

July 4, 1961

C. W. KANDLE
WING COLLAR DRILL

2,990,896

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2 Sheets-Sheet 1

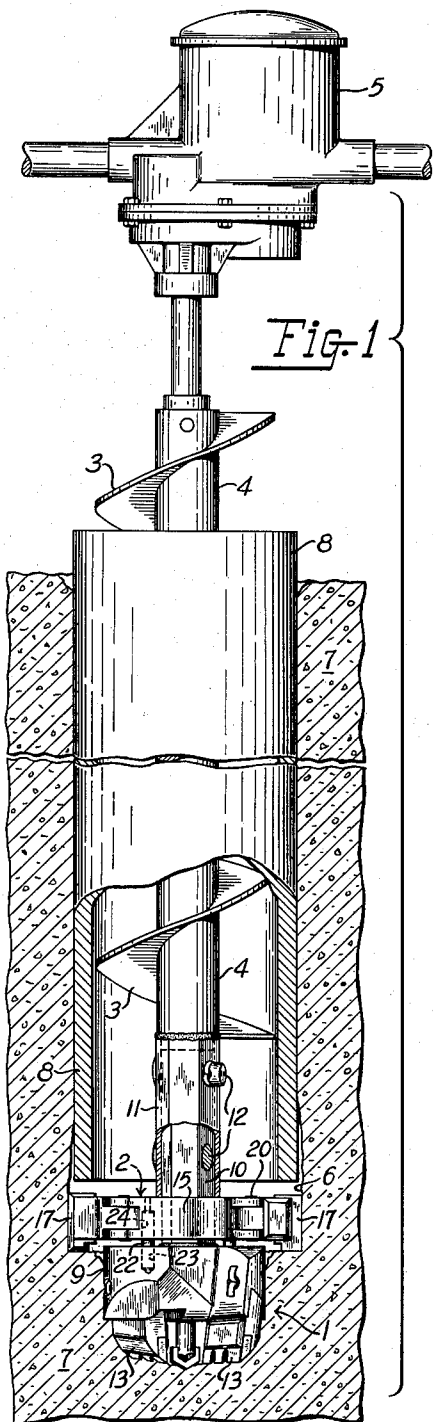


Fig. 1

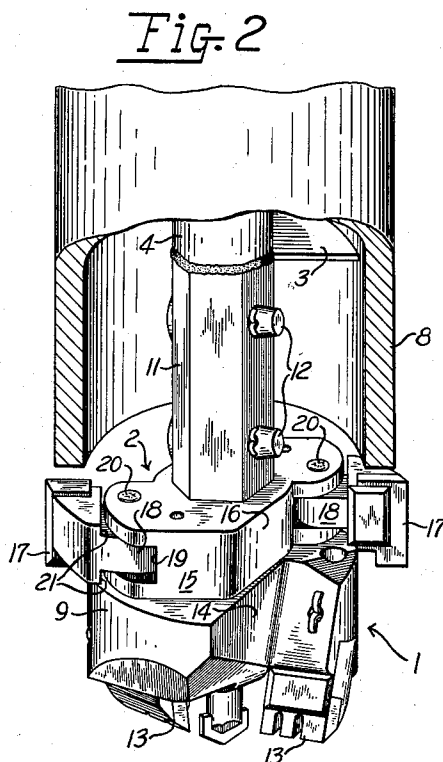


Fig. 2

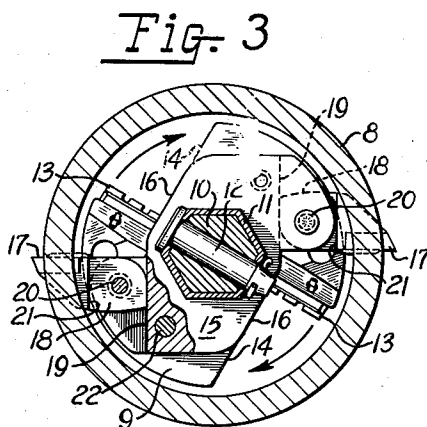


Fig. 3

INVENTOR.
CHARLES W. KANDLE
BY

Andrew, Secor & Starke
Attorneys

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Fig. 4

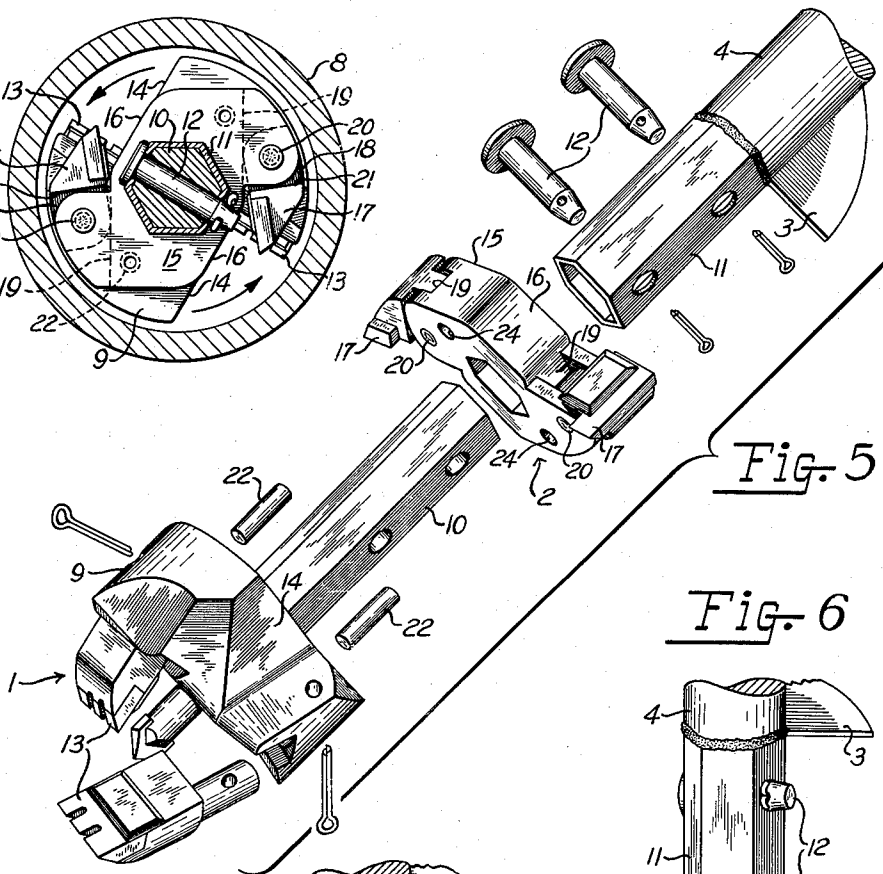
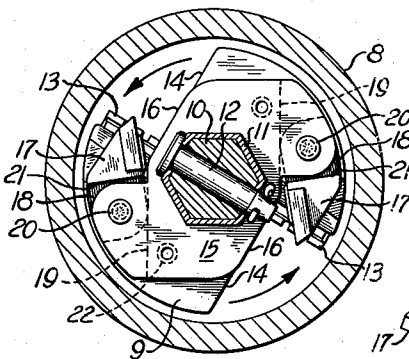


Fig. 5

Fig. 6

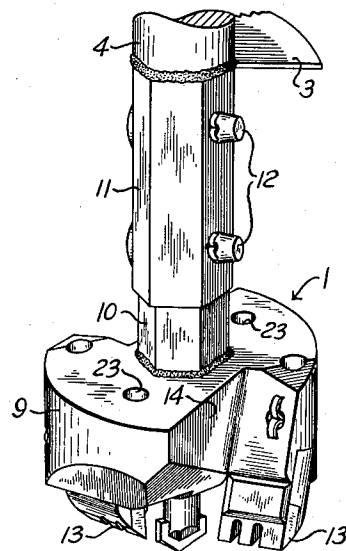
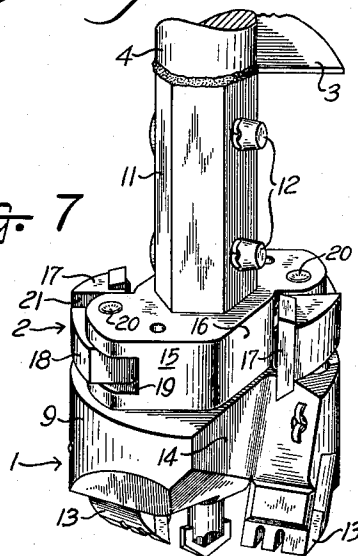


Fig. 7



INVENTOR.
CHARLES W. KANDLE
BY
Andrew, Scales & Sturck
Attorneys

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2,990,896

WING COLLAR DRILL

Charles W. Kandle, 1420 Robinhood Lane,
La Grange Park, Ill.

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3 Claims. (Cl. 175-171)

This invention relates to a wing collar drill for use in earth drilling wherein a casing is employed following the drill.

The invention employs the combination of a drill head with a removable wing collar and a spoil removal flight, the wing collar being foldable to substantially the diameter of the spiral flight and drill head for removal through the casing and being expandable to a diameter for cutting in excess of the diameter of the casing.

The construction of the wing collar in cutting the outer walls of the hole being drilled provides for the inward delivery of the spoil to the flight for raising the spoil within the casing along with the spoil from the drill head.

The invention is illustrated in the accompanying drawings which show the best mode presently contemplated for carrying out the invention.

In the drawings:

FIGURE 1 is a vertical axial section of a hole being drilled showing the operation of the wing collar drill in earth boring with a casing;

FIG. 2 is an enlarged perspective view of the drill with the casing broken away and sectioned and with the wing collar expanded at the end of the casing;

FIG. 3 is a horizontal transverse section taken just above the wing collar and through the casing, looking downward to show the cutting position for the wing collar, as when rotating in a cutting direction;

FIG. 4 is a view similar to FIG. 3 in which the drill is reversed in rotation and showing the wing collar collapsed for removal upwardly through the casing;

FIG. 5 is an enlarged detail exploded view showing the disassembly of the drill;

FIG. 6 is an assembly perspective of the drill head and flight without the wing collar, as for drilling without a casing; and

FIG. 7 is a view similar to FIG. 6 showing the assembly of the drill head, wing collar and the flight, the wing collar being collapsed.

The drill, as shown in the drawings, comprises a drill head 1, a wing collar 2 disposed immediately above the drill head, a spiral flight 3 extending upwardly from the wing collar and having a central axial drive shaft 4 secured to the drill head for driving the same, and a drive motor 5 carried at the upper end of the drive shaft.

As shown in FIGURE 1, when the drill is in operation the drill head 1 is in the bottom of the hole 6 being drilled in the earth 7 and the motor 5 is above the ground. A casing 8 is disposed in the hole 6 and is moved downwardly with the drill as the latter cuts, so that the lower end of the casing is maintained close to the wing collar 2. Reference is made to United States Patent No. 1,726,438 for a showing of a means for advancing casing 8 with the drill head 1 in service.

The drill head 1 may have any suitable construction, and preferably comprises a transverse circular plate 9 having a central axial upstanding stub shaft 10 for coupling the same to the lower end of drive shaft 4, as by sleeve 11 and pins 12.

The plate 9 carries a plurality of removable cutting teeth 13 beneath the same and facing downwardly for drilling action. The forward sides of the cutting teeth 13, in the direction of rotation when drilling, are inclined upwardly to lift the spoil upwardly through segmental openings 14 in plate 9 in front of the corresponding teeth.

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The rear side of each opening 14 is inclined to lift the spoil through the plate 9 where it is picked up by the rotating spiral flight 3.

The number and distribution of teeth 13 beneath plate 9 provides for a continuous cutting action on the bottom of hole 6 to a diameter corresponding to the diameter of plate 9. The plate 9 has a substantial thickness at its outer edge to serve as a centering control for drilling alignment should the end of casing 8 become substantially spaced above the drill for any reason.

The stub shaft 10 is non-circular, preferably square or hexagonal, and wing collar 2 has a central hole there-through complementary to the shaft, so that when the wing collar is assembled on the shaft and above the plate 9, the wing collar has to rotate with the drill head 1.

The wing collar 2 comprises a circular plate 15 corresponding generally in diameter to that of plate 9 and having segmental openings 16 registering with the corresponding openings 14 of plate 9 to provide means for the passage of spoil through the wing collar to flight 3.

A plurality of wing cutters 17 are pivotally carried by plate 15 at the outer circumference thereof, there being one wing cutter 17 for each opening 16 and disposed just behind the corresponding opening. Each cutter 17 has a shank 18 extending in a recess 19 in the outer edge of plate 15, and a pin 20 extends vertically downwardly through the plate 15 and shank 18 to pivotally secure the cutter 17 to plate 15.

The cutters 17 face forwardly of the direction of rotation for drilling and cut into the wall of the hole above plate 9, whereby the hole is enlarged to a diameter to accommodate the casing 8. The spoil from cutters 17 is directed inwardly by cutters 17 to rise with the spoil being lifted through segmental openings 16 from drill head 1.

The body of each cutter 17 provides shoulders 21 above and below the shank 18 and which engage the outer edge of plate 15 to provide a stop determining the extended cutting position for the cutter.

Means are provided between the plate 15 and plate 9 for maintaining them in an axially spaced relationship so as to prevent any binding of the swingable wing cutters. This same means also functions to insure that the plate 15 is correctly assembled on the drill head so that the openings 16 on plate 15 are directly above their corresponding openings 14 of plate 9 to receive material there-through.

This means takes the form of a pair of circumferentially spaced pins 22 seated in holes 23 of plate 9 and extending upwardly therefrom. Corresponding holes 24 in the bottom side of plate 15 register with and receive these pins 22. As shown best in FIG. 1, holes 24 do not extend for their full diameter through plate 15 and the upper ends of pins 22 bottom in the upper ends of these holes. Thus the pins keep plate 15 spaced a distance above plate 9 and prevent improper assembly of plate 15 on the non-circular shaft 10. Furthermore, the pins serve a third function of absorbing some of the torsional thrust imposed by the cutting action of cutters 17.

The openings 16 in plate 15 are of a size to receive the corresponding cutters 17 when the drill is reverse rotated to retract the cutters to a folded non-cutting position. When the cutters 17 are folded into the corresponding recesses 19 the maximum diameter of the wing collar 2 corresponds generally to the diameter of drill head 1 and both are smaller than the inside diameter of casing 8, so that they may be removed from the hole without removing the casing from the hole. The cutting edge of each cutter 17, when the latter is folded as described, protrudes from the circumference of wing collar 2 just sufficiently to assure that the cutters 17 will catch on the wall of the hole and be automatically

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expanded to cutting position thereby when the drill is positioned for cutting in the bottom of the hole and is rotated in a forward cutting direction.

The spiral flight 3 is integrally secured to shaft 4 and both are made up in convenient longitudinal sections to be coupled end to end providing for drilling of holes of different depth. The sections of the shaft 4 and flight 3 are coupled together in any suitable manner for providing a drive shaft extending continuously from motor 5 to drill head 1.

In general, the initial drill assembly will comprise a length sufficient to accommodate a single joint or length of casing 8. When the drilling operation has progressed to a point where it is desirable to join the second length of casing end to end with the first, the drill is reversed in rotation to fold the cutters 17 inwardly and then pulled upwardly through the first length of casing. A second length of casing is then joined to the first and sufficient lengths of shaft 4 and flight 3 are added between motor 5 and drill head 1 to receive the two casing lengths. The drill is then lowered inside the casing to drilling position and the drilling is resumed by forward rotation of drill head 1 and wing collar 2 by motor 5. As the drilling proceeds, the casing 8 is lowered in the hole with the drill. Any suitable number of casing lengths may be employed in accordance with the depth of hole required.

The drill has been found advantageous for horizontal drilling as under paved streets, and in which the casing generally aids in maintaining the desired direction or guidance of the drill in operation.

Where it is desirable to drill a portion of the hole without casing, the wing collar 2 may be removed and the head 1 assembled with flight 3 as shown in FIG. 6.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. An earth boring drill assembly, comprising a drill shaft carrying a spiral flight for the removal of spoil in service, means to rotate the drill shaft and spiral flight selectively in either a clockwise or counterclockwise direction, a drill head having a stub shaft adapted for coupling to the drill shaft, a collar having wing cutters thereon, said collar being adapted for mounting on the stub shaft of said drill head and together with said head being coupled to said drill shaft, said collar and drill

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head having registering openings to pass spoil to the spiral flight for removal, said wing cutters being pivotally mounted on said collar on axes disposed rearwardly of the spoil removal openings and parallel to the drill shaft and having an extended position radially beyond the periphery of the drill head, said cutters being adapted to pivot to an extended position upon rotation of the drill shaft in a cutting direction to cut a hole in service to a larger diameter than provided by said drill head and to a retracted position within the spoil removal openings upon rotation of the drill shaft in the opposite direction to fold the cutters to a diameter at least as small as the diameter of said drill head, and means disposed between said collar and drill head and engageable therewith to maintain a spaced relationship therebetween and thereby prevent binding of the wing cutters and provide for proper registry of the spoil passing openings.

2. The invention set forth in claim 1 wherein the means disposed between said collar and drill head to maintain a spaced relationship therebetween and provide for proper registry of the spoil passing openings comprises pin means which rotationally lock the collar and drill head together and absorb a portion of the torsional thrust imposed by the cutting action of the wing cutters in service.

3. The invention set forth in claim 1 wherein the means disposed between said collar and drill head to maintain a spaced relationship therebetween and provide for proper registry of the spoil passing openings comprises a plurality of removable pin members, said collar and drill head having aligned recesses adapted to receive the pin members to rotationally lock the collar and drill head together and absorb a portion of the torsional thrust imposed by the cutting action of the wing cutters in service.

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