July 4, 1933. H. R. SMITH 1,916,688

EARTH BORING APPARATUS

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FIG.1.

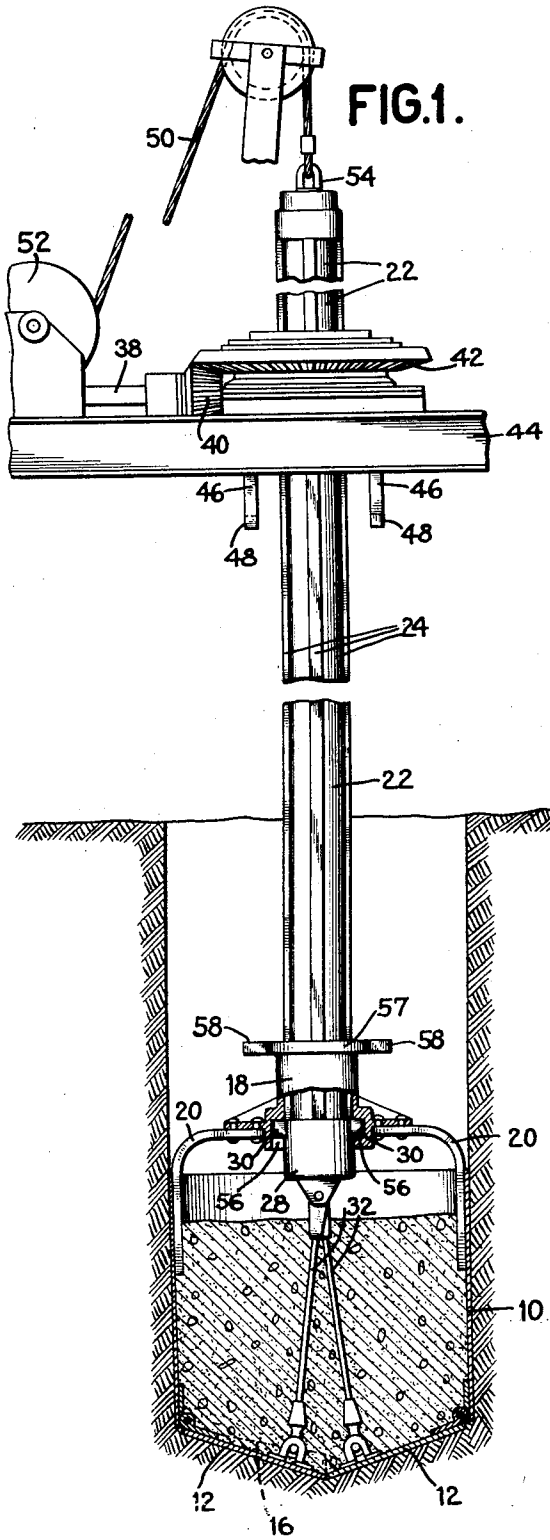


FIG.2.

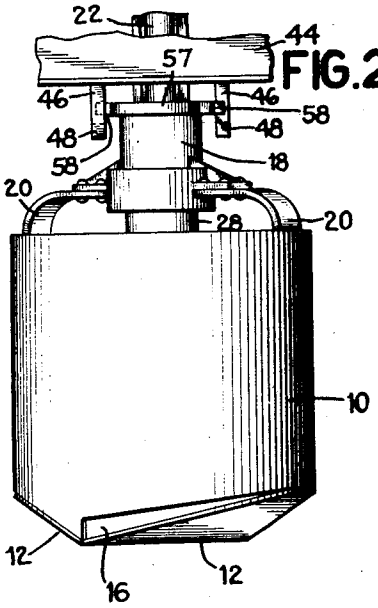
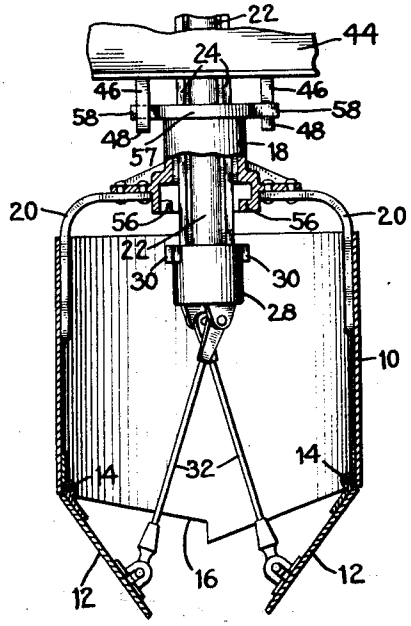


FIG.3.



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FIG.4.

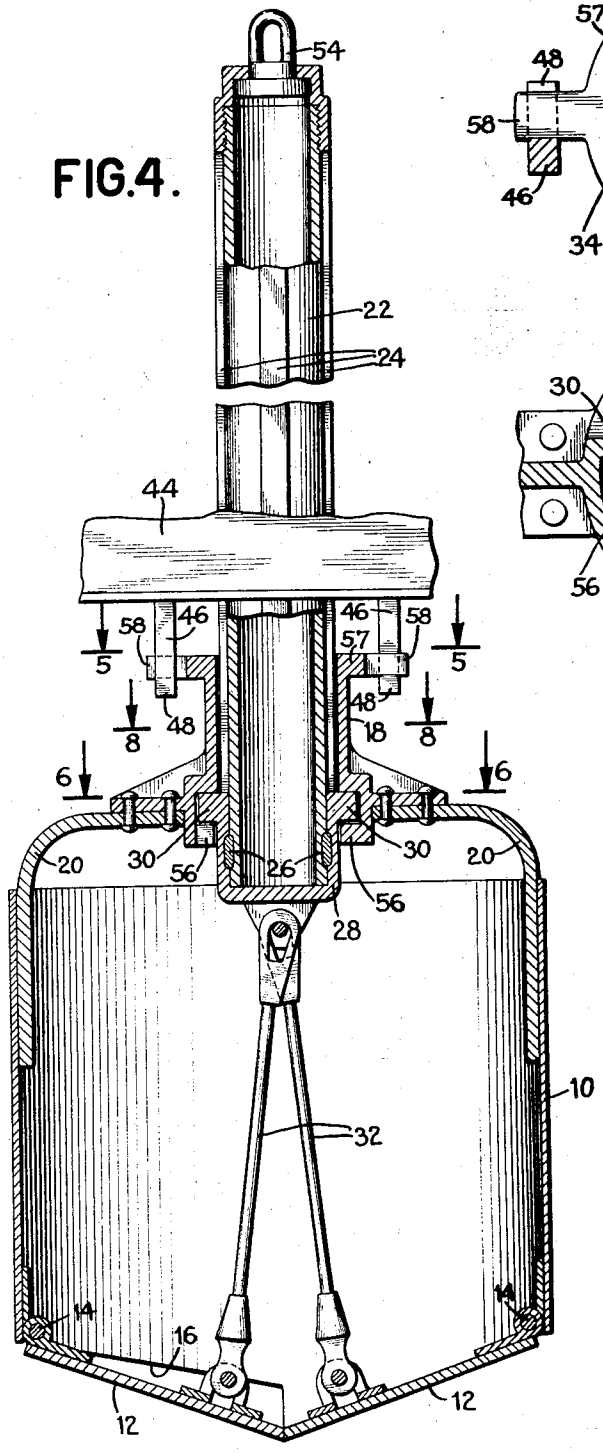


FIG.5.

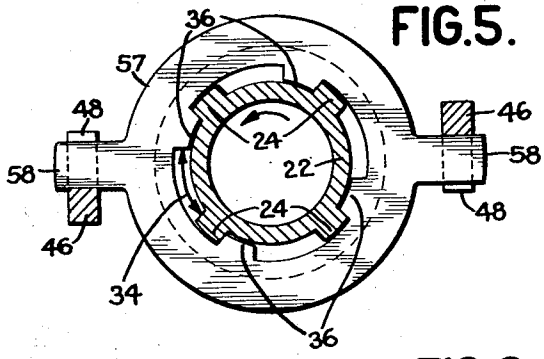


FIG.6.

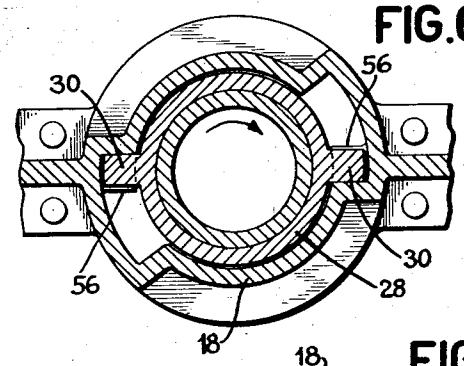


FIG.7

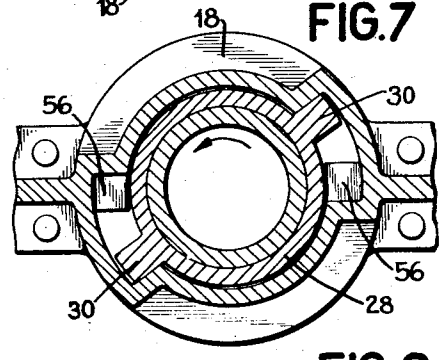
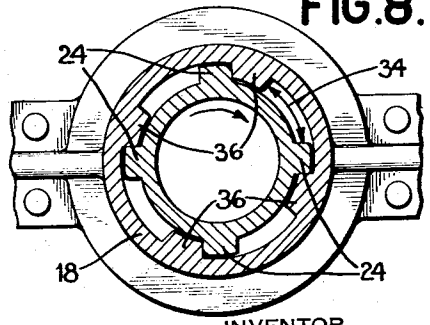


FIG.8.



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UNITED STATES PATENT OFFICE

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EARTH BORING APPARATUS

Application filed March 3, 1932. Serial No. 596,429.

This invention pertains to apparatus for boring holes in the earth to be filled with concrete to form foundation columns for buildings or other structures. The disclosed apparatus comprises a rotary bucket, means for rotating the bucket, means for raising and lowering the bucket, and means for controlling the opening and closing of the bucket gates. The present invention pertains particularly to the last named feature, an object of the invention being to disclose a simple arrangement for that purpose, controllable at the will of the operator through the instrumentality of the bucket rotating means, as distinguished from previous devices controllable by cables, rods or other devices separate from the rotating means. Some previous devices require the use of vertically movable cross-heads within the buckets, which are objectionable because the cross-heads decrease the useful capacity of the bucket and sometimes hinder the free discharge of material from the buckets when the discharge gates are opened. The present device entirely does away with the cross-head and its attendant drawbacks.

Further and other objects and advantages will be apparent from the specification and claims, and from the accompanying drawings which illustrate what is now considered the preferred embodiment of the invention.

Fig. 1 is a view of the apparatus with the filled bucket in the hole, ready for raising.

Fig. 2 shows the raised bucket being lowered onto the overhead sustaining hooks.

Fig. 3 shows the bucket in cross-section, supported on the hooks and with the discharge gates partly open.

Fig. 4 shows the apparatus after discharge with the gates closed, ready for removal from the hooks.

Fig. 5 is a cross-section on line 5—5 of Fig. 4 after the bucket has been rotated to a position above its supporting hooks.

Fig. 6 is a cross-section on line 6—6 of Fig. 4 with parts in driving relationship.

Fig. 7 is the same view as Fig. 6 but with the parts in different relative rotative positions.

Fig. 8 is a cross-section on line 8—8 of Fig. 4 with parts in driving relationship.

In the drawings, 10 designates a rotary bucket having at its bottom a pair of gates 12 hinged at 14 and adapted, when the bucket is rotated in proper direction to bore into the earth in auger-like manner, the detritus entering the bucket through openings such as 16, all in well known manner.

The bucket is provided at its top with an axially aligned drive hub 18 rigidly connected to the bucket by bail 20. Passing vertically through hub 18 is drive shaft 22 having longitudinal splines 24. For convenience the shaft is made hollow.

On the lower end of shaft 22, and secured thereto by keys 26 is a cap 28, having a pair of external ears 30. Each gate 12 is connected to cap 28 by a rod or cable 32.

Drive shaft 22 is rotatable within hub 18 and relatively thereto through an angle indicated by line 34 (Figs. 5 and 8). This movement is limited by splines 36 projecting inwardly from the hub body to engage splines 24 on the drive shaft. While digging, splines 24 on shaft 22 engage splines 36 to rotate the bucket to the right as indicated by the arrow in Fig. 8, the drive shaft being rotated by reversible power through shaft 38, pinion 40 and gear 42, supported by overhead framework 44, which also supports a pair of downwardly projecting abutments 46 having hook-like lower ends 48. Shaft 22 may be raised or lowered through gear 42 by means of cable 50 passing around drum 52 and connected to the shaft by swivel 54.

Normally, while the digging operation is going on (with gates closed and drive shaft rotating to the right) ears 30 are above ledges 56 which form a part of the lower end of hub 18 (Fig. 6) so that shaft 22 cannot be lowered with relation to hub 18, thus latching the gates against opening, and at the same time permitting the weight of the drive shaft to bear down on the bucket, if desired while digging.

With the parts in the positions just described the bucket is rotated to the right until it is full (Fig. 1). Then the bucket is raised until flange 57, which forms the upper

part of hub 18, is above the level of hooks 48 (Fig. 2). Then the bucket is rotated to the left until ears 58 encounter abutments 46 which prevent further rotation of the bucket to the left, but do not prevent further rotation of the drive shaft relatively to the bucket through the angle 34 (Figs. 5 and 8). This rotation of the shaft relatively to the bucket, moves ears 30 off of ledge 56 (Fig. 6) to the position shown in Fig. 7. The drive shaft is then lowered until ears 58 rest on hooks 48. With the bucket supported on the hooks and ears 30 free from ledges 56, the gates are unlatched, so that when the shaft is lowered still further, moving through the bucket hub 18 as in Fig. 3, the gates are free to open in response to the weight of the material in the bucket, assisted by whatever thrust may be transmitted from the shaft to the gates by links 32.

After the contents of the bucket have dropped out of the bucket, the gates are closed by raising the drive shaft again until ears 30 reenter the bottom of hub 18 above the level of ledges 56. The shaft is then rotated to the right, causing ears 30 to relatch the gates by resuming their operative positions above ledges 56, and moving splines 24 through angle 34, as in Fig. 8, until they contact with hub splines 36. Further rotation of the shaft to the right rotates the bucket away from abutments 46 and out of engagement with hooks 48 so that the bucket is free to be lowered into the hole to resume digging. After the bucket is refilled as in Fig. 1, its contents are again discharged as described.

It is to be understood that the invention is not limited to the specific embodiment herein illustrated and described, but may be used in other ways without departure from its spirit as defined by the following claims.

What I claim is:

1. In a machine of the class described, in combination, a rotary digging bucket having a discharge gate, a latching device for said gate, and a drive shaft connected to the bucket and rotatable in one direction for operating said bucket and rotatable in reverse direction for operating said latching device to release said gate.

2. In a machine of the class described, in combination, a rotary digging bucket having a discharge gate, a drive shaft operatively connected to said bucket, and means operated by the shaft when rotated in one direction relative to the bucket to latch said gate against opening and when rotated in the other direction to unlatch said gate to permit opening.

3. In a machine of the class described, in combination, a rotary digging bucket having a discharge gate, a drive shaft for said bucket, and means interconnecting said shaft and said bucket and operated upon rotary and vertical movement of said shaft relatively to said bucket to release said gate to permit discharge of the bucket contents therethrough.

4. In a machine of the class described, in combination, a rotary digging bucket having a discharge gate, a drive shaft for said bucket, means interconnecting said shaft and said gate and means operated upon rotary movement of said shaft relatively to said bucket to release said gate to permit discharge of the bucket contents therethrough.

5. In a machine of the class described, in combination, a rotary digging bucket having a discharge gate, a drive shaft for said bucket, and means interconnecting said shaft and said bucket and operated upon rotary movement of said shaft relatively to said bucket to release said gate to permit discharge of the bucket contents therethrough.

6. In a machine of the class described, in combination, a rotary digging bucket having a discharge gate, a drive shaft for said bucket rotatable relative thereto, and means operated upon rotary and vertical movement of said shaft relatively to said bucket to close said gate.

7. In a machine of the class described, in combination, a rotary digging bucket having a discharge gate, a drive shaft for said bucket having limited rotation relative to said bucket to control latching mechanism, and means operated upon vertical movement of said shaft relatively to said bucket to actuate said gate.

8. In a machine of the class described, in combination, a rotary digging bucket, a drive shaft for said bucket rotatable in both directions, and means operated when the shaft is given a limited rotary movement in one direction to support the bucket in elevated position and when rotated in reverse direction to release the bucket from its support.

9. In a machine of the class described, in combination, a rotary digging bucket having a discharge gate, a drive shaft for said bucket, a support for said bucket, means for rotating said shaft to cause said bucket to engage said support, said means being adapted for subsequently rotating said shaft relatively to said bucket, and means operating upon subsequent rotation of said shaft to release said gate and to permit discharge of the bucket contents therethrough.

10. In a machine of the class described, in combination, a rotary digging bucket having a discharge gate, a drive shaft for rotating said bucket, and latching means for the gate operated by rotary and vertical movement of the shaft.

In testimony whereof I hereto affix my signature.

HERMAN R. SMITH.