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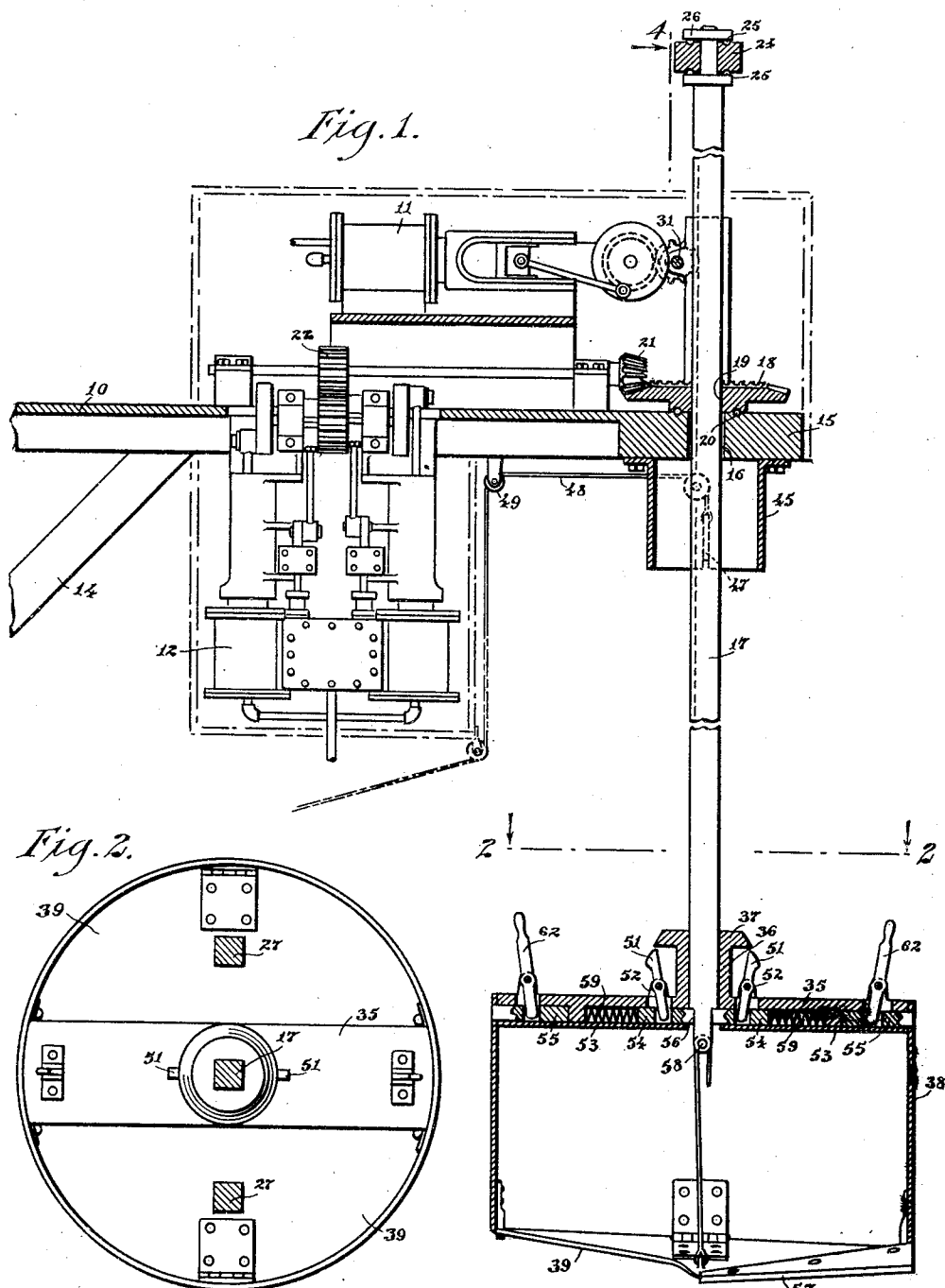
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1,883,013

VERTICAL FOUNDATION BORING MACHINE

Filed July 30, 1928

3 Sheets-Sheet 1



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Fig. 3.

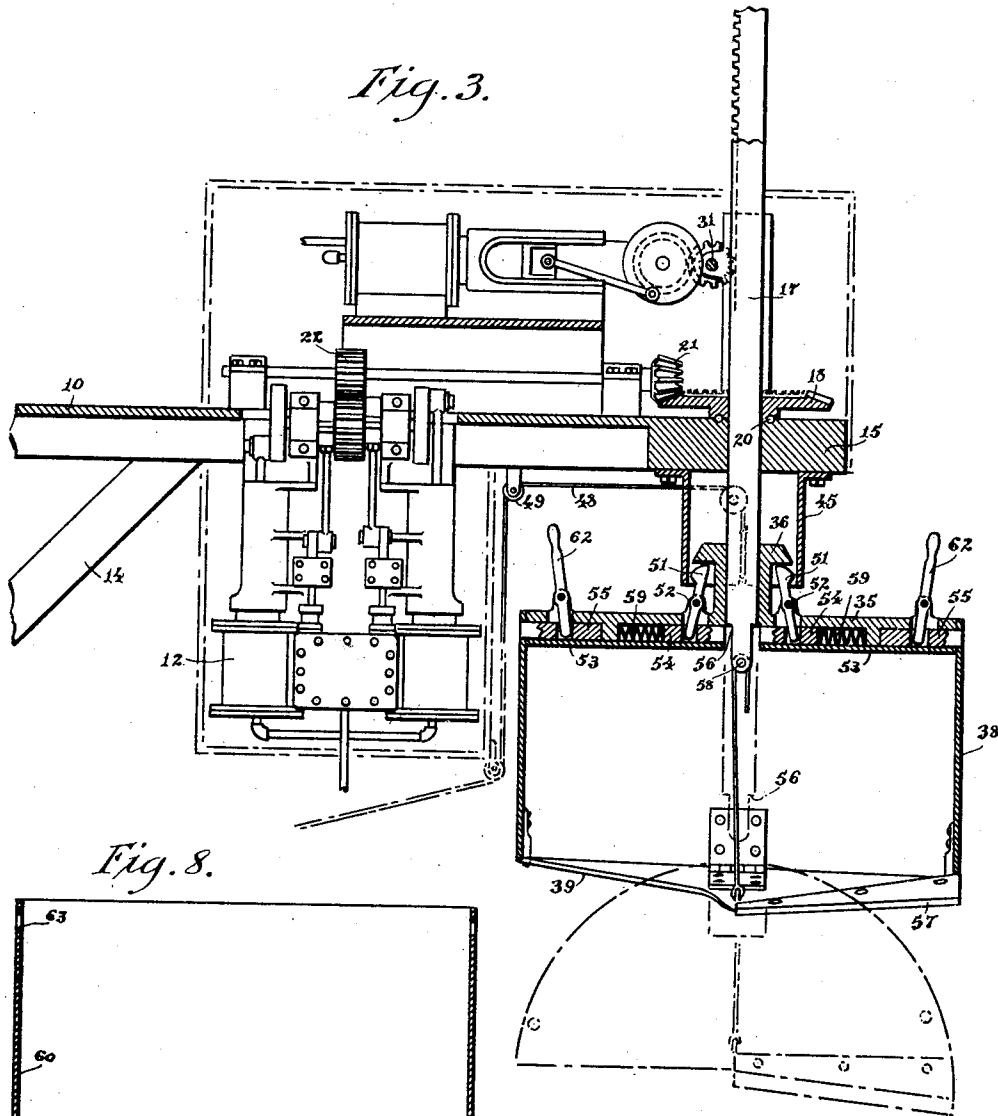


Fig. 8.

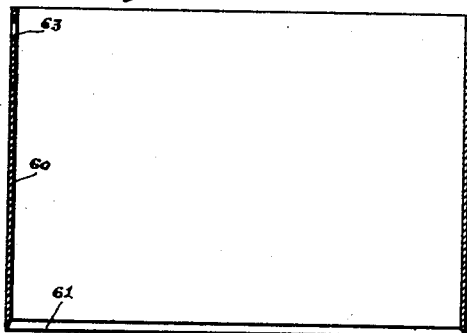
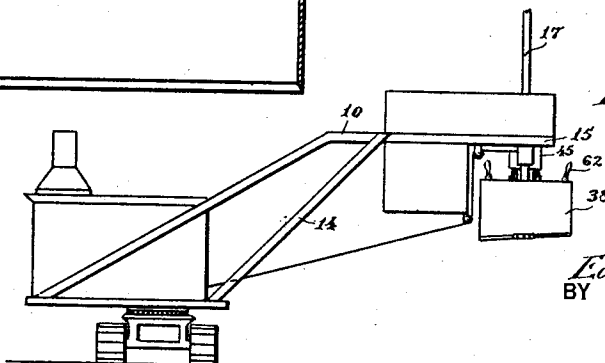


Fig. 7.



WITNESSES

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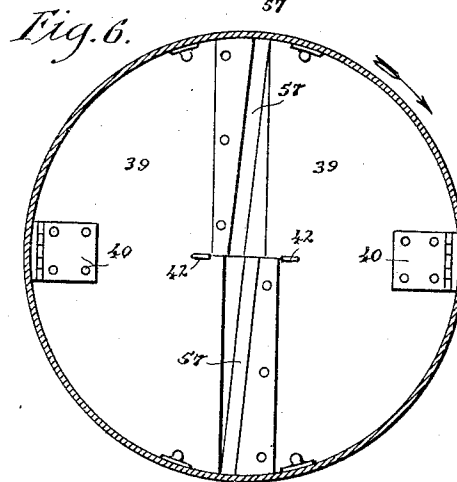
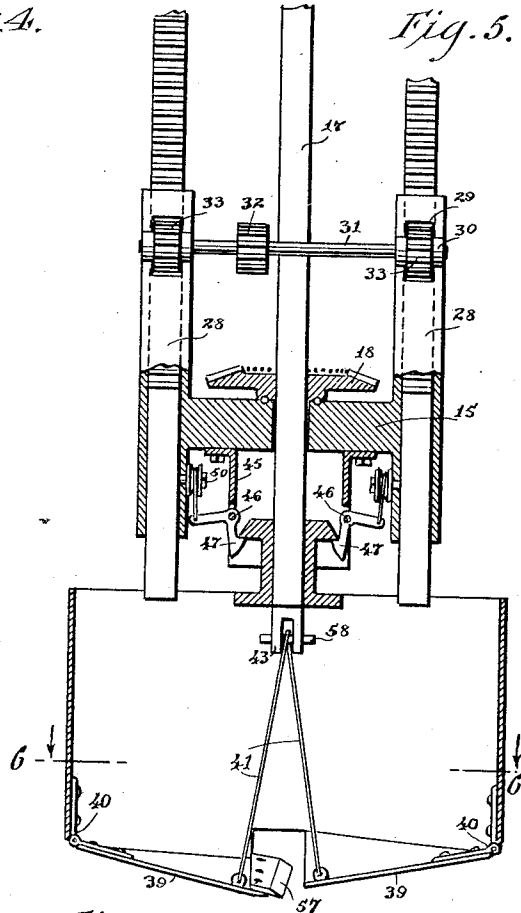
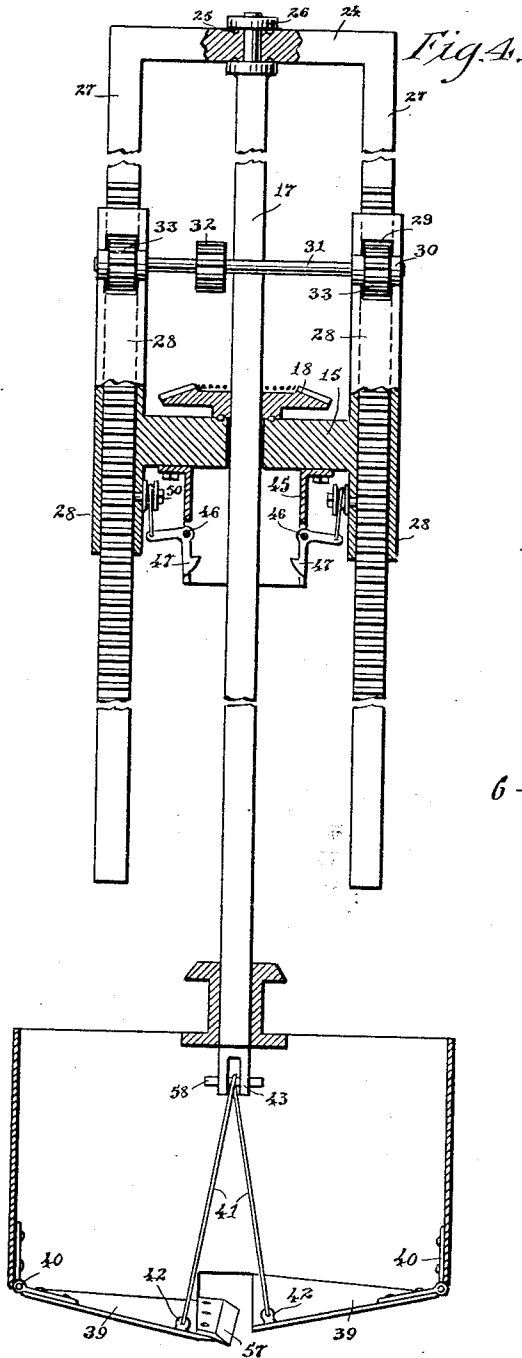
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VERTICAL FOUNDATION BORING MACHINE

Filed July 30, 1928

3 Sheets-Sheet 3



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VERTICAL FOUNDATION BORING MACHINE

Application filed July 30, 1928. Serial No. 296,355.

This invention relates to earth-digging and excavating machinery.

It is among the objects of the invention to provide an improved earth-boring and excavating device of the auger type in which the boring element forms a portion of the excavating bucket.

It is a further object of the invention to provide an improved device of the character described in which a single shaft is provided for rotating the boring element and for guiding the earth-removing portion thereof in vertical movement.

A further object of the invention is to provide improved operating mechanism for rotating the boring element and for lifting the boring element and its associated bucket, said apparatus being such as to provide for simultaneous operation of lifting or lowering and turning of the boring element.

Another important object of the invention is to provide an improved boring element which is adapted to form the bottom of an excavating bucket to which the boring elements are hingedly secured, whereby they may be lowered to effect the dumping of the bucket.

Other objects of the invention include the improved construction and interrelation of parts, whereby the whole forms a simple and improved structure by means of which the excavation and boring of earth may be facilitated in a speedy and economic manner.

These and many other objects of the invention will be apparent from a consideration of the specification taken in connection with the drawings, in which—

Fig. 1 is a view partly in section of one form of my present invention.

Fig. 2 is a view taken on the lines 2—2 of Fig. 1.

Fig. 3 is a view similar to Fig. 1 of the bucket and boring element in elevated position, the dotted lines indicating the boring element in discharging position.

Fig. 4 is a sectional view taken on the lines 4—4 of Fig. 1.

Fig. 5 is a view similar to Fig. 4 with the bucket in elevated position.

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 5.

Fig. 7 is a view of my invention as applied to a travelling turntable power plant.

Fig. 8 is a sectional view showing a casing which may be utilized in connection with my present invention.

Referring more to Fig. 1 of the drawings, the invention is shown as mounted upon a crane structure including a horizontal member 10 forming the bed for the associated motors 11 and 12, and including a supporting strut 14. The bed 10 is extended outwardly to form a base 15 apertured as at 16 to accommodate a rotating shaft 17 which may preferably be square in cross section as indicated by the sectional view Fig. 2. Mounted upon the shaft 17 there is provided a bevel gear 18 which is apertured as at 19 to conform with the cross section of the shaft 17, whereby rotation of the gear 18 will effect rotation of the shaft 17. The shaft 17 is however, free to move longitudinally through the aperture 19 to accommodate raising or lowering of the bucket as will be hereinafter described. The bevel gear 18 is preferably mounted to rest upon ball bearings 20 interposed between it and the upper face of the bed 15.

For actuating the bevel gear 18 there is provided a complementary driving gear 21 which may preferably be actuated by means of a train of gears 22 associated with the motor 12. Motor 12 is herein illustrated as being a double cylinder steam or compressed air motor. It is understood however, that it is within the scope of the invention to provide any desired means for imparting rotation to the shaft 17, such means could include the provision of an electrical motor, and any desirable equivalent of the gears 22,

21 and 18. For controlling vertical movement of the shaft 17 there is provided a cross head 24 within which the upper end of shaft 17 is rotatably mounted by the use of ball bearings 25 and a retaining cap 26. By referring to Fig. 4 it will be noted that the extremities of the cross head 24 are provided with vertical depending rack-bars 27 which lie in the same plane and parallel to the rotatable member 17.

The base 15 is preferably provided with casing members 28 adapted to receive and guide the free ends of the racks 27. The casings 28 are preferably apertured as at 29 and are provided with bearings 30 adapted to receive the free ends of a horizontally extending vertical movement controlling shaft 31 provided with an intermediate driven gear 32 and driving gears 33 which are adapted to extend through the apertures 29 and engage the teeth of the racks 27. The shaft 31 may preferably be driven through connection of its driven gear 32 with the motor 11. In this connection it is also understood that the motor 11 is only intended to be diagrammatically illustrated and any form of equivalent power supply or mechanism for controlling the vertical movement of the rotating element 17 may be provided without departing from the spirit or scope of the present invention.

Considering the structure thus described, it may be readily seen that it provides means for readily controlling the vertical or rotational movement of the rotating element 17. The rotating element 17 is provided at its extremity with a transversely extending head 35 which includes a collar 36 including an extending flange 37. The collar 36 is slidably mounted on the shaft 17, but is rotatable thereby. The extremities of the head 35 have depending therefrom an annular rim 38 forming the side walls of a circular excavating bucket, the bottom of which is formed by a pair of complementary spiral members 39 which are hingedly secured to the lower edge of the rim 38 as at 40, and which, when in horizontal position with their upper faces near the peripheries of their edges abutting the periphery of the rim 38, form an auger-like boring implement as seen in Figs. 1, 4, 5 and 7. For retaining the elements 39 in the horizontal position thus shown, there is provided a pair of supporting links 41 which are secured as at 42 adjacent the diametric edges of the members 39 opposite their hinged connection 40. The upper ends of the links 41 are preferably carried between bifurcated portions 43 of the extremity of the rotatable member 17 which passes through the collar 36. It may be thus readily seen that should the collar 36 remain stationary while the rotatable member 17 is lowered, the boring elements 39 will be free to swing outwardly upon their hinges 40 to discharge

the accumulation of earth from within the rim 38. This position of the members 39 is illustrated in the dotted line position shown in Fig. 3.

Referring more particularly to Figs. 4 and 5 there is provided depending from the base 15 an annular flange member 45 surrounding the rotatable member 17. The member 45 is longitudinally slotted and provided with pivot pins 46 adapted to form the axis of bell crank latch members 47, the movement of which may be controlled by a flexible cable 48 passing over a pulley 49 of the base 15 and dividing to pass over a pair of pulleys 50 carried by the depending portion of the members 28, the extremities of the cable 48 being secured to the free ends of the latch members 47. Cooperating with the depending flange 45 there is provided a pair of pivoted arms 51 carried by the extending member 35 and pivotally secured thereto as at 52.

Beneath the member 35 and retained in spaced relation thereto, there is provided a second similarly extending member 53 between which and the member 35 two pairs of dogs 54 and 55 are provided. The dogs 54 are adapted to move into and out of operative relation with a squared shoulder 56 of the shaft 17. When in fully diverging position of the arms 51, the dogs 54 about the shoulder 56 and prevent longitudinal movement of the shaft 17 with respect to the collar 36. In converging position of the arms 51 as shown in Fig. 3, the dogs 54 release the shoulder 56 and allow the shaft 17 to extend through and beyond the collar 36.

The operation of the above described portion of the invention is as follows. The shaft 17 is lowered by rotation of the shaft 31 in clockwise direction, and the bucket assembly is positioned for operative engagement with the earth. Rotation of the shaft 17 is effected through the gear 18. The bucket formed by the rim 38 in combination with the boring elements 39 is thus in the position shown in Fig. 1. It will be seen that by rotation of the shaft 17 and the imparting thereby of rotation to the bucket, that the cutting edges 57 of the members 39 act as an auger in boring into the earth; the earth thus bored being deposited between the sides of the rim 38. When it is desired to empty the bucket of the earth accumulated therein, the source of power 11 is reversed, causing the shaft 31 to rotate in a counter clockwise direction, raising the shaft 17 by virtue of its connection with the cross head 24 and the depending flanges 27; the rotation of shaft 17 by virtue of the bevel gear 18 having ceased.

Continued vertical upward movement of the shaft 17 is adapted to carry with it the member 35 and associated bucket apparatus. By this continued motion the flange 37 of the collar 36 is received within the depending annular member 45 carried by the base

15; the bevelled peripheral edges of the flange 37 camming outwardly the latch members 47 and passing therebetween up within the depending member 45. It will be noted that the side walls of the depending member 45 effect a camming action on the slanting sides of the arms 51, thus moving them to the converging position shown in Fig. 3, thus moving the dogs 54 out of engagement with the shoulder 56 on the lower end of the shaft 17, whereby shaft 17 may extend through and beyond collar 36.

If the cable 48 in the meantime is slack, the latches 47 assume by gravity the position shown in Fig. 5, whereby upon reversal of the shaft 31 and downward movement of the shaft 17, the latch members will retain the flange 37 and the collar 36 within the depending member 45 as shown in Fig. 5. The member 35 and the associated side 38 are thus retained in the elevated position as shown in Fig. 3. The shaft 17 however, by movement of the dogs 54 into disengaging position is free to move downwardly to the dotted line position shown in Fig. 3. The cutting edges 57 of the boring members 39 are thus lowered by swivel movement of the members 39 about their hinges 40; the supporting links 41 diverging outwardly to accommodate this movement. This movement of the members 39 permits the discharge of earth accumulated within the bucket; it being readily understood that the structure may then move by the turntable shown in Fig. 7, to the desired position for discharging.

The apparatus may then be returned to a position of vertical elevated relation to the ground to be excavated. The rotating element 17 is then returned to the position shown in Fig. 5, the cable 48 tightened and thus withdrawing the latch members 47 from engagement with the flange 37 and allowing the rim 38 and head 35 to be supported by the upper face of the members 39 supported by the links 41 of the rotating member 17. It will also be noted that a pin 58 acts to retain the links 41 in connection with the extremity of the rotating member 17. When the rotating element 17 is lowered to operative position, the arms 51 are forced outwardly to re-assume the position shown in Fig. 1 by action of expanding coiled springs 59 positioned between the member 35 and the member 53.

It may thus be seen that the lowering, raising, turning and dumping of the apparatus is provided for by simple control of the rotating motor 12, the vertical control motor 11, and the flexible cable 48.

Referring more particularly to Fig. 8 of the drawings, there is provided a casing member 60 which may be carried by the member 35 and surround the side 38 of the bucket, whereby a casing may be sunk around the

aperture bored by the bucket and its associated bucket-boring elements. The casing member may be any desired length, and is preferably provided at its lower edge with a tapered cutting edge 61 adapted to facilitate its placement in the aperture.

The casing member 60 may if desired be rotated by the rotating shaft 17. This is readily accomplished by the means of securing the casing 60 to the bucket. For this purpose, the dogs 55 are provided which have radial movement with respect to the shaft 17 controlled by manual controlling levers 62. It may be readily seen that when the casing 60 is positioned around the bucket, diametrically opposite apertures 63 therein may be arranged to coincide with the dogs 55 whereby converging movement of the handles 62 will cause the extremities of the dogs 55 to extend through the apertures 63, thus retaining the casing 60 in position around the bucket and for rotation with the bucket and with the rotating shaft 17.

It will be understood that the invention may assume various changes and modifications, and the free use of equivalents may be resorted to without departing from the spirit or scope of the present invention as outlined in the appended claims.

I claim:

1. A device of the character described including a vertically rotatable shaft, means to rotate the shaft, a collar carried by said shaft, said collar including a bucket having boring elements associated therewith, means for preventing downward vertical movement of said shaft with respect to said collar, means for releasing said first named means to allow downward vertical movement of said shaft with respect to said collar, and means simultaneously operable to retain said collar in elevated position upon released position of said first named means.

2. A boring and excavating unit comprising a collar mounted for rotation with a vertical shaft, depending annular walls carried by said collar, and semi-circular boring elements hingedly secured to the lower edges of said walls, means connecting said last named members with said vertical shaft, and means for permitting vertical movement of said shaft with respect to said collar to control hinged movement of said cutting elements.

3. In a device of the character described, including a rotatably and vertically movable driving shaft, an excavating tool mounted upon said shaft, said tool including a cross head centrally apertured to receive said shaft for free movement therethrough, said shaft and aperture being similarly angular to provide for rotation of said tool by rotation of said shaft, an automatic means independent of the shaft to support the excavating tool at a predetermined elevation.

4. In a device of the character described, including a rotatably and vertically movable driving shaft, an excavating tool mounted upon said shaft, said tool including a cross head centrally apertured to receive said shaft
 5 for free movement therethrough, said shaft and aperture being similarly angular to provide for rotation of said tool by rotation of said shaft, and a closure for said tool operable
 10 by movement of said shaft through said cross head, an automatic means independent of the shaft to support the excavating tool at a predetermined elevation.

5. In a device of the character described, including a rotatably and vertically movable driving shaft, an excavating tool mounted upon said shaft, said tool including a cross head centrally apertured to receive said shaft
 15 for free movement therethrough, said shaft and aperture being similarly angular to provide for rotation of said tool by rotation of said shaft, a closure for said tool, means carried by said cross head for preventing movement of said shaft downwardly through said
 20 cross head and means normally above the cross head for operating the closure when the cross head is elevated thereto.

6. In a device of the character described, including a rotatably and vertically movable driving shaft, an excavating tool mounted upon said shaft, said tool including a cross head centrally apertured to receive said shaft
 30 for free movement therethrough, said shaft and aperture being similarly angular to provide for rotation of said tool by rotation of said shaft, a closure for said tool operable by movement of said shaft through said cross head, and means carried by said cross head for preventing movement of said shaft downwardly through said cross head, said means
 35 including movable dogs adapted to abut said shaft upon downward movement thereof.

7. In a device of the character described, including a rotatably and vertically movable driving shaft, an excavating tool mounted upon said shaft, said tool including a cross head centrally apertured to receive said shaft
 45 for free movement therethrough, said shaft and aperture being similarly angular to provide for rotation of said tool by rotation of said shaft, a closure for said tool operable by movement of said shaft through said cross head, and means carried by said cross head for preventing movement of said shaft
 50 downwardly through said cross head, said means including movable dogs adapted to abut said shaft upon downward movement thereof, said dogs being externally automatically operable upon upward movement of
 55 said tool with said shaft, whereby they are moved outwardly from the path of said shaft through said cross head.

8. In a device of the character described, including a rotatably and vertically movable
 65 driving shaft, an excavating tool mounted

upon said shaft, said tool including a cross head centrally apertured to receive said shaft for free movement therethrough, said shaft and aperture being similarly angular to provide for rotation of said tool by rotation of said shaft, said tool further including a cylindrical shell constituting bucket sides, and a pivoted closure bottom for said bucket constituting an earth-boring blade.

9. In a device of the character described, including a rotatably and vertically movable driving shaft, an excavating tool mounted upon said shaft, said tool including a cross head centrally apertured to receive said shaft
 75 for free movement therethrough, said shaft and aperture being similarly angular to provide for rotation of said tool by rotation of said shaft, said tool further including a cylindrical shell constituting bucket sides, a pivoted closure bottom for said bucket constituting
 80 an earth-boring blade, and a connecting means for said blade and shaft whereby movement of said shaft through said cross head will permit pivotal movement of said blade to open said bucket.

10. In a device of the character described, including a rotatably and vertically movable driving shaft, an excavating tool mounted upon said shaft, said tool including a cross head centrally apertured to receive said shaft
 85 for free movement therethrough, said shaft and aperture being similarly angular to provide for rotation of said tool by rotation of said shaft, said tool further including a cylindrical shell constituting bucket sides, a pivoted closure bottom for said bucket constituting
 90 an earth-boring blade, and a connecting means for said blade and shaft whereby movement of said shaft through said cross head will permit pivotal movement of said blade to open said bucket, said connecting means being adapted to lift said bucket by upward movement of said shaft.

11. In a device of the character described, including a rotatably and vertically movable driving shaft, an excavating tool mounted upon said shaft, said tool including a cross head centrally apertured to receive said shaft
 95 for free movement therethrough, said shaft and aperture being similarly angular to provide for rotation of said tool by rotation of said shaft, said tool further including a cylindrical shell constituting bucket sides, a pivoted closure bottom for said bucket constituting
 100 an earth-boring blade, a connecting means for said blade and shaft whereby movement of said shaft through said cross head will permit pivotal movement of said blade to open said bucket, said connecting means being adapted to lift said bucket by upward movement of said shaft, and movable dogs carried
 105 by said cross head for normal position adapted to be abutted by a portion of said shaft upon downward movement thereof through said cross head, said dogs being automatical-
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ly operable upon upward movement of said shaft to move outwardly from the shaft aperture to permit downward movement of said shaft through said aperture.

5 12. In a device of the character described, an excavating tool having a closure movable relatively to the body of the excavating tool, a shaft for rotating said excavating tool and for hoisting said excavating tool to an elevated position, means operable automatically
10 when the excavating tool reaches the said position for engaging said excavating tool regardless of the rotative position of the excavating tool and thereby supporting the excavating tool in elevated position, and means
15 cooperating with the shaft for opening the closure.

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