July 25, 1939. A. HIRSCH 2,167,153

ELECTRICIAN'S DRILL

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Fig. 1.

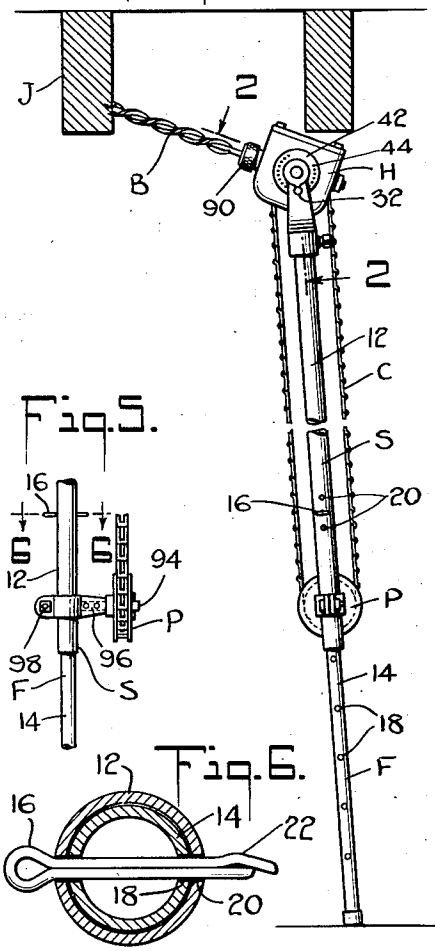


Fig. 2.

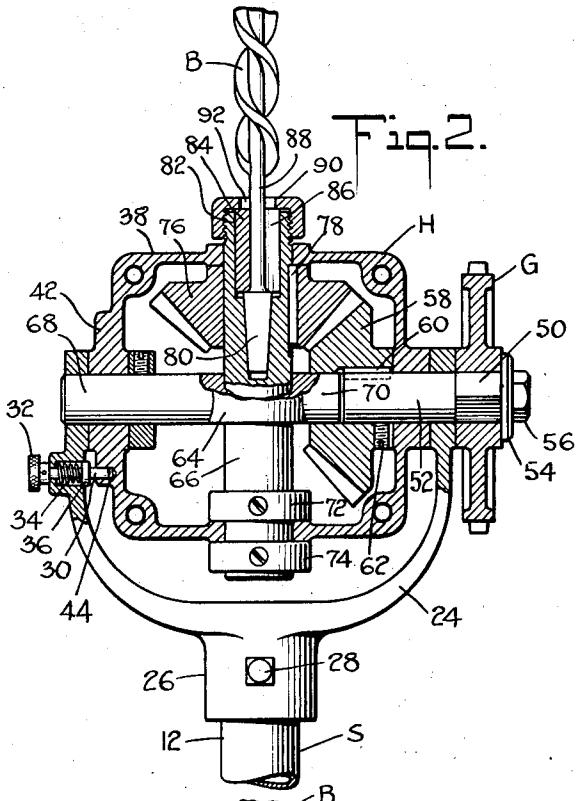


Fig. 5.

Fig. 6.

Fig. 4.

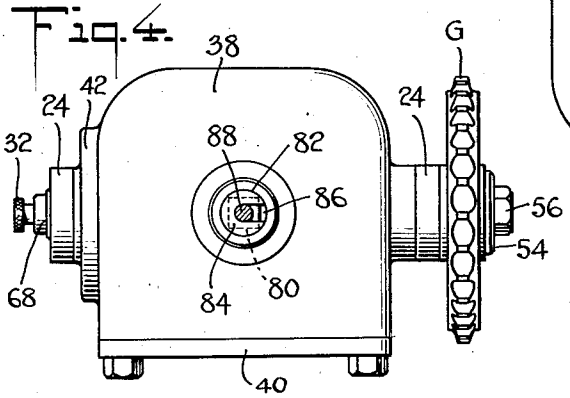
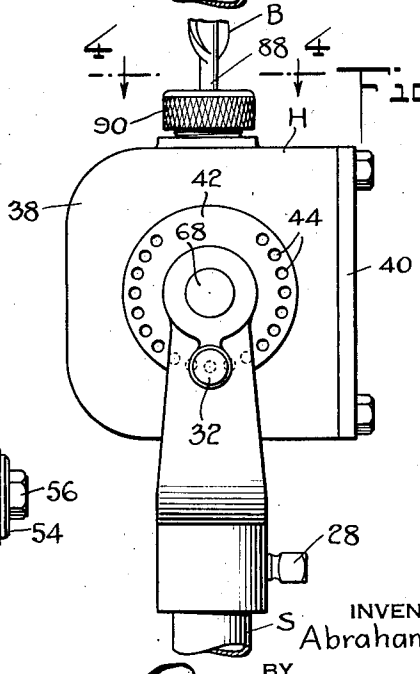


Fig. 3.



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ELECTRICIAN'S DRILL

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4 Claims. (Cl. 144—105)

This invention relates to a drill or boring machine, and more particularly to a drill especially adapted for use by electricians.

In wiring homes and buildings, electricians drill numerous holes through flooring joists to receive the flexible armored or so-called BX cable. Machines for this purpose require horizontal drilling of the hole, and frequently the machine cannot be used because the space between the joists may be insufficient to receive the machine and bit. In such case it is necessary for the electrician to use a hand brace and bit with suitable extensions between the bit and brace, the bit being held at an angle such as to pass beneath one joist while boring through the next. The electrician must, of course, work at the top of a ladder, and the task is made difficult and dangerous, and the work proceeds more slowly than is desirable.

An object of the present invention is to overcome the foregoing difficulties and to provide a generally improved apparatus for drilling or boring holes, horizontally, vertically, or at an angle, in these and analogous situations. A more particular object resides in the provision of a simple and inexpensive pull chain machine having a readily and quickly adjustable head for changing the angle of the bit relative to the position of the machine. Another and more detailed object is to provide a special chuck for receiving the bit, while minimizing the necessary length of projection of the bit from the machine. Still another object centers about simplified means for adjusting the length of the support or foot of the machine.

To the accomplishment of the foregoing and such other objects as will hereinafter appear, my invention consists in the boring machine elements and their relation one to the other, as hereinafter are more particularly described in the specification and sought to be defined in the claims. The specification is accompanied by a drawing in which:

Fig. 1 is a side elevation showing the machine in use;

Fig. 2 is an enlarged section through the head of the machine, taken in the plane of the line 2—2 of Fig. 1;

Fig. 3 shows the head of the machine in elevation, with the bit positioned vertically;

Fig. 4 is a plan view of the head of the machine, taken in the plane of the line 4—4 of Fig. 3;

Fig. 5 illustrates the support bracket for the lower pulley; and

Fig. 6 is an enlarged section taken in the plane of the line 6—6 of Fig. 5.

Referring to the drawing, the machine comprises an elongated extensible support S, at the upper end of which is oscillatably mounted a head or gear casing H. The head detachably carries an auger bit B of conventional type, and the latter is driven by manually pulling a suitable chain C running over a sprocket gear G at its upper end and an idle or support pulley P at its lower end. The lower part or foot F of support S is telescopically received within the upper part of the support, and the over-all length of the support may be adjusted with the foot F bearing against the floor, while the head H is in proper position to drill the desired hole. In Fig. 1 it will be noted that the bit B is disposed at an angle relative to the support S, thus making it possible to drill a hole through the joist J, despite the fact that the spacing between the joists is too small to receive the entire upper end of the machine, as would be required if the bit could assume only a horizontal position. In Fig. 1 the appearance of the machine is distorted because the intermediate part of support S has been cut away in order not to take excessive room on the drawing. It will also be noted that in Figs. 3 and 4 the bit has been turned to a vertical position, that is, a position in alignment with the support, thus making it possible to drill a vertical hole directly overhead while standing on the floor.

Considering the arrangement in greater detail, the extensible elongated support is preferably made of telescopically related tubular members or pipes. The larger pipe 12, which may have a diameter of, say, one inch, is located at the top, while the smaller pipe 14 is dimensioned to fit slidably within pipe 12. The pipes may have a length of, say, six feet, making it readily possible to reach overhead joists, ceiling, or flooring when the support is extended. The extension of lower pipe 14 is fixed by a suitable pin 16 which passes through holes in both pipes. An exact adjustment of length is unnecessary, because the foot of the machine may be brought into contact with the floor by disposing the support at an angle, as is indicated in Fig. 1. The holes 18 in pipe 14 may be spaced at a distance of, say, three inches, while pipe 12 may be provided with a group of three holes 20 spaced, say, one inch apart. This makes it possible to adjust the over-all length of the support at intervals of one inch. Pin 16 may be of any suitable type and is here illustrated as a cotter pin having one tip slightly sprung at 22 (see Fig. 6), thereby pre-

venting accidental loss of the pin, although it may, of course, be removed and inserted by ordinary hand pressure.

At its upper end, the support S carries a yoke 24 the collar 26 of which is secured to pipe 12 by a suitable lock screw 28. The yoke may, of course, be permanently secured to pipe 12, the only advantage of using lock screw 28 being for removability if it be desired to interchange the present head with one of another type. At one side the yoke 24 carries a lock pin 30. This pin is reciprocable toward and from head H by means of a suitable knob 32. It is normally moved inwardly toward head H by a compression spring 34 wound around pin 30 and housed within a recess in yoke 24. Spring 34 bears against a collar 36 secured to pin 30.

The gear housing or head H comprises a hollow member 38 closed by a plate 40. One side of member 38 is thickened over a circular area to form a ring 42 having a series of holes 44 disposed thereabout. These holes lie on a circle concentric with the axis of oscillation of the head, and are so located as to be in alignment with pin 30. For the present purpose it is not necessary to provide a very fine angular adjustment of the bit relative to the support, and an adjustment at intervals of, say, 15 degrees, is sufficient. The holes 44 are accordingly distributed at an angular spacing of, say, 15 degrees. It will be understood that by pulling knob 32 outwardly, the head H is readily oscillated to any desired angular position, whereupon the knob 32 is released until pin 30 springs into the nearest one of the holes 44.

Referring to Fig. 2, it will be seen that the sprocket gear G is mounted on the squared end 50 of a stub shaft 52, the gear being held on the shaft by a suitable washer 54 and nut 56. At its inner end shaft 52 carries a mitre gear 58, the shaft and gear being keyed together at 60 and being locked against axial movement by a set screw 62. It will be noted that shaft 52 is journaled in one side of yoke 24 as well as in one side of housing H. The shaft 52 therefore acts not only as a power input shaft but also as a trunnion or bearing for oscillation of housing H relative to the support. The housing is supported at its opposite side by a transverse member 64 enlarged at its middle and apertured to permit the chuck shaft 66 to pass rotatably therethrough. The outer end 68 of transverse member 64 passes through the housing wall 42 and the yoke arm opposite the sprocket gear, and thus acts as the other trunnion or bearing for oscillation of the housing within the yoke. The inner end 70 of transverse member 64 is received within the innermost part of mitre gear 58, the latter acting as a support for the end 70, thereby aiding in keeping alignment of the trunnion and the drive shaft 52.

The chuck shaft 66 passes entirely through the housing at right angles to drive shaft 52. Referring to Fig. 2, it will be seen that the lower end of chuck shaft 66 is supported against axial thrust by relatively large-surfaced collars 72 and 74 secured on opposite sides of the housing wall. The other end of the chuck shaft carries a mitre gear 76 keyed at 78 and meshing with mitre gear 58.

Chuck shaft 66 is made relatively large in diameter so that it may be hollowed to receive the tapered squared end 80 of the bit. It is, of course, possible to project the upper end of shaft 66 well out of the housing and to fit the same with a conventional screw chuck. I prefer, however, to use the present special form of chuck because it shortens the necessary distance between the tip of the bit and the head of the machine, and this in turn reduces the necessary spacing between joists when drilling the holes horizontally rather than at an angle. However, the feature is not essential, and there is no great objection to angular drilling of the holes, because an angularly disposed hole merely necessitates a slight bending of the BX cable when passing the same through the successive joists.

In the present structure the chuck shaft 66 is provided with a tapered squared seat dimensioned to receive the end of my conventional bit. Above the squared seat the shaft is bored to form a cylindrical passage 82 in which is received a sleeve 84. This sleeve is radially slotted at 86 to be received about the shank 88 of the bit. The outer end of shaft 66 is threaded to receive a flanged collar 90 which bears against the upper end of sleeve 84. The hole 92 at the center of collar 90 is made large enough to receive the squared end 80 of the bit. To lock the bit in place, it is merely necessary to slide collar 90 over the squared end of the bit; to then place sleeve 84 sidewardly over the shank 88 of the bit below collar 90; whereupon the bit and sleeve are slid into the chuck, and collar 90 is screwed in place, the exterior of the collar being suitably roughened or knurled, of course, to facilitate handling the same.

Inasmuch as the sprocket chain C is pulled directly by hand to actuate the drill, the lower end of the chain may be supported on a pulley, rather than a sprocket gear. The pulley P acts essentially as a support or guide which keeps the chain relatively taut. As will be seen in Figs. 1 and 5, the pulley is mounted on a shaft 94 secured between straps 96 bent around pipe 12, the opposite ends of the straps being clamped together by a nut and bolt 98. Should it be desired to vary the length of the chain or to disassemble the machine for repair, it is merely necessary to loosen bolt 98, thus permitting elevation of the pulley and removal of the chain.

The mechanism within housing H is assembled in place by passing the transverse member 64 into the housing and then outwardly through wall 42. Mitre gear 58 is then lowered in place and secured to shaft 52. Member 64 may then be drawn inwardly until the end 70 is received within mitre gear 58. Chuck shaft 66 is, of course, readily inserted in place because it may be moved entirely through the housing from one side wall to the other. The housing is preferably fully enclosed, as shown, because this protects the gearing against dirt and chips, and also because the housing may, if desired, be packed with a suitable heavy lubricant.

In operation the bit is positioned horizontally if there is adequate space between joists. The head of the machine is supported at the right height by projecting the foot F downwardly the desired amount. The chain is then pulled until the hole has been drilled through the joist. It should be understood that no particular pressure is needed, because the bits employed for this purpose are of the auger type and have a screw tip which itself functions to draw the bit through the wood.

When the spacing between joists is relatively close, the electrician pulls knob 32 outwardly and swings the head of the machine to a somewhat angular position. The hole is then drilled as before. In any situation where a hole is to be

drilled at a steep angle, or where there is little working room as in a corner or the like, the head may be readjusted to a suitable angle for the particular circumstance encountered. Moreover, vertical holes may be drilled directly overhead by adjusting the bit to a position in alignment with the support. At this time the support is drawn upwardly with one hand, while the chain is pulled with the other hand.

The machine has the advantage of saving labor, for it is much easier to pull the chain of the machine than to turn a brace. It may be used in difficult situations where ordinarily one or several extensions might have to be employed between a bit and a brace. This is especially desirable because the use of extensions makes it more difficult to turn the brace, probably because the parts do not line up exactly. Moreover, when drilling vertical holes, it is much more difficult to hold a brace in place and to bear upwardly on the bottom of the same while turning the brace, than it is to operate the present apparatus. Most importantly, however, my improvement greatly increases the safety of the workman, for it eliminates drilling of holes while working at the top of a ladder, which procedure has frequently led to accident and injury.

It will be apparent that while I have shown and described my invention in a preferred form, many changes and modifications may be made in the structure disclosed, without departing from the spirit of the invention defined in the following claims.

I claim:

1. A drill comprising an elongated support, a gear housing oscillatably received at the upper end of said support, a sprocket gear mounted outside said housing on a shaft concentric with the axis of oscillation of the housing, a manual pull chain extending around said sprocket gear, manually releasable means for fixing the angular adjustment of the housing relative to the support, and a chuck shaft extending out of said housing and adapted to receive a conventional bit, said chuck shaft extending transversely of and being geared to said sprocket gear shaft.

2. An electrician's drill comprising an elongated extensible support, a yoke at the upper end of said support, a gear housing oscillatably received in said yoke, a sprocket gear mounted outside said housing on a shaft concentric with the axis of oscillation of the housing, a pulley mounted partway toward the lower end of the support, a manual pull chain extending around said pulley and said sprocket gear, manually releasable means on said yoke for fixing the angular adjustment of the housing relative to the support, and a chuck shaft extending out of said housing and adapted to receive a conventional electrician's auger bit, said chuck shaft extending transversely of and being geared to said sprocket gear shaft.

3. A drill comprising an elongated support, a gear housing oscillatably received at the upper end of said support, a sprocket gear mounted outside said housing on a shaft concentric with the axis of oscillation of the housing, a manual pull chain extending around said sprocket gear, a chuck shaft extending out of said housing and adapted to receive a conventional bit, said chuck shaft extending transversely of and being geared to said sprocket gear shaft, the angular adjustment between the housing and the support being readily changeable and being fixed by mechanism including a ring of holes on one side of the housing, a locking pin on said support reciprocable into and out of any one of said holes, and resilient means normally urging said pin toward the holes.

4. An electrician's drill comprising an elongated extensible support made up of telescopically related pipes, a yoke at the upper end of said support, a gear housing oscillatably received in said yoke, a sprocket gear mounted outside said housing on a shaft concentric with the axis of oscillation of the housing, a wheel mounted near the lower end of the upper pipe, a manual pull chain extending around said wheel and said sprocket gear, a chuck shaft extending transversely out of said housing and adapted to receive a conventional bit, gearing interconnecting the sprocket gear shaft and the chuck shaft, the angular adjustment between the housing and the support being readily changeable and being fixed by mechanism including a ring of holes on one side of the housing, a locking pin on said yoke reciprocable into and out of any one of said holes, and resilient means normally urging said pin toward the holes.

ABRAHAM HIRSCH.