Oct. 8, 1929. C. WILD 1,730,704

DIGGING MECHANISM FOR WELLS AND THE LIKE

Filed Oct. 27, 1927 3 Sheets-Sheet 1

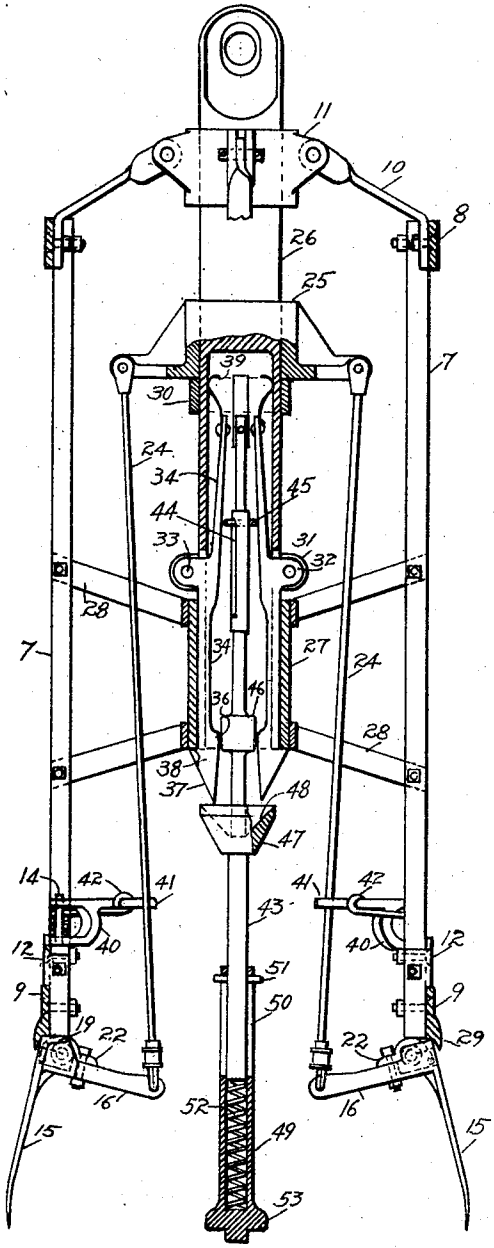


Fig. 1.

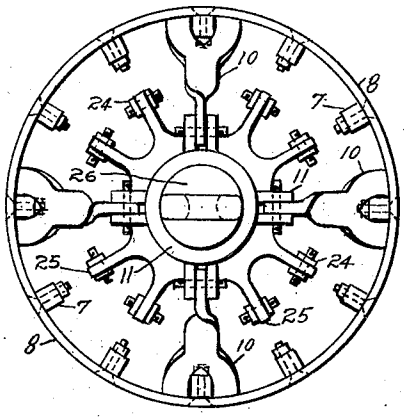


Fig. 2.

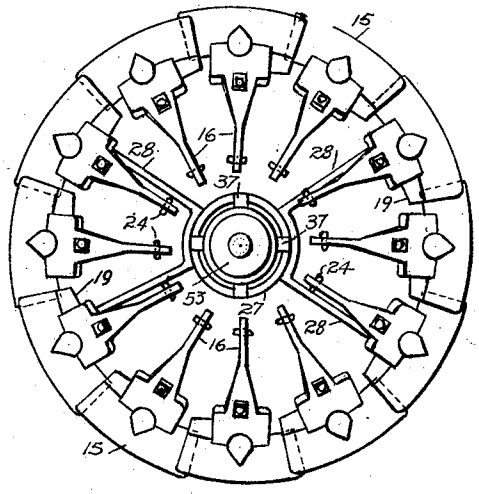


Fig. 3.

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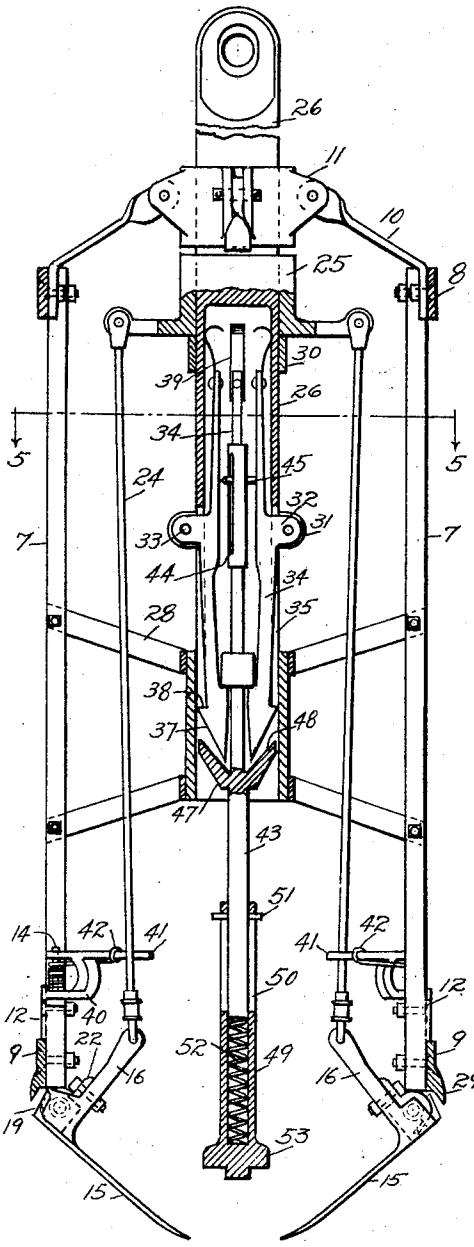


Fig. 4.

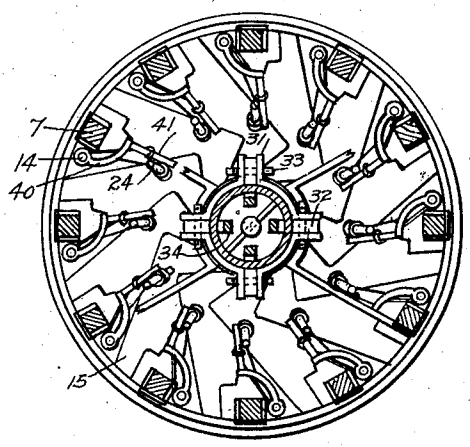


Fig. 5.

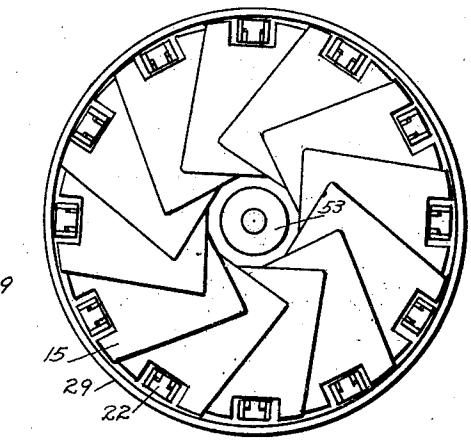


Fig. 6.

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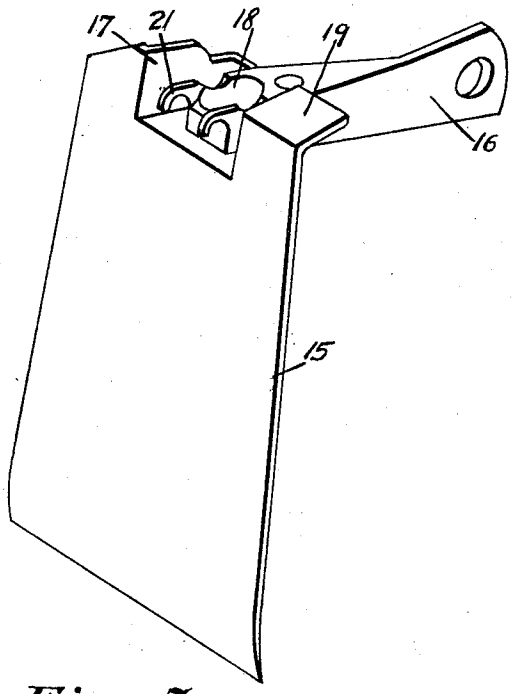


Fig. 7.

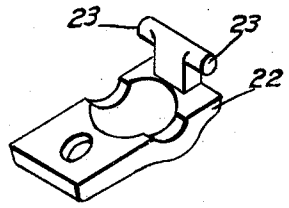


Fig. 8.

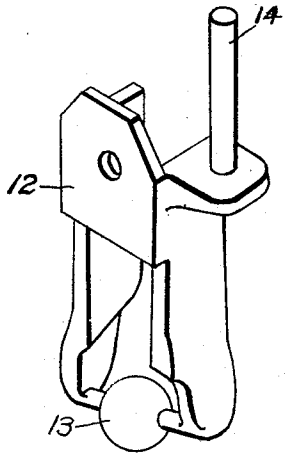


Fig. 9.

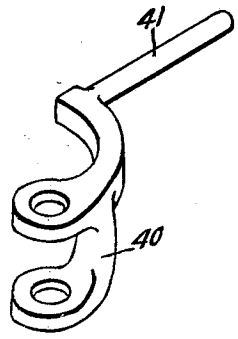


Fig. 10.

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Patented Oct. 8, 1929 1,730,704

UNITED STATES PATENT OFFICE

CHARLES WILD, OF EUREKA, CALIFORNIA

DIGGING MECHANISM FOR WELLS AND THE LIKE

Application filed October 27, 1927. Serial No. 229,146.

This invention relates to mechanism for sinking wells or prospect holes, the object of the invention being to provide a device of the above mentioned class, of novel and improved construction, operative within a casing, to sink holes or wells in comparatively soft earth, such as loam, clay or sandy soil, and to operate to form a hole somewhat larger than the outside of the casing, and which will penetrate the material below the bottom of the casing when the device is lowered within the well or hole and which will operate to scrape the bottom of the hole when the movable parts of the device are set in motion when the device is pulled upwardly, and which will retain the scraped up material until the device is withdrawn to a position above the surface of the ground where a mechanism not included in this application, operates to hold the device in suspension while the material which has been brought up from the bottom of the hole is being dumped when the lifting cable of the device is slackened and its moving parts assume their original positions.

With the foregoing and other objects in view, which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention, herein disclosed, may be made within the scope of what is claimed, without departing from the spirit, or sacrificing any of the advantages of the invention.

Referring to the drawings:—

Figure 1 is a vertical sectional view through the device, illustrating the shovel blades in their open positions. For clarity, but two of the shovel blades with their operating mechanisms are shown, as they are typical of all the other shovel blades.

Figure 2 is a top plan view of the device.

Figure 3 is a bottom plan view of the device, illustrating the shovel blades in their open positions.

Figure 4 is a vertical sectional view of the device, illustrating the shovel blades in their closed positions. For clarity, but two of the shovel blades with their operating mechanisms are shown.

Figure 5 is a sectional view taken on line 5—5 of Figure 4.

Figure 6 is a bottom plan view of the device, showing the shovel blades in their closed positions.

Figure 7 is a perspective view of one of the shovel blades.

Figure 8 is a perspective view, showing the bottom of the retaining cap, which is the upper member of the ball and socket shovel blade connection.

Figure 9 is a perspective view of the cage bar end member, the lower end of which is the ball member of the ball and socket shovel blade connection.

Figure 10 is a perspective view of the lever arm, which presses against the shovel blade connecting rod.

Referring to the drawings in detail, the device comprises a cage formed of vertical bars 7, arranged in spaced relation with each other, the upper ends thereof being secured to ring 8, while the lower ends, with the cage bar end member 12 mounted thereon, connect with ring 9.

Angularly disposed bars 10 are fastened at their lower ends to the ring 8 and at their upper ends to the guide head 11, as shown by Figure 1 and by Figure 4 of the drawings.

A shovel blade 15, is pivotally connected at the lower end of each of cage bars 7, by means of the ball and socket connection made up of the various parts, illustrated by the drawings and as herein further described. The cage bar member 12, which is mounted on the lower end of each of the cage bars 7, is open at the lower end portion, the sides of the opening being connected by means of the cylindrical extensions of the ball 13, which is a member of the ball and a socket connection above mentioned. The axis of the cylindrical extensions of the ball 13, which passes through the center of the ball, is somewhat angularly disposed with reference to both the horizontal plane and the vertical radial plane passing through the center of the ball 13, so as to cause the shovel blades 15 to overlap each other alternately on the out-

sides and on the insides of the blades as shown by Figure 3 and by Figure 6 of the drawings.

The concave members of the ball and socket connection, mentioned above, have elongated side openings through which the cylindrical extensions of the ball 13 pass, so that the shovel blades 15 may swing freely throughout the distance, permitted by the length of the said elongated openings, as shown by Figure 7 and by Figure 8 of the drawings.

The inwardly extended lever arms 16 of the shovel blades 15 extend in a direction somewhat away from a radial line passing through the center of the ball 13, as shown by Figure 3 and also by Figure 5 of the drawings.

Lever arm 40 is pivotally connected to the cage bar end member 12 by means of the stem 14 at the upper end of the said member 12, and the end 41 is forced against the connecting rod 24 by means of the spring 42, which is secured to the stem 14 of the cage bar end member 12, and serves to reduce lost motion of the shovel blades and maintain them somewhat tilted so that they will overlap in their open positions and also in their closed positions.

The shovel blade 15 in the open position, shown by Figure 1 of the drawings, is prevented from further opening by means of the inwardly extended shoulder 19, coming in contact with the bottom ring 9 of the cage, the joint between the top of the shovel blade 15 and the ring 9 being protected from the loose material at the side of the hole by the downward apron like projection 29 of the ring 9, as illustrated by Figure 1 of the drawings.

The upper end of the shovel blade 15 is formed into a pocket 17, which is open at the back and at the top of the said shovel blade. The inwardly extended lever arm 16 of the shovel blade 15, which projects into the pocket 17, terminates in two downwardly disposed hooks 21, spaced apart, under which the cap 22 is secured at the end by means of the projections 23 of the cap and the hooks 21 of the shovel blade. The cap 22 is secured in position, at the end opposite the hooked end having the projections 23, by means of a bolt. The ball 13 fitting into the top of the shovel blade 15, at 18, and being secured by the cap 22, forms the ball and socket connection, upon which the shovel blades 15 swing.

Vertical rods 24 have pivotal connection with the inner ends of the inwardly extended lever arms 16 of the shovel blades 15 and also have pivotal connection with the head 25, which rests against a shoulder 30 of the tube 26.

The tube 26 is mounted to reciprocate thorugh the head 11 and through the fixed cylinder 27, the vertical axis of which coincides with the vertical axis of the supporting cage, the fixed cylinder being secured by means of the radial bars 28, which are fastened to the bars 7 of the supporting cage and to the cylinder 27. The upper portion of the tube 26 is solid and at the upper end is formed with an opening to accommodate a cable, rope or other flexible member whereby the device may be raised or lowered within a well or prospect hole.

Levers 34 within the tube 26 are pivotally supported at the outside of the said tube, by means of pins 33 and the outwardly extended portions 32 of the levers, and by the jaws 31, which are secured to the tube 26. Elongated openings 35 are provided in wall of the tube 26 to support the sides of the lower portions of the levers 34, which extend to the bottom of the said tube, as shown by Figure 1 of the drawings, and out of which said openings 35, the lower ends of the levers 34 move and assume the positions, shown by Figure 4 of the drawings. The lower ends of the levers 34 are projected inwardly at 36 and wedge shaped outwardly at 37 and are provided with outwardly extended shoulders 38, which operate to engage the lower end of the fixed cylinder 27 and prevent upward movement of the tube 26 when the moving parts of the device are in the positions indicated by Figure 1 of the drawings. Flat springs 39 secured to the upper ends of the levers 34 operate against the inner side of the tube 26 to move the upper ends of the said levers inwardly and the lower ends outwardly to engage the shoulder 38 of the lever 34 with the bottom of the fixed cylinder 27, and is the resilient means by which the lower ends of the levers 34 operate to open, and against which the said lower ends of the said levers are closed.

The rod 43, the upper end of which is within the tube 26, is provided at the upper end thereof, with an elongated opening 44 to accommodate the pin 45, which is secured to the tube 26, so that the rod 43 may move vertically throughout the length of the said elongated opening. The enlarged portion 46 of the rod 43 engages the inner projections 36 of the lower portions of the levers 34 when the rod 43 is freely suspended, and is clearly shown by Figure 1 of the drawings. The enlarged portion 47 of the rod 43 is shaped internally like an inverted cone, as indicated by the numeral 48, and when the rod 43 is moved upwardly, the sides 48 of the inverted cone engage the wedge shaped lower ends 37 of the levers 34 and operate to move them inwardly. The rod 43 is slidably connected at the lower end with the tube 49, which is closed at the lower end and formed into a circular enlargement 53. Between the lower end of rod 43 and the bottom of the tube 49, is a helical compression spring 52. The tube 49 is provided with an elongated opening 50 to accommodate the pin 51 in the rod 43 so that the tube 49 and the rod 43 may

move throughout the length of the elongated opening 50 of the tube 49.

In the use of the device, the device, with the shovel blades 15 in their open positions, as shown by Figure 1, is forced into the upper end of the casing, and being suspended by a cable, rope or other flexible member, is lowered within the casing to the bottom of the well or prospect hole where the shovel blades 15 are forced by the weight of the device, to penetrate the material at the bottom of the well or hole. The enlarged portion 53 of the tube 49, striking the bottom of the well or hole forces upwardly, both the tube 49 and the rod 43, sudden shock being prevented by means of the helical compression spring 52, which intervenes between the end of the rod 43 and the bottom of the tube 49. The upward movement of the rod 43 moves the enlarged portion 46 of the rod from the wedge portions 36 of the levers 34, and the lower ends of the levers 34 are moved inwardly by means of the conical sides 48 of the rod enlargement 47 and the wedge points 37 of the levers 34, so that the shoulders 38 of the levers are disengaged from the lower end of the fixed cylinder 27, so that the tube 26 is free to move upwardly within the said fixed cylinder, as shown by Figure 4 of the drawings. When the device is being removed from the well or hole, the first upward movement of the cable, or other flexible member to which the device is attached, pulls the tube 26 up within the fixed cylinder 27, but no movement is imparted to the cage. The head 25, being attached to the tube 26, also moves upwardly and by means of the connecting rods 24, which are pivotally secured to the head 25 and to the inwardly extended lever arms 16 of the shovel blades 15, the shovel blades are closed inwardly, overlapping each other as they close, forming a closed bottom for the cage. In closing, the shovel blades 15 scrape the bottom of the hole, and when they are closed they retain the scraped up material within the cage. When the shovel blades are completely closed, as shown by Figure 4 of the drawings, the head 25 may or may not be in contact with the guide head 11 of the cage, but upward movement is imparted to the cage, and the device and the enclosed material, which has been scraped up from the bottom of the hole, is conveyed above the surface of the ground, where an especially designed mechanism, not shown in the files, operates to hook under the upper circular member 8 of the cage and hold the device in suspension so that when the lifting cable or rope is slackened sufficiently, the moving parts of the device assume their original locked positions and at the same time the enclosed material is released and discharged into the hopper or chute of the above mentioned especially designed mechanism, which operates to move out of the way when the well digging device is adjusted to enter the upper end of the casing and be again lowered to the bottom of the well or prospect hole.

I claim:—

1. In a device of the character described, a cage including vertical bars, arranged in spaced relation with each other, a circular member for connecting the upper ends of the bars, a circular member for connecting the lower ends of the bars, shovel blades having inwardly extended lever arms at their upper ends, being movably supported by the lower ends of the vertical bars of the cage, so that the inner side of one edge of each shovel blade extends beyond the edge and on the outside of the adjacent shovel blade, so that the shovel blades, when in their vertical operative positions, form a cylindrical extension of the lower end of the cage to penetrate material when the device is dropped to the bottom of the well or prospect hole, means having pivotal connection with the inner ends of the lever arms of the shovel blades, whereby the shovel blades may be moved inwardly to close the lower end of the cage and pick up material and hold material, when the means, whereby the device is lifted and lowered within the well or prospect hole, operates to lift the device from the bottom of the well or prospect hole.

2. In digging mechanism, a cage, digging shovels pivoted at the lower end of the cage and arranged in circular form with one side portion of each shovel overlapping one side portion of each next adjacent shovel, and means for operating the shovels simultaneously to vary the overlap of their side portions and the size of the central opening between their ends.

3. A digging mechanism as set forth in claim 2, and provided with universal joints for pivoting the shovels to the cage so that they may tilt freely in a plurality of directions.

4. A digging mechanism as set forth in claim 2, the said cage having balls secured to it, and the shovels being provided with sockets which move freely on the balls in a plurality of directions.

5. A digging mechanism as set forth in claim 2, the said shovels being provided with inwardly projecting arms all inclined in a direction pointing to one side of the axis of the cage, and having the means for operating the shovels connected to the free end portions of their arms.

6. A digging mechanism as set forth in claim 2, the said cage being provided with a stop device which limits the outward movement of the shovels.

7. In a digging mechanism, a cage having a guide at its axis, a lifting member slidable in the guide and provided with a head, shovels pivoted to the lower end of the cage and provided with inwardly projecting arms, rods

connecting the said arms with the lifting head, and spring-pressed lever arms supported by the cage and bearing on one side of the said rods and operating to press them laterally in similar directions.

8. In a digging mechanism, a cage having a guide at its axis, a lifting tube slidable in the guide, locking levers pivoted inside the lifting tube and having outwardly projecting shoulders for engaging with the bottom end of the guide, a head on the lifting tube, shovels pivoted to the lower end of the cage and provided with inwardly projecting arms, connections between the said arms and head, and a releasing rod arranged on the axis of the lifting tube and projecting below the cage and provided with an enlargement which presses the said shoulders inwardly when the releasing rod is pushed upwardly, so as to permit the shovels to be operated by the lifting tube and head.

9. A digging mechanism as set forth in claim 8, the said releasing rod being provided with a telescopic spring-pressed buffer tube for striking against the ground.

10. A digging mechanism as set forth in claim 8, the said releasing rod having a longitudinal slot in its upper part, and the lifting tube being provided with a pin which extends crosswise of it through the said slot.

11. A digging mechanism as set forth in claim 8, the said locking levers having projections on their lower parts which face the axis of the tube, and the said releasing rod having an enlargement which bears on the said projections and forces the levers outwardly and holds them in the locked position when the releasing rod is slid downwardly.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature.

CHARLES WILD.