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EXCAVATOR HAVING MEANS FOR FORMING POLYGONAL HOLES

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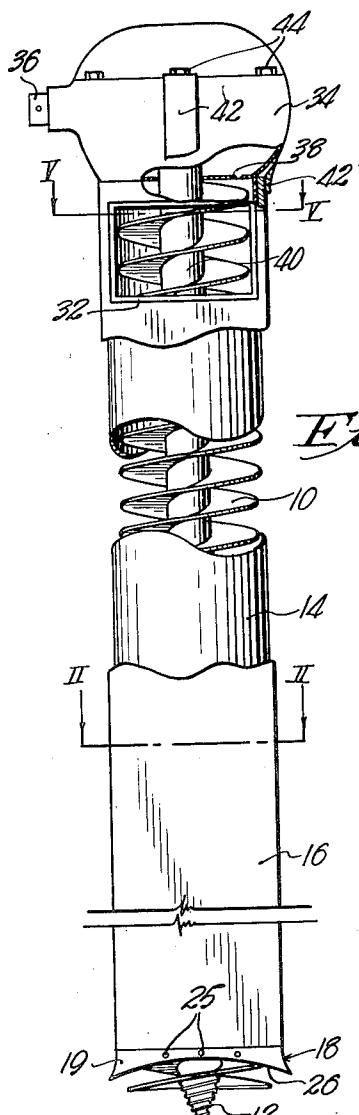


Fig. 1.

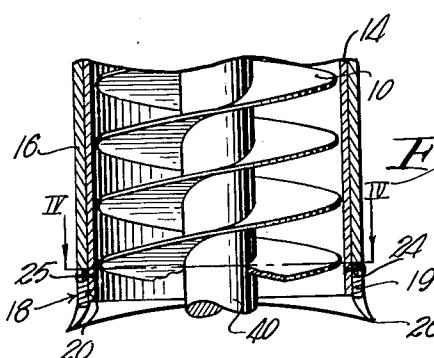


Fig. 3.

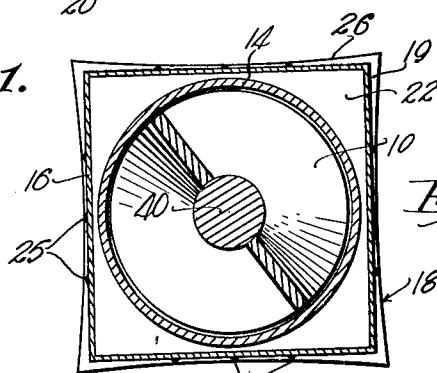


Fig. 4.

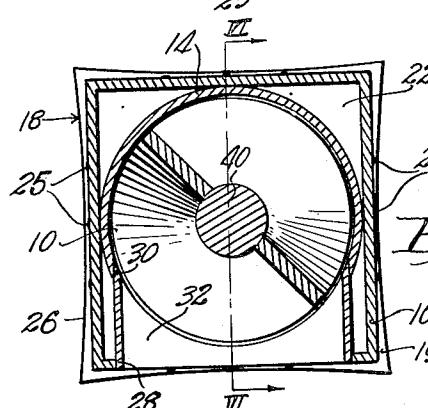


Fig. 5.

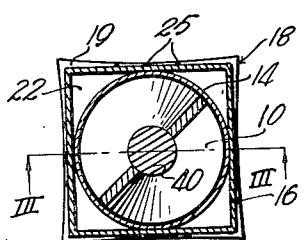


Fig. 2.

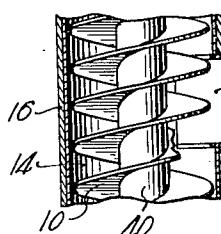
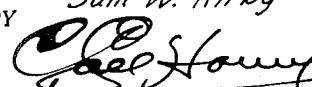


Fig. 6.

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## UNITED STATES PATENT OFFICE

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EXCAVATOR HAVING MEANS FOR FORMING  
POLYGONAL HOLESHarry G. Cochrane, Ottawa, and Sam W. Kirby,  
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3 Claims. (Cl. 255—21)

**1**

This invention has to do with excavators or earth digging apparatus, the primary object being to provide means for forming holes having straight or flat side walls, preferably vertical and terminating in right angle corners throughout.

It is the most important object hereof to present a grave digger or assembly for digging polygonal holes having means coacting with a primary auger digging assembly to shape the sides of the hole and to thereby produce angled corners simultaneously and in a single operation as the auger descends and raises the loosened earth.

Another important object of the present invention is the presentation of a hole digger that so forms the hole as to assure ease of removing the assembly from the hole without binding or excess drag as the raising operation takes place.

Other objects hereof include the provision of a novel cutter head or ring having a keen cutting edge to assure proper wall and corner formation and relatively easy downward forcing of the assembly into the ground; to provide a replaceable cutter member that may be repaired or removed from time to time as desired; and to provide means for directing the loosened earth upwardly within the confines of the rotating auger.

In the drawing:

Figure 1 is a side elevational view of an excavator having means for forming polygonal holes made pursuant to our present invention.

Fig. 2 is a cross-sectional view taken on line II—II of Fig. 1.

Fig. 3 is a fragmentary, enlarged, cross-sectional view taken on line III—III of Fig. 2.

Fig. 4 is a cross-sectional view taken on line IV—IV of Fig. 3.

Fig. 5 is a cross-sectional view taken on line V—V of Fig. 1; and

Fig. 6 is a cross-sectional view taken on line VI—VI of Fig. 5.

An elongated auger 10, having a lead screw 12 on one end thereof, a cylindrical tube 14 circumfering auger 10, and a shell 16 telescoping tube 14 are all substantially coextensive in length.

Shell 16 is substantially square in cross-section and the innermost length of its four side walls is approximately the same as the outside diameter of tube 14. And, the diameter of auger 10 is also substantially the same as the inside diameter of tube 14.

Except for the cross-sectional area of tube 14 at its lowermost open end, the proximal end of shell 16 is fully closed by a continuous, polygonal cutter head 18 joining shell 16 and tube 14. Head 18 has four identical sides 19 corresponding to the walls of shell 16 and a central opening 20 for telescopically receiving tube 14.

The upper face 22 of head 18 having opening 20 therein is flat and the outermost and upper-

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most peripheral edge thereof is square to conform with shell 16. Shell 16 circumscribes this edge of head 18 and a lap joint 24 is formed between head 18 and shell 16. A plurality of rivets 25 or like fastening elements pass through the joint 24 and connect head 18, with shell 16 and tube 14.

The sides 19 all flare outwardly from the joint 24 toward the lowermost edge 26 thereof, which edge 26 is sharpened to present a cutter or knife. Cutting edges 26 are each arcuate throughout the lengths thereof with the arch or curve thereof being upwardly, whereby the lowermost points of head 18 are at the four corners thereof. The lowermost edge of tube 14 is above edges 26 and screw 12 as well as a portion of auger 10 are below edges 26.

An outlet opening 28 in one side of shell 16 at the upper end thereof registers with an aligned outlet opening 30 in tube 14 by means of a tubular throat member 32 telescoped within openings 28 and 30 and secured to tube 14 and shell 16.

A hollow housing 34, having differential gearing therein (not shown) and including a driven shaft 36, has a perforated bottom wall 38 for rotatably receiving shaft 40 of auger 10 and resting upon the upper end of tube 14. Shafts 36 and 40 are operably intercoupled by said gearing in the usual manner and a number of straps 42 secured to shell 16 join with housing 34 by means of bolts 44 thereof.

In operation, the entire excavator is normally disposed in a vertical condition as illustrated in Fig. 1 of the drawing. However, the angularity of the hole to be formed may be varied to suit the desires of the user. In any event, rotative motion is imparted to the auger 10 continuously as the entire assembly is forced downwardly into the earth through any suitable means.

A prime mover operably connected with the driven shaft 36 of the differential in housing 34 will effectively rotate auger 10 and it is contemplated that a suitable hydraulic drive be attached to the outer face of shell 16 in any manner to aid the pulling action of auger 10 in forcing shell 16 downwardly as the head 18 cuts the earth. As the assembly progresses downwardly, the auger 10 will cut and loosen the earth in the usual manner and move or convey such loosened dirt upwardly through the tube 14 along the longitudinal axis of the latter and direct the same into the throat member 32 through outlet 30, and dump such loosened earth exteriorly of the shell 16.

If desired, any suitable chute or other conveyance may be provided for receiving the dirt from the throat member 32 and carrying the same to a point remote from the hole being dug. It is seen that the head 18 effectively cuts the dirt away around the periphery of the auger 10 forming a polygonal hole and such dirt as is

loosened and cut by the edges 26 of head 18, will be directed inwardly into the tube 14, and be carried upwardly by auger 10.

The particular form and shape of the walls 19 of head 18 including the outward flared configuration thereof, together with the arcuate edges 26 of walls 19, cooperate in cutting the hole and directing the loosened earth inwardly to a position where the same will be picked up and conveyed by auger 10. By virtue of the fact that portion 22 of head 18 completely fills the space between the outer face of tube 14 and the inner faces of shell 16, all dirt that is dug away and loosened by auger 10 and by cutter head 18 will be directed into the tube 14 rather than between tube 14 and the inner faces of shell 16. The upper ends of tube 14 and/or of the shell 16, may be closed if desired, but it has been found that the loosened dirt will effectively find its way from tube 14 through throat 32 without piling up 20 at the bottom wall 38 of housing 34.

The inherent weight of the device, together with the pulling action of lead screw 12 all cooperate in causing the assembly to move downwardly and to force the edges 26 to cut the earth away. It has been found that holes made through use of apparatus of this character have relatively straight, flat side walls and right angle corners and that the walls are relatively smooth, all depending of course, upon the nature of the 30 earth being dug and excavated.

It is, of course, contemplated that one or more of the assemblies hereof may be mounted on a suitable frame not shown, and since such vertical, reciprocable mounting of the shell 16 may be quite conventional, the same has not been shown. By way of example, the reciprocable motivation of the device may constitute the power lift of a conventional tractor or caterpillar and the shaft 36 might well be driven directly from the power take-off of such tractor. Furthermore, the shell 16 in addition to being mounted for vertical reciprocation, could well be secured to a frame that would permit lateral shifting thereof or movement in a reciprocable path on a horizontal axis, thereby facilitating the digging of several polygonal holes for each setting of the tractor or other support for the excavator hereof.

The importance of head 18 and its particular formation is of prime importance and the fact that the same may be removed for repair, sharpening and/or replacement by merely removing and reinserting rivets 24, is of notable significance. The disposition of one or more convolutions or at least part of the convolution of the auger 10 below the lowermost edge 26 of head 18, causes the auger 10 to loosen the earth ahead of the cutter 18, thereby aiding the function of the latter in shaving away and directing dirt into the tube 14.

It has been found that when a polygonal hole is thus formed, the entire assembly may be easily and quickly removed therefrom since the only part that will drag or contact the walls of the hole, is the polygonal cutting edge 26. Obviously, while the shell 16 and the edge 26 has been shown as substantially square, the configuration thereof may be varied to suit the desires of the user. In other words, differing adaptations of the excavator may require alterations 70 and it is contemplated herein that the device may well be used to dig graves, form foundation

walls for buildings, prepare holes for insertion of posts where the polygonal nature thereof may be of an advantage and for many other excavating uses as may become apparent to those skilled in the art.

Consequently, the many details of construction hereof that are capable of modification and which fairly come within the spirit of the invention as defined by the scope of the appended claims, are to be understood as embraced hereby.

Having thus described our invention, what is claimed as new and desired to be secured by Letters Patent is:

1. An excavator comprising an elongated shell, 15 said shell being polygonal in cross section, interiorly and exteriorly; a polygonal cutter head in the shell at the normally lowermost end thereof, said head having an outwardly curved cutting plate adjacent the normally lowermost end of each wall of the shell respectively; a cylindrical, open bottom tube in said shell and substantially coextensive in length therewith; an auger rotatably mounted in the tube; and outlet means for the tube adjacent the normally uppermost end thereof, said head surrounding the tube and joining the tube and the shell whereby to close the lowermost end of the shell.

2. An excavator comprising an elongated shell, 25 said shell being polygonal in cross section, interiorly and exteriorly; a cylindrical tube in said shell and substantially coextensive in length therewith; an auger rotatably mounted in the tube; outlet means for the tube adjacent the normally uppermost end thereof; closure means within the shell, surrounding the tube and joining the tube and the shell near the lowermost ends thereof; and an elongated cutting plate on the lowermost end of each wall respectively of the shell, each plate having a longitudinal cutting edge and being transversely arched outwardly as said edge thereof is approached.

3. An excavator comprising an elongated shell, 35 said shell being polygonal in cross section, interiorly and exteriorly; a cylindrical tube in said shell and substantially coextensive in length therewith; an auger rotatably mounted in the tube; outlet means for the tube adjacent the normally uppermost end thereof; closure means within the shell, surrounding the tube and joining the tube and the shell near the lowermost ends thereof; and an elongated cutting plate on the lowermost end of each wall respectively of the shell, each plate having a longitudinal cutting edge and being transversely arched outwardly as said edge thereof is approached, said cutting edges being arched upwardly between the ends thereof.

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