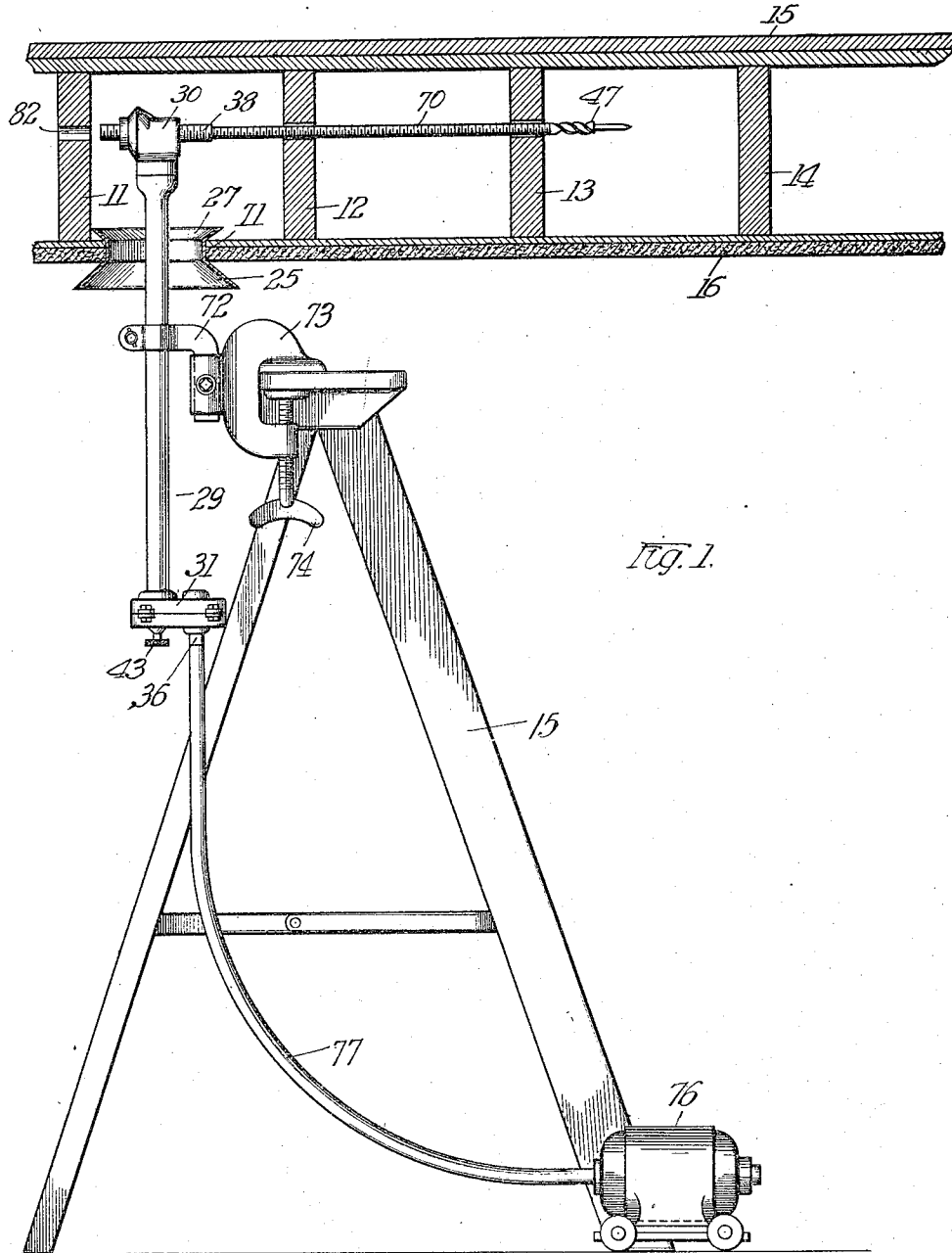


Fig. 1.

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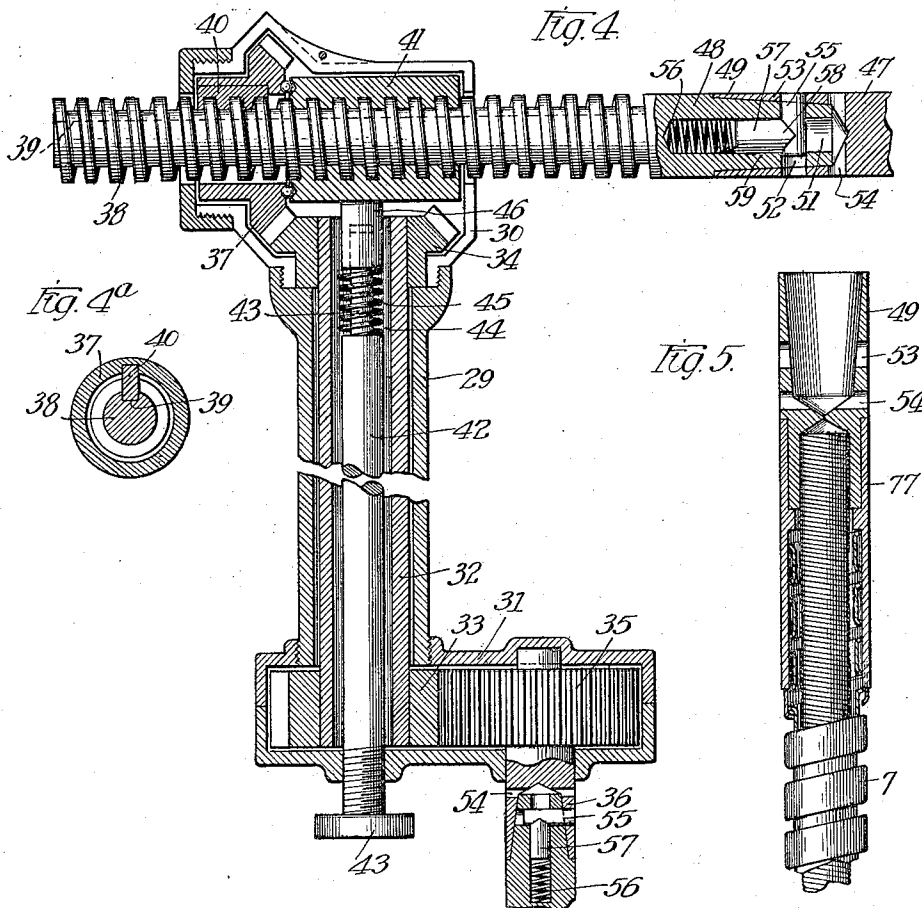
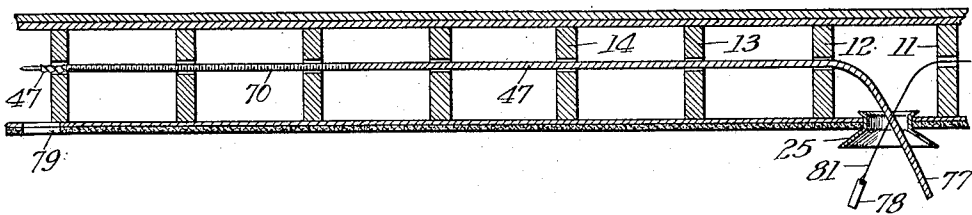


Fig. 2.



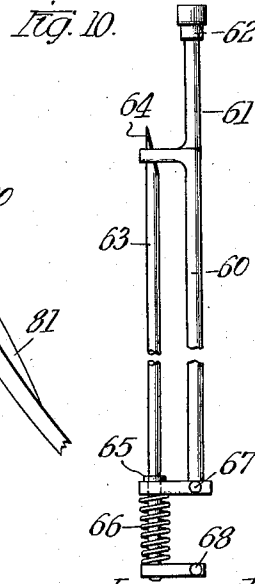
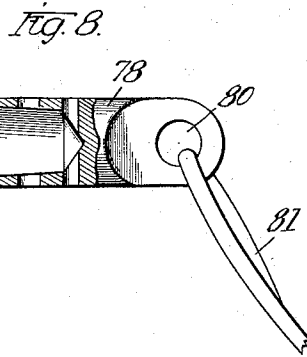
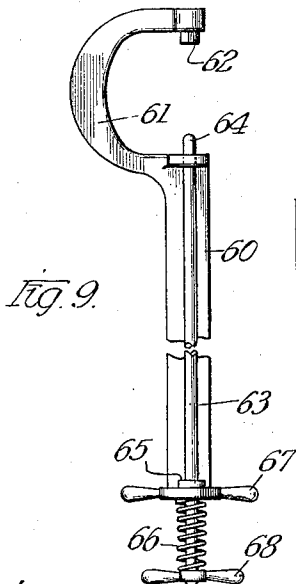
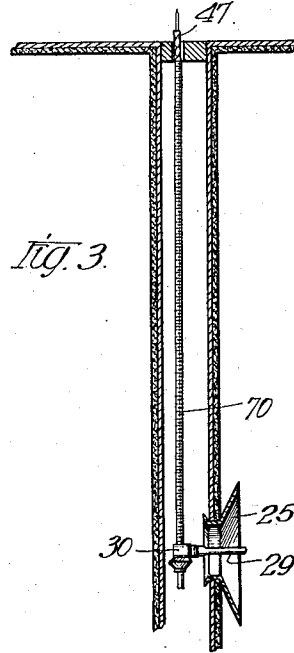
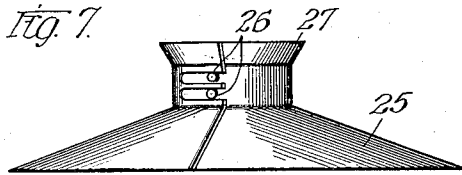
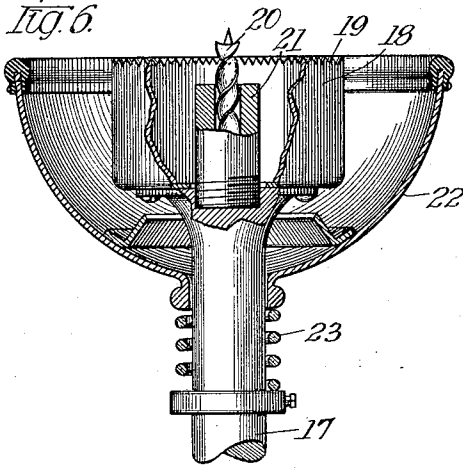
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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BORING APPARATUS.

1,204,673.

Specification of Letters Patent.

Patented Nov. 14, 1916.

Original application filed January 15, 1913, Serial No. 742,090. Patented September 21, 1915, No. 1,154,035.

Divided and this application filed September 18, 1915. Serial No. 51,344.

To all whom it may concern:

Be it known that I, ALBERT R. LOCKE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Boring Apparatus, of which the following is a specification.

My invention relates to an apparatus for drilling holes through a series of comparatively inaccessible separated bodies such as joists and other such supports in a hollow wall, and is especially applicable as a means for installing electric wires and interior conduits for said wires, in the spaces between the plastered sides of a vertical hollow wall and between the floor of one room and the ceiling of a subjacent room.

My new and improved apparatus is especially adapted and valuable for use in installing wires, cables, and conduits in buildings that have been completed, although it may be employed with great saving and cost of labor in buildings before the walls have been plastered or otherwise finished.

In placing wires and conduits therefor in a hollow wall in which perforatable supports such as wooden joists, studs and the like are contained at intervals, such supports must necessarily be perforated when lines of wires or conduits are extended at an angle to the longitudinal dimensions of such supports. Heretofore it has been necessary to tear up a portion of the floors or walls in finished buildings before such supports could be perforated for the introduction of wires and conduits.

In using my apparatus it is not necessary to disturb the walls further than to make a relatively small aperture through such wall or floor, as at a point where an outlet box is to be located. Through this aperture or opening a suitable drill or bit is inserted and a series of apertures may be drilled or bored through the successive joists or studs in perfect alinement to some objective point, and at right angles to the application of power.

As a part of my machine I provide a suitable drill stock and a rigid, composite, bit extension, the latter comprising a series of separable sections capable of being inserted through said opening and conveniently joined into a rigid whole until enough of said sections have been added to said bit extension to produce a length sufficient to span at least three of the supports.

By this means a guide is provided whereby the series of perforations will be made in substantial alinement, so that when long runs are desired to be made a flexible shaft may be connected to the rear end of the elongated bit extension, without the necessity of making further extensions thereto by use of additional relatively short sections.

The method by which this apparatus is used is described and claimed in my patent entitled "Method of perforating separated obstructions in hollow walls" No. 1,154,035, issued September 21, 1915.

In the drawings, Figure 1 is a section of a floor, showing the application of the drilling device as a means for carrying my invention into effect. Fig. 2 is a similar but somewhat smaller section, showing the application of the flexible shaft as a means for rotating the elongated bit extension and bit. Said shaft is herein shown adapted to pass through the perforations made by the bit. The bit is held in substantial alinement by the rigid extension, so that all of the holes will be made in substantially the same horizontal plane. Fig. 3 is a section of a vertical partition showing the method of drilling through a relatively remote obstruction within the partition by the application of additional sections of the rigid bit extension to the boring bit to provide a sufficiently elongated structure to reach the obstruction. Fig. 4 is an enlarged section of the boring apparatus. Fig. 4^a is an end view of the head of said apparatus. Fig. 5 is a section of a portion of the flexible shaft. Fig. 6 is a means for boring the holes through the plastering, thereby to provide an aperture for insertion of the boring bit and driving shaft therefor, and also to accommodate the introduction of an electric circuit outlet box. Fig. 7 shows a protecting shield applied to the opening thus produced, as shown in Fig. 3. Fig. 8 shows a drawing-in attachment to take the place of the working bit after the holes have been drilled, thereby to draw into the openings or holes a cord as the bit and the connecting means are being withdrawn, the cord being used to pull the wires or conduits into the perforations thus made. Fig. 9 is a side view of a device for separating the sections of the shaft for rotating the bit. Fig. 10 is a similar view of the device at right angles to the view shown in Fig. 9.

In all the views the same reference characters are employed to indicate similar parts.

11, 12, 13 and 14 are a series of separated joists for supporting the floor 15 and ceiling 16. It is desirable to perforate these joists, in the manner substantially as shown in Fig. 1, for a distance substantially equal to the length of the wires or conduit to be inserted. These joists are usually 16 inches apart, from center to center, and run from 2 to 3 inches thick when they are composed of wood. Before the drilling apparatus is inserted into the space between the floor and the ceiling, it is necessary to make a hole in the ceiling or in the floor for the purpose of inserting the bits, sections of shaft, and the boring tool, and also for the purpose of providing room or repose for an outlet box.

In order that the plastering may not be injured in the process of drilling the holes and installing the conduit I provide a special tool for making such perforations, such tool being shown in Fig. 6. It consists of a rotatable stem 17 having a cup 18, preferably of sheet metal, secured to the end thereof. The cup is provided on its free open end with cutting teeth 19. For the purpose of holding the tool and preventing lateral displacement, I place a bit 20 in the sleeve 21. When the stem 17 is rotated, the bit 20 will enter the surface of the wall and prevent the tool from being laterally displaced by providing a perforation before the teeth 19 are brought into contact with the surface. The cup 18 is of the size of the hole desired to be made. A shield 22 is mounted on the stem 17 and is yieldingly pressed forwardly by means of a spring 23. The shield is adapted to be moved longitudinally of the stem 17. Its free edge is provided with a rubber guard 24 to prevent the device from injuring the ceiling decoration or wall paper. Now, when the stem 17 is rotated for the purpose of drilling the hole, the cup bit 18 will cut a hole of its size through the plastering and laths, and the shield 22 will remain in contact with the ceiling and permit the stem 17 by means of the spring 23 to be advanced into the hole being drilled. The shield 22 will catch the dirt and will prevent it from falling on the floor and injuring the contents of the room.

It sometimes happens that the hole made by the bit must be eccentric with a gas pipe and when this is the case the sleeve 21, which is removable, and which may or may not be used with the bit 20, is to be used where a gas pipe is to be within the confines of the holes to be made by the bit 18. The gas pipe then will serve to guide the tool, and the bit 20 will not be necessary. After a hole has been driven through the ceiling or wall in the manner described, the shield 25

is contracted and placed in the hole, expanded, and secured in expanded position, by means of the bolts and nuts 26. A flange 27 prevents its withdrawal until it has been again contracted after loosening the bolts 26. The shield 25 protects the raw surfaces of the hole made in the ceiling or wall and prevents them from being chipped or broken away and also prevents contact of the soiled hands of the workman with the wall while work is being done through the aperture provided in a manner described.

The bit stock, or means for rotating the bit, consists of the tube 29, which may be of any convenient and suitable length and has a head 30 secured to the upper end thereof, as by screw threads, and a casing 31 similarly secured to the lower end thereof. A hollow shaft 32 passes through the tube 29 and has secured on its lower end a pinion 33 and on its upper end a bevel gear wheel 34. A gear wheel 35 is contained in the casing 31 and in constant mesh with the pinion 33 and is adapted to be rotated by any means that may be secured to the coupling member 36.

A bevel gear wheel 37 has its axis at right angles to that of the wheel 34 and is in constant mesh therewith and is adapted to be turned thereby. A screw threaded bit-holding stock 38 is adapted to be moved longitudinally through the head 30. It is provided with a spline 39 in which a feather 40 is adapted to be freely moved. The feather 40 is also secured in the bevel gear wheel 37 so that when the gear wheel 37 is rotated the screw 38 is positively rotated therewith. A cylindrical nut 41 is contained within the head 30 and has threaded engagement with the stock 38. Now, if the shaft 32 be rotated the bevel gear wheel 37 will be rotated through the agency of the bevel gear wheel 34, and if the nut be unrestrained the said nut 41 and the stock 38 will be rotated together, but if the nut 41 be held against rotation then the stock 38 will be rotated and longitudinally advanced from the head to the right or to the left in accordance with the direction of rotation of the shaft 32. For the purpose of holding the nut 41 against rotation, I provide a screw threaded shaft 42 provided with a knurled head 43 and adapted to screw into the casing 31. The shaft 42 is reduced, as at 43, to provide a shoulder 44 for the spring 45. The reduced end 43 enters a plug 46 which has direct bearing upon the cylindrical nut 41. The tension of the spring on the thrust plug 46 may be varied by turning the head 43. If the shaft 42 is turned to the right more tension is applied to the spring 45 and the plug 46 is pressed more firmly against the screw nut 41 to retain it against rotation and by this means the speed of advancement of the stock 38 may be varied.

ried by varying the slip or the rotative stability of the nut 41. It will be understood that if the nut 41 is positively held against rotation the reciprocating movement of the stock 38 will be at its maximum speed and any slip between the plug 46 and the nut 41 will reduce the speed of the stock 38 in its lateral movement.

The boring bit 47 is connected to the stock 38 by means of a coupling comprising a male and a female portion 48 and 49 respectively. The male portion 48 is tapered as at 50, and is provided with an axial bore as at 51, and a transverse bore as at 52. The female portion 49 is provided with a transverse bore as at 53, and a parallel bore as at 54. The tapered portion 50 of the coupling enters the transverse bore 54. A latch bolt 55 is contained in the bore 52 and is yieldingly held with one end projecting from the bore 52 by means of a spring 56. A plug 57 is adapted to slide freely in the bore 51 and is held in an outward position by means of the spring 56 and is provided on its outer end with a taper, as at 58. The spring-pressed latch bolt 55 is provided with a corresponding tapered notch in which the end 58 projects. If pressure be applied on the outer end of the latch bolt 55, the bolt 57 will be pushed inwardly, by the operation of the tapering portions 58 and 59 of the respective parts, against the resilient yielding resistance of the spring 56. After the latch bolt has been released the spring 56 and the plug 57 will return the latch bolt to its normal position as shown in Fig. 4. To disconnect the coupling between the parts 38 and 47 it is only necessary to apply pressure to the end of the latch bolt 55 until it has been pressed inwardly sufficiently to clear the female portion on the member 47 after which the parts may be separated.

It sometimes occurs that the parts will fit tightly together and it requires some force to separate them even when the latch bolt 35 has been removed from the coupling member of the female portion of the coupling. I therefore provide a tool substantially as shown in Figs. 9 and 10 wherein the frame 60 is U-shaped as at 61 and is provided at its outer extremity with a projection 62 which is of such size and length as to press the latch bolt 55 inwardly to clear the female member 49. It is also provided with a reciprocable member 63 tapered on its end, as at 64, to form a drift. The drift member 63 is held outwardly against the collar 65 by a spring 66. A handle 67 is provided on the frame 60 and a similar handle is provided on the reciprocable member 63 as at 68.

To uncouple the stock 38 from the tool 47, or any two portions or sections of the drilling apparatus provided with a joint,

substantially as shown in Fig. 4, it is necessary to place the projection 62 in register with the perforation 52 and apply sufficient pressure to force the spring bolt 55 inwardly, then the two handles 67 and 68 are grasped, and pressure is applied to draw the handles together and the drift 64 is forced into the perforation 54 until the tapered end thereof comes in contact with the end of the tapered coupling member 50 when the male portion 50 will be forced out or ejected from the female portion 49, after which the spring bolt 55 will be returned by the spring 56 to its normal position. After the separation the tool 60 will firmly hold the drill tool 47 so that it cannot possibly be unintentionally disengaged. When it is desired to couple together two parts having the coupling members described, it is only necessary to press the male portion into the female portion, when the spring bolt 55 will snap into the bore 53 of the female portion of the coupling and the spring bolt 55 with its coöperating perforation provides a means whereby the coupling members may be positively rotated together.

In Figs. 1 and 3 I have shown a composite rigid drill bit extension 70. In Fig. 1 it is shown passing through horizontal joists 12 and 13. It will be extended by the addition of other sections until the bit 47 has reached the joist 14 or until this rigid extension portion spans at least three of the joists. These rigid extension sections may be of various lengths for convenient insertion through the apertures 71 in which the shield 25 is secured, as shown in Fig. 1.

The rigid extension portion 70 is somewhat smaller than the ultimate diameter of the bit so that the perforations made by the bit are somewhat larger than the rigid portion and somewhat larger than the flexible shaft which is to be subsequently employed in carrying out my method of operation. The bit extension sections are preferably threaded on their outside surfaces for the purpose of providing a means for feeding the bit 47 in a manner to be hereafter described. Each of the sections of the rigid bit extensions 70 is provided on its respective end with a male and female coupling member, substantially as shown in Fig. 4. A drill-operating mechanism, shown in detail in Fig. 4, is held in drilling position upon a support, such as a step-ladder or the like, in an adjustable bracket 72 which is adjustably secured to a clamp 73 held in place by a screw 74 on a suitable support, such as a step-ladder 75 or the like.

The bit stock 38 may be rotated by means of an electric motor 76 connected to the coupling 36 by a flexible shaft 77, when desired, or if preferred a hand-operated crank may be connected to the coupling 36 and the bit stock may be manually rotated. In Fig. 5

an enlarged view of the flexible shaft is shown, and the manner of its connection to the coupling 49.

Any convenient means for controlling the operation of the electric motor 76 may be employed and located near the drilling apparatus 29, as on the step-ladder or other suitable support, whereby the speed of the motor may be varied and the direction of rotation thereof may be changed at will.

After a series of holes have been drilled through the spaced-apart obstructions in the walls, such as the joists thereof, the tool bit 47 may be removed, in the manner described, through another perforation, as 79, as shown in Fig. 2, and the pull-in attachment 78, shown in Fig. 8, may be connected onto the end of the drilling shaft in lieu thereof. This pull-in attachment 78 is provided with a hole 80 into which a cord, wire, or cable, 81 is threaded and to which it is attached, so that when the drilling apparatus is withdrawn from the perforations which it has made, the cord or wire 81 will be drawn into the said perforations so that subsequently a conduit or wire may be pulled thereinto.

In Fig. 3 means are shown for drilling through an obstruction located at a relatively remote point by increasing the length of the rigid bit extension by addition of more sections than is necessary when drilling through the horizontal supports shown in Fig. 4.

The use and operation of my system are as follows: A perforation is made through a ceiling wall 16, after which the shield 25 is placed through the perforations so made, to protect the bounding edges of the ceiling or the additional portions of the wall. This shield is held in place by means of an inner flange 27 and when the shield has been compressed and subsequently expanded is secured in position to prevent its displacement.

The tool 29 is now placed through the perforation in the shield 25 into the space bounded by the floor, ceiling, and joists 11 and 12, and it may be held in selected position as by the adjustable clamp 72 secured to the stationary support or the step-ladder 75, by the clamp 73. At this time a short bit 47 is inserted directly into the bit stock 38 and the hole is first drilled through the joists 11, as at 82. As heretofore explained the bit stock may be given a reciprocating motion by tightening the screw of the shaft 42, by turning the head 43 until the plug 46 makes a rather positive engagement with the rotatable nut 41. As heretofore explained the bit stock 38 is directly rotated through the gears 34 and 37 and the feather 40 which is secured to the gear wheel 37. It will, of course, be understood that when drilling the hole 82 the tool is turned around so that the end provided with one member

of the coupling faces the joist 11. After the hole 82 has been bored the device is returned to the position shown and the bit stock 38 is retracted until it is substantially flush with the right hand side of the support, and the projected rear portion has entered the aperture 82. The bit is now removed from the stock 38 and a short section of the bit extension 70 is inserted between the bit and the stock 38 in a manner heretofore described, without removing the tool from its position. The stock 38 is now advanced until the bit comes into contact with the joist 12, when a hole is bored through the joist, after which the bit and the sections of the extension that have been attached thereto are disconnected from the stock 38, in a manner heretofore described, and another section added until the bit 47 is brought into contact with the joist 13, at which time other bit extensions are connected in and the stock 38 again advanced in a manner heretofore described until a hole is made in the joist 14. Now then the rigid bit extension is supported in three joists, 12 13 and 14 in a horizontal manner. It will continue to drill holes in substantially the same plane as long as the rigid portion of the bit is urged forwardly and sufficiently rotated. I now attach the flexible shaft 77 to the rigid bit extension 70 and continue the rotation of the shaft 77 and the bit by means, preferably, of an electric motor 76. As the outside portion of the rigid bit extension is screw threaded and as it bears always upon at least three of the supports 12, 13, and 14, the screw threads, by their contact with the lower portion of the holes that have been made in the supports, operate as a means for feeding the bit 47 forwardly without the necessity of applying pressure from the outside end of the flexible shaft. This feed is not positive so as to require excessive power of the motor or to apply excessive strain to any portion of the drilling mechanism, but it is sufficient to urge forward the bit 47 with sufficient effect to readily drill the holes.

Having described my invention, what I claim is:

1. A drilling mechanism comprising a tube; a rotatable shaft therein; means at one end of said tube to rotate said shaft; a head having an axial opening at right angles to the tube secured to the other end of the tube; a screw-threaded splined bit-stock passing through said opening; a beveled gear wheel, carrying a feather for insertion within said spline; a beveled gear wheel on said shaft in mesh with the first mentioned gear wheel to rotate said bit stock by rotation of the shaft and a feed nut for said bit stock positioned within said head, and overlying the end of the shaft.

2. A drilling mechanism comprising a

5 tube; a rotatable shaft therein; means at one end of the tube to rotate said shaft; a head secured to the other end of the tube having an axial opening at right angles to the tube; a screw threaded, splined, bit stock passing through said opening; a beveled gear wheel carrying a feather for insertion within said spline to drive said bit-stock; a beveled gear wheel on said shaft in mesh
 10 with the first mentioned gear wheel to rotate said bit-stock by rotation of said shaft; a feed nut for said bit stock positioned within said head, and overlying the end of the shaft, and means for varying the forward
 15 speed of said bit stock by resisting rotation of said feed nut.

3. A drilling mechanism comprising a tube; a rotatable shaft therein, means at one end of the tube to rotate said shaft; a head secured to the other end of the tube having an axial opening at right angles to the tube; a screw threaded, splined bit-stock passing through said opening; a beveled gear wheel carrying a feather for insertion
 20 within said spline to drive said stock; a beveled gear wheel on said shaft in mesh with the first mentioned beveled gear wheel to rotate said bit-stock by rotation of said shaft; a feed nut for said bit stock positioned within said head and overlying the shaft at the front of the first mentioned bevel gear, means to frictionally resist the rotation of said nut to vary the forward
 30 movement of said bit-stock and a thrust bearing between the feed nut and first mentioned bevel gear.

4. A drilling mechanism comprising; a rotatable hollow shaft; means at one end thereof to rotate said shaft; a screw threaded splined bit stock; a gear wheel carrying a feather for insertion within said spline to drive said stock; a driving connection between said gear and shaft; a feed nut on said bit stock adjacent the end of the shaft to feed the stock forward as it is rotated; and a rod passing through said hollow shaft, operable from the driven end thereof to cause frictional resistance to the rotation of said feed nut and thus vary the forward movement of the bit stock.

5. A drilling mechanism comprising a tube; a rotatable hollow shaft therein; means at one end of the tube to rotate said shaft; a head secured to the other end of the tube, having an axial opening at right angles to the tube; a screw threaded splined bit stock passing through said opening; means within said head to rotate said bit stock by rotation of said shaft; a feed nut on said bit stock within said head; and a rod passing through said hollow shaft operable from the driven end thereof to control the rotation of said feed nut and thus vary the forward movement of the bit stock.

In testimony whereof I hereunto set my hand in the presence of two subscribing witnesses.

ALBERT R. LOCKE.

In the presence of—

STANLEY W. COOK,

LORETTA A. GIBBONS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."