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[54] MUCKING APPARATUS
19 Claims, 10 Drawing Figs.

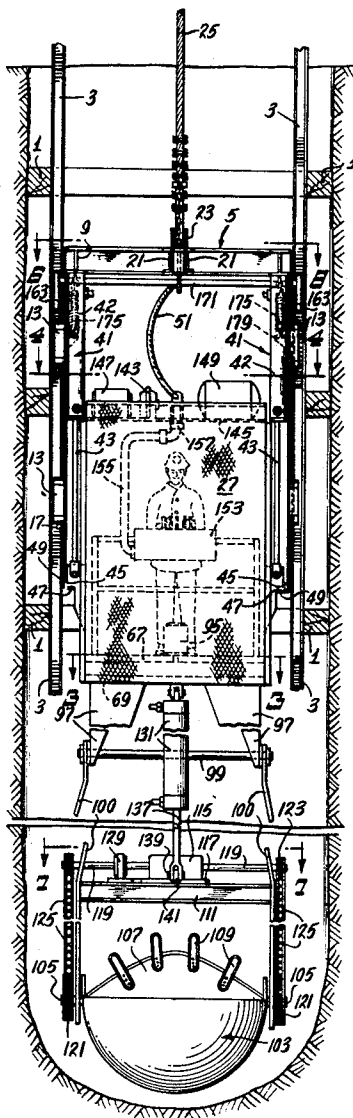
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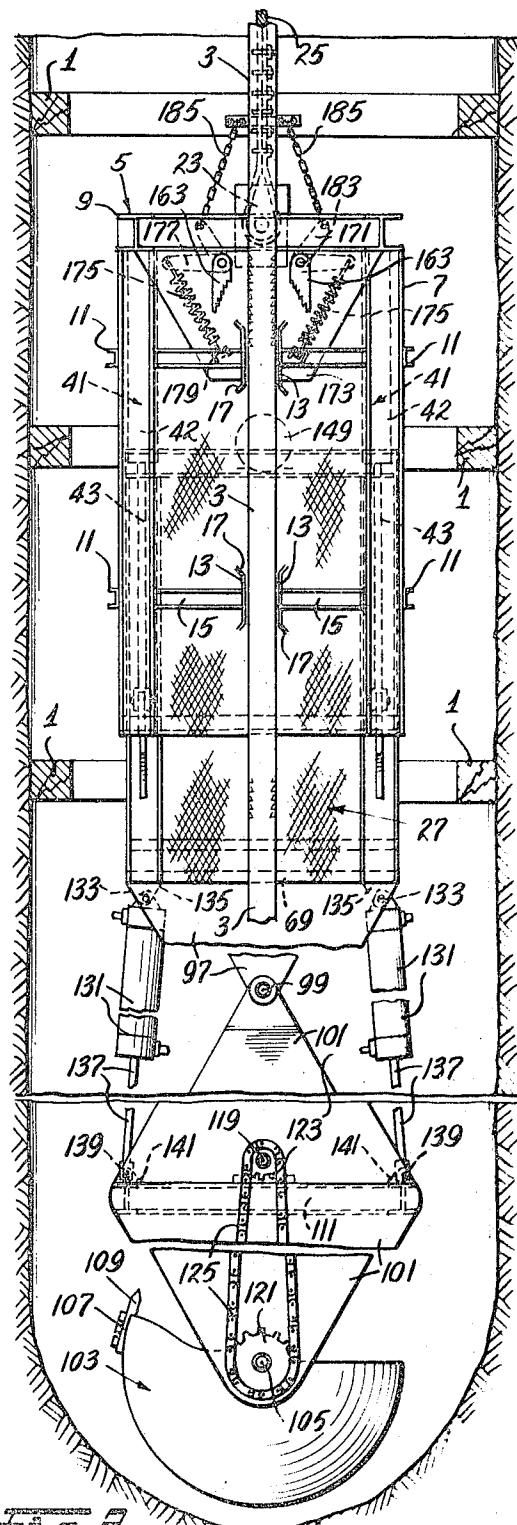
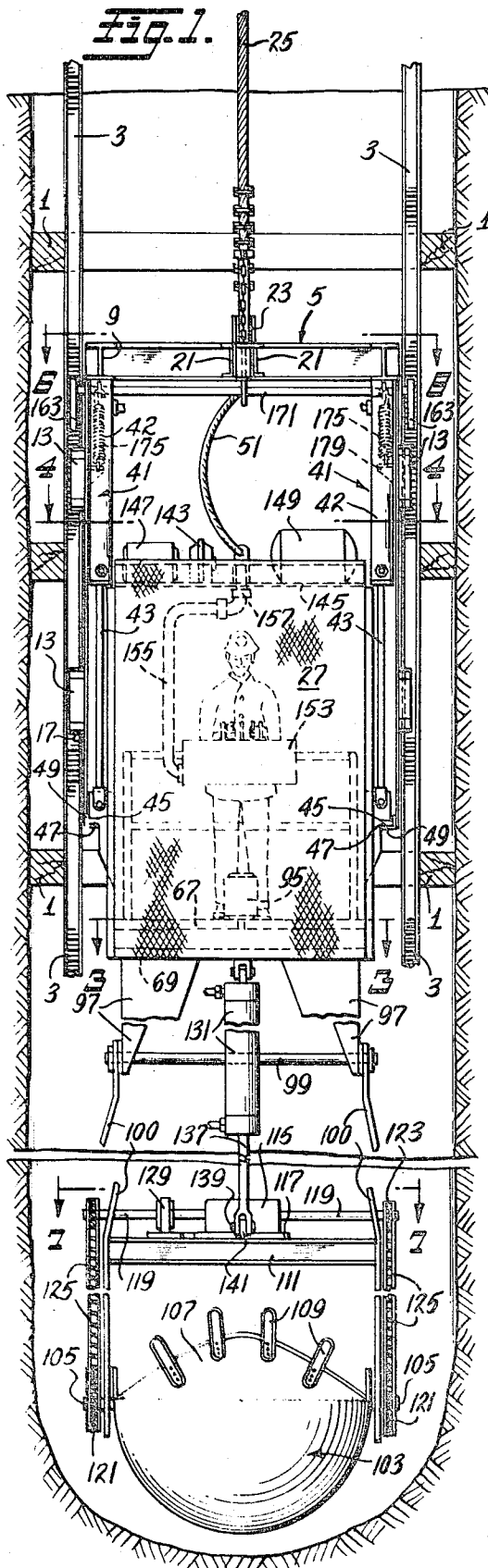
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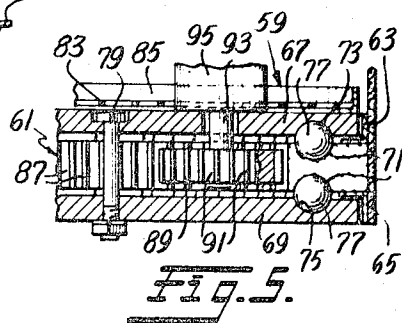
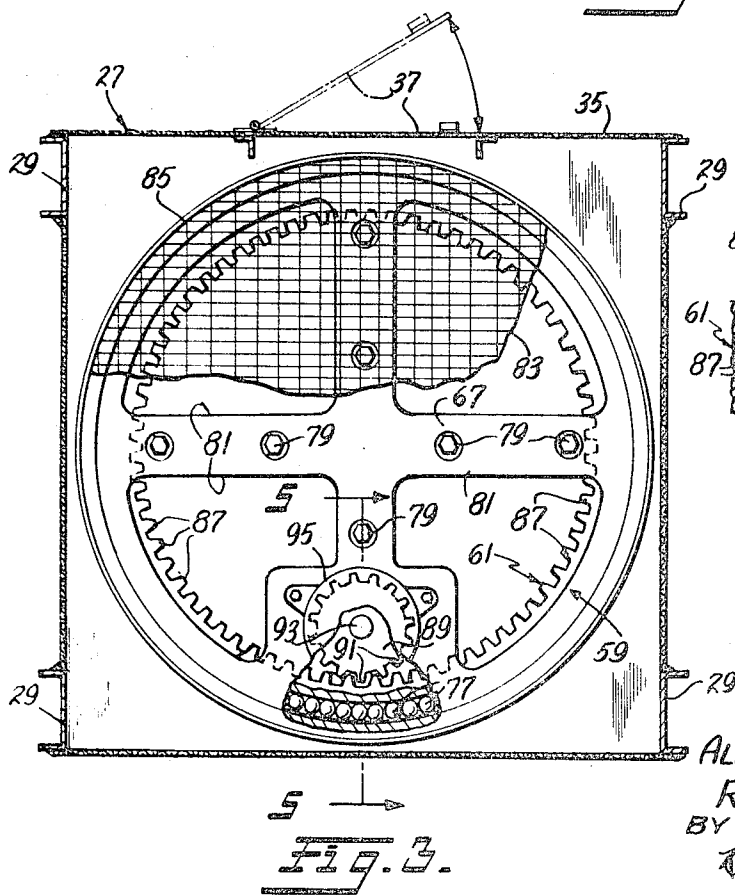
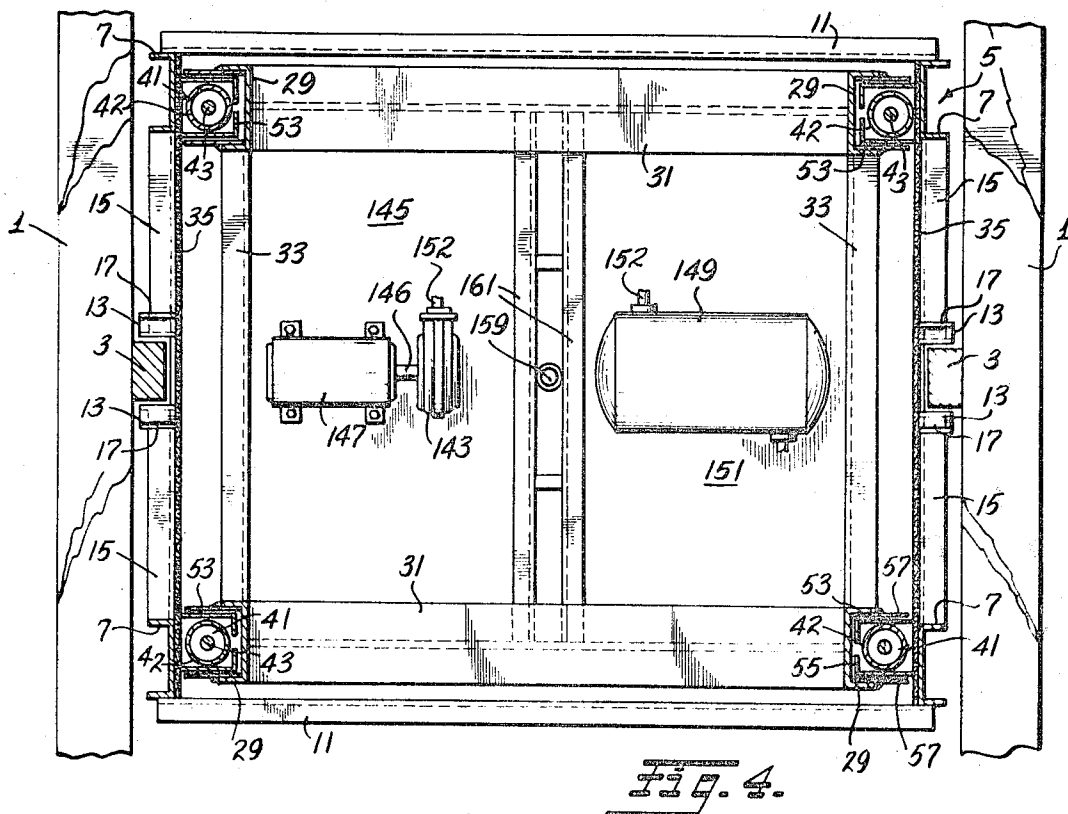
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ABSTRACT: The bucket is rotatably mounted between the lower ends of a pair of links suspended for lateral, pivotal movement for a support depending from the rotatable turntable which forms the center portion of the floor of the operator's cage. The operator's cage which is movable vertically within the outer cage, carries a complete fluid supply and control system controlled from a control panel mounted on a swivel in the operator's cage for actuating the movable components of the apparatus.

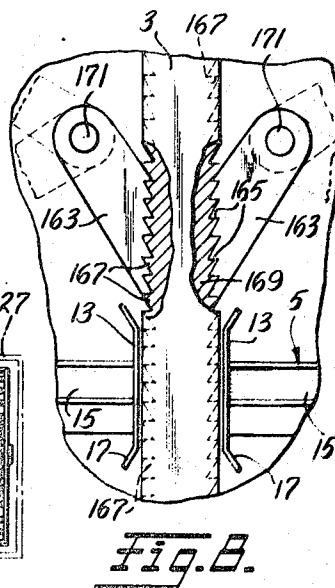
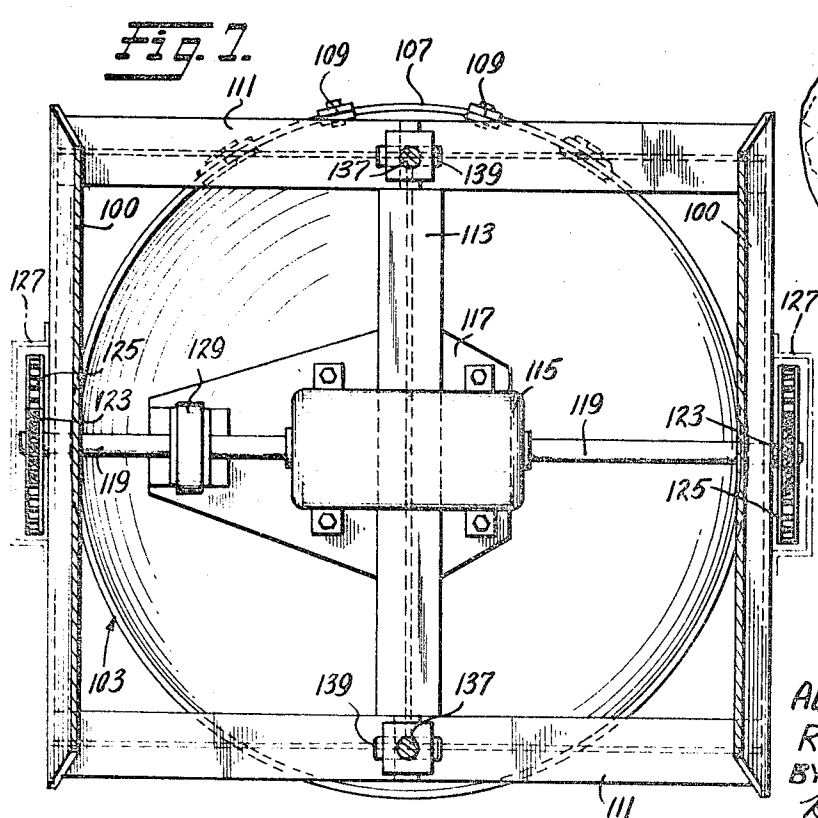
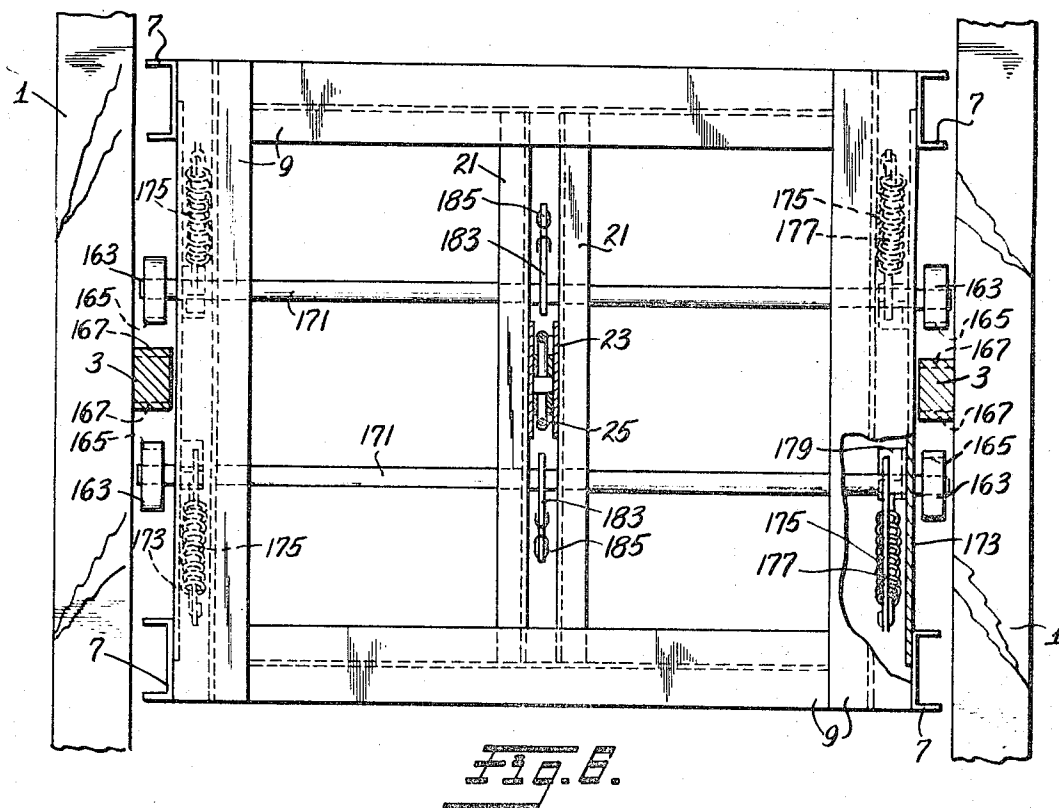




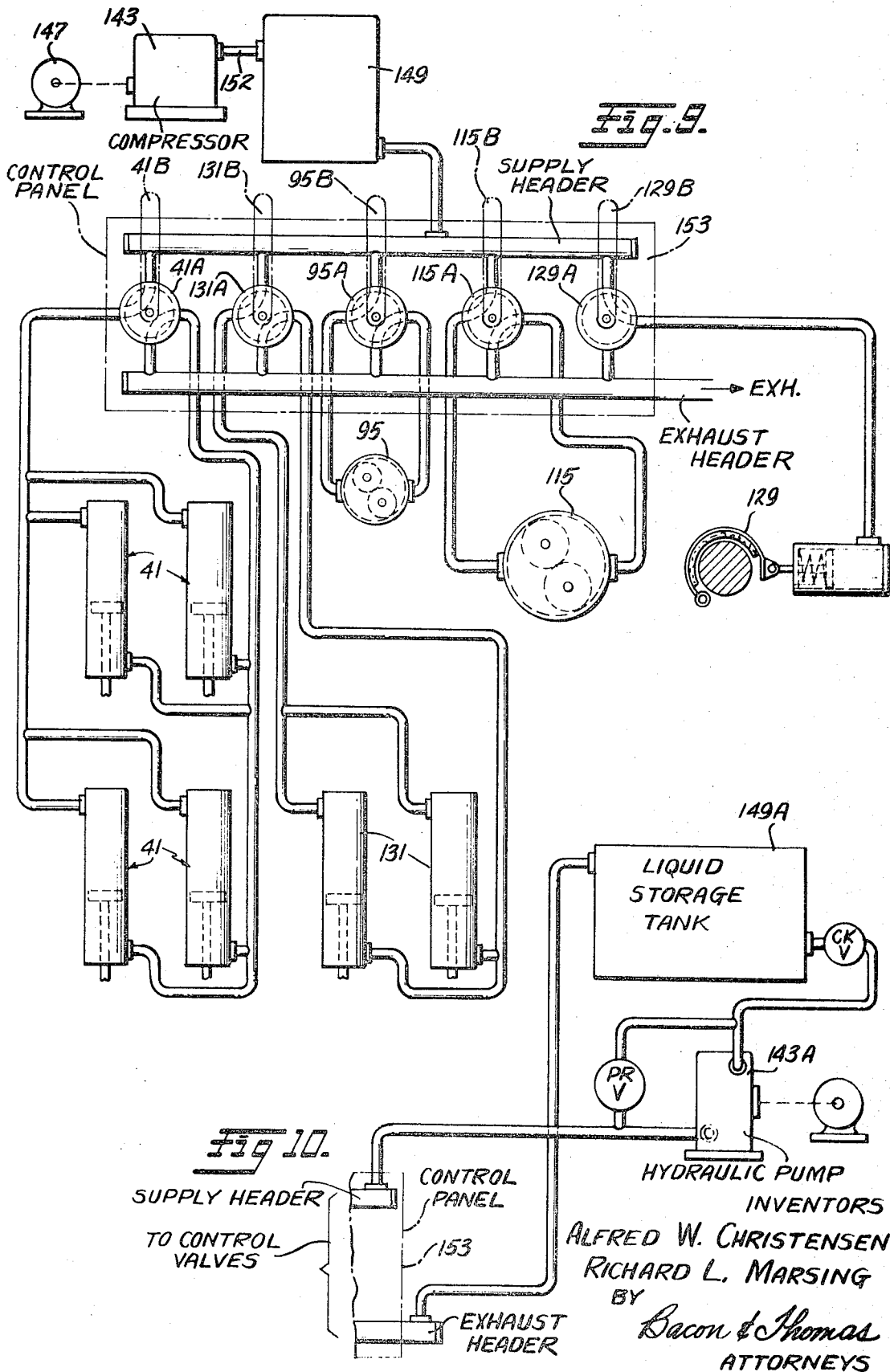
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MUCKING APPARATUS

SUMMARY OF THE INVENTION

The present invention relates to mucking apparatus employed in connection with the sinking of shafts in mining operations. The entire mucking apparatus is adapted to be guided vertically in the shaft on tracks or guides installed in the shafts. A hoist or other lifting device disposed above the mucking apparatus serves to lower the mucking apparatus into mucking position in the shaft and to raise the apparatus out of the shaft or to a dumping point after the bucket is full.

It is an object of the invention to provide a mucking apparatus which carries all of the power means and controls necessary for digging in the shaft.

Another object of the invention is to provide a mucking apparatus in which the operator is stationed in an inner cage which he can control for moving it vertically with the digging bucket relative to an outer stationary cage.

A further object of the invention is to provide mucking apparatus having an increased digging, loading and unloading circumference.

An additional object of the invention is to provide mucking apparatus which will simplify mucking operations and which is strong, durable, of simple construction and easy to operate and to maintain.

With these objects in mind, a more complete understanding of the invention will be had by referring to the following specification taken with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view showing one side of the mucking apparatus suspended in a shaft provided with guide rails and support timbers;

FIG. 2 shows a side view of the mucking apparatus taken at an angle of 90° to the view shown in FIG. 1;

FIG. 3 is an enlarged plan view, partly in cross section, taken on line 3-3 of FIG. 1 showing the rotatable turntable in the center of the floor of the operator's cage.

FIG. 4 is an enlarged horizontal, cross-sectional view taken on line 4-4 of FIG. 1;

FIG. 5 is an enlarged fragmentary, cross-sectional view taken on line 5-5 of FIG. 3 showing a portion of the support and drive mechanism for the turntable;

FIG. 6 is an enlarged top plan view partly in section taken on line 6-6 of FIG. 1;

FIG. 7 is an enlarged horizontal, sectional view taken on line 7-7 of FIG. 1;

FIG. 8 is an enlarged, fragmentary view, partly in cross section, showing the safety dog latches engaged with the ratchet teeth of steel racks carried by the vertical shaft guides;

FIG. 9 is a schematic diagram of the fluid supply and control system for operating the mucking apparatus; and

FIG. 10 is a fragmentary schematic diagram of a modified form of fluid supply and control system shown in FIG. 9.

DETAILED DESCRIPTION OF THE INVENTION

The present mucking apparatus is adapted to be used for digging or mucking in a vertical shaft in the earth which is provided with the usual shoring timbers 1 to which are attached a pair of vertical guides 3 positioned opposite each other on opposing sides of the shaft. The vertical guides 3 terminate short of the bottom of the shaft and are extended downwardly as the depth of the shaft increases.

The mucking apparatus of this invention includes an outer cage 5 of generally cubical configuration formed of steel girders welded together to form a rigid framework. As shown, the corners of the outer cage 5 may be formed of vertical channel irons 7 connection together at their upper ends by a framework of I-beams 9 which are welded to each other and to the channel irons. In order to further strengthen the outer cage, a plurality of spaced, horizontal channel irons 11 are welded to opposite sides of the vertical channel irons 7. Heavy metallic guide shoes 13 of generally U-shaped configuration

are carried by the other two sides of the outer cage where they are welded between the ends of channel iron sections 15. The other ends of the channel iron sections 15 are welded to the vertical channel iron corner members 7 of the cage. The U-shaped guide shoes loosely embrace the vertical guide 3 of the shaft and the upper and lower ends 17 of the sides of the guides shoes 13 are inclined outwardly away from the vertical guide 3 so that the guide shoes 13 will slide freely on the vertical guides during vertical up and down movement of the apparatus in the shaft.

extending across the top of the outer cage 5 is a pair of parallel, spaced apart channel irons 21 welded to the adjacent I-beams 9. Welded between the channel irons 21 at the center of the cage is a cable terminal member 23 of generally tear or oval shaped configuration. The entire mucking apparatus is adapted to be moved vertically in the shaft by a cable 25 which is fastened at its lower end around the cable terminal member 23 and is attached at its upper end to a power operated lifting mechanism, not shown, disposed above the apparatus either outside of the shaft or at a level in the shaft above the mucking apparatus.

An operator's cage 27 is mounted within the outer cage 5 for limited vertical movement relative thereto. The vertical channel iron 29 forming the corner posts on the operator's cage are welded at their upper ends to horizontal I-beams 31 and channel irons 33 to form a rigid framework. The sidewalls of the operator's cage, between the vertical corner channel irons 29, are covered with expanded metal 35 or heavy screening so as to provide adequate visibility for the operators. A gate 37 is provided in one wall of the operator's cage 27 to permit the operator to enter and leave the cage and a suitable safety railing is mounted in the cage around the operator's station in order to provide additional protection for the operator.

The operator's cage 27 is moved vertically relative to the outer cage 5 by a plurality of vertically disposed, conventional reciprocating fluid motors 41. One of the fluid motors 41 is positioned at each corner between the operator's cage and the outer cage and the upper end of the cylinder 42 of each fluid motor is rigidly secured as by welding to an adjacent I-beam 9. The piston rod 43 of each of the fluid motors 41 extends through an opening in the lower end of the cylinder and is fixed at its lower end to a heavy metal bracket 45 welded or otherwise rigidly secured to the web of the adjacent vertical channel iron 29 adjacent the lower end thereof. The brackets 45 are formed with a horizontal shoulder portion 47 which abut against heavy metal, L-shaped stop members 49, welded to the inner surface of the web of the vertical channel irons 29 at the lower end thereof, when the operator's cage reaches the limit of its downward travel relative to the outer cage. The cooperating shoulder portions 47 and the stop members 49 provide a safety lock and prevent the operator's cage from falling from within the outer cage in the event of failure of the fluid motors 41. A further safety feature for preventing the operator's cage from falling from within the outer cage is a safety cable 51 suitably connected at its upper end with the I-beams 9 of the outer cage and at its lower end with the I-beams 31 of the operator's cage.

The cylinders 42 of the reciprocating fluid motors 41 are each enclosed with a U-shaped channel member 53 with the free ends of the legs of the channel members 53 being welded to the adjacent web of the vertical channel iron 7 of the outer cage. The U-shaped channel members 53 thus serve to protect the cylinders 42 and also provide vertical guides for the operator's cage. The web 55 of the channel members 53 is positioned closely adjacent the web 57 of the vertical channel irons 29 forming the corner posts of the operator's cage and, in order to provide suitable deep guide ways on the operator's cage for cooperating with the channel members 53, the vertical plates 57, are welded to the inner surface of the legs of the channel irons 29.

The center portion of the floor of the operator's cage is formed by a circular rotatable turntable 59. The turntable includes an annular bull gear 61 bolted or welded to the angle

irons 63 and 65, FIG. 5, which comprise a portion of the fixed part of the floor of the operator's cage. An upper circular plate 67 is positioned above the upper surface of the bull gear 61 and a lower circular plate 69 is positioned below the lower surface of the bull gear. Ball bearing races 71 are formed in the upper and lower surfaces of the bull gear and cooperating races 73 and 75 are formed in the surfaces of the plates 67 and 69 facing the gear for the ball bearings 77 shown mounted in the bearing races. The upper and lower circular plate 67 and 69 are secured together for rotation on the ball bearings 77 by bolts 79 which pass through suitable aligned openings in the plates 67 and 69. The upper and lower plates 67 and 69 are formed with a plurality of large, generally triangular shaped openings 81 and the upper surface of the upper plate 67 is covered with a circular metal grating 83 confined within an annular angle iron frame 85 suitably fastened to the upper surface of the upper plate member 67.

The annular bull gear 61 has spur teeth 87 formed on its inner periphery and a pinion gear 89 having spur teeth 91 in mesh with the spur teeth 87 of the bull gear, is fixed on the shaft 93 of a reversible fluid motor 95 which is bolted in fixed position to the upper surface of the upper plate 67.

Since the bull gear 61 is fixed and the upper and lower plates 67 and 69 are concentric with the bull gear, actuation of the fluid motor 95 in either direction to rotate the pinion gear 89 will result in rotation of the turntable 59 as the pinion gear 89, in effect, walks around the bull gear.

A pair of arcuate support plates 97 of generally triangular configuration, are welded opposite each other on opposite sides of the lower surface of the lower circular plate 69 and mount in aligned openings formed adjacent the lower ends thereof a horizontal bearing rod 99.

A pivotal link assembly is disposed below the arcuate support plates 97 and includes a pair of spaced apart triangular shaped link members 101 pivotally mounted at their upper ends on opposite ends of the bearing rod 99. A mucking bucket 103 of substantially semispherical configuration is disposed between the lower end of the link members 101 and carries pivot pins 105 which extend outwardly from opposite sides of the bucket adjacent the rim thereof. The pivot pins 105 are rotatably mounted in aligned openings formed in the lower ends of the link members 101. As shown, the edge 107 of the bucket, which is employed for digging, is curved in a manner somewhat similar to the digging edge of a shovel and a plurality of elongated, heavy metal digging teeth 109 are rigidly secured to the digging edge by suitable means such as rivets, bolts or by welding.

Midway between the opposite ends of the triangular shaped link members 101 and at the point of greatest width thereof, the link members 101 are maintained in fixed spaced relation by a pair of spaced I-beams 111 welded at their ends to the inner surfaces of the link members. A bracing I-beam 113 is welded between the I-beams 111 midway between the link members 101. This welded arrangement of I-beams 111 and 113 with the link members 101 provides a strong, rigid link assembly for rotatably mounting the bucket 103 and for pivotally connecting the bucket with the rotatable operator's platform or turntable through the support plates 97 which form a part of the rotatable support mechanism.

The mucking bucket 103 is mounted between the links 101 for rotation in either direction through a full 360°. The bucket 103 is driven in either direction by a reversible fluid motor 115 bolted to a support plate 117 which is welded or otherwise rigidly secured to the I-beam 113. The fluid motor 115 includes elongated drive shafts 119 which extend outwardly from either end thereof and pass freely through suitable openings provided in the link members 101. Suitable sprockets 121 are fixed on the outer ends of the pivot pins 105 and drive sprockets 123 are fixed on the outer ends of the drive shafts 119. The sprockets 121 and 123 at either side of the link members 101 are connected together by drive chains 125. In order to protect the sprockets 121 and 123 and the drive chains 125, suitable metal guards 127 are secured to the

outer surfaces of the link members 101 enclosing the sprockets and chains.

In order to hold the bucket 103 in any selected position and particularly after it is filled with earth, a suitable shaft brake 129, which is adapted to be actuated by fluid pressure and which may be of any conventional design is rigidly mounted on the support plate 117 for cooperative engagement with one of the drive shafts 119, as shown best in FIG. 7.

In order to provide the maximum mucking or digging circumference for the bucket 103, a pair of reciprocating fluid motors 131 are connected at the upper ends thereof, by the pivot pins 133 to the clevis members 135 fixed to the lower surface of the rotatable plate 69 at opposite sides thereof and midway between the support plates 97. The other end of the fluid motors 131, that is the free end of the piston rods 137 thereof, are pivotally connected by the pivot pins 139 to brackets 141 welded to the upper surface of the I-beams 111 midway between the opposite ends thereof. The fluid motors 131 are preferably double acting so that by extending one and retracting the other, the link members 101 and the mucking bucket 103 will be pivoted laterally of the shaft and the operator's cage. The apparatus is designed for the link members and bucket to be pivoted about the horizontal bearing rod 99 in either direction from the depending vertical position through an angle of approximately 45°.

The double acting reciprocating fluid motors 41 and 131 and the reversible rotating fluid motors 95 and 115 as well as the fluid actuated brake 129 are of conventional construction and may be actuated either by air or liquid under pressure. In order to furnish air under pressure to the various fluid actuated components mentioned above, a conventional air compressor 143 is fixedly secured to the upper surface of a metal plate member 145 forming the ceiling of the operator's cage. The compressor 143 is driven by the shaft 146 of a suitable motor 147 which may be either electric or internal combustion. A storage tank 149 having a discharge line for the compressed operating fluid is also mounted on the ceiling of the operator's cab on the upper surface of a plate 151 and is connected to the compressor outlet by a pipe 152. Suitable conventional pressure regulators and controls, not shown, are provided for controlling the operation of the motor and compressor in accordance with the fluid pressure in the tank for maintaining the tank pressure within safe and desired limits.

In the event that hydraulic fluid under pressure is to be employed for operating the various components, the arrangement shown in FIG. 10 may be employed. In this case, the shaft 146 of the motor 147 drives a conventional hydraulic pump 143A having a supply line connecting the inlet of the pump with a liquid supply tank 149A and a discharge line for hydraulic fluid under pressure. A suitable pressure relief valve is connected in a bypass line connecting the discharge line with the supply line for regulating the discharge pressure, and a one-way check valve is positioned in the supply line.

The fluid under pressure, either air or liquid, is distributed to the fluid operated motors and brake through a control panel 153 located in the operator's cage. Since the operator who controls the operation of the various fluid actuated components of the apparatus stands on a rotatable turntable and rotates with it, the control panel 153 is arranged to rotate with the turntable and operator through an angle of 360° in either direction. For connecting the control panel 153 with the pressure fluid, a heavy, rigid fluid conduit 155 extends outwardly from one end of the control panel 153 and then upwardly to adjacent the ceiling of the operator's cage where it extends horizontally to a conventional fluid tight swivel joint 157 in the form of an elbow which is pivotally connected to a short fluid conduit 159 held in fixed position between a pair of space channel irons 161 welded to the I-beams 111 midway between the opposite ends thereof.

The control panel includes a conventional fluid control valve 41A with a manual operating lever 41B for controlling the flow of fluid under pressure simultaneously to and from the four reciprocating fluid motors 41, a valve 95A and

manual lever 95B for controlling the flow of fluid under pressure to and from the reversible, rotary fluid motor 95, a valve 131A and manual lever 131B for controlling the flow of fluid under pressure to and from the two reciprocating fluid motors 131, a valve 115A and manual lever 115B for controlling the flow of fluid under pressure to and from the reversible rotary fluid motor 115, and a valve 129A with manual lever 129B for controlling the flow of fluid under pressure to the fluid brake 129 or for venting it.

The control panel also includes a supply header for the pressure fluid connected by a pipe with each of the valves 41A, 95A, 115A, 129A, and 131A as well as a discharge or exhaust header connected by a pipe with each of the valves 41A, 95A, 115A, 129A and 131A. When air is the fluid employed, the outlet line of the air pressure tank 149 is connected with the short fluid conduit 159 and the conduit 155 is connected with the supply header for furnishing air under pressure to the control panel, and the exhaust header carried by the control panel is connected with the atmosphere. When hydraulic fluid is employed, the conduit 155, the elbow 157 and the fixed conduit 159 provide two concentric fluid passages, one passage connecting the control panel supply header with the pressure discharge line of the hydraulic pump 143A and the other passage connecting the control panel exhaust header with hydraulic storage tank.

The operation of the apparatus described above for digging or mucking a shaft in the earth is entirely under the control of the operator situated in the inner cage. By operating the control valves for the various components, the operator is able to raise and lower the mucking bucket in the shaft, to rotate it about a vertical axis, and to pivot it laterally to reach any part within a large circumference. After the bucket is brought into engagement with the earth and filled as a result of rotating it by actuating the fluid motor 115, the fluid brake 129 may be actuated to hold the bucket from turning and spilling its contents while the mucking apparatus is being lifted in the shaft, by power operated lifting means connected with the cable 25, to a point where the bucket may be dumped.

It is to be understood that the valves 41A, 95A, 115A, and 131A may be of any conventional type arranged for selectively connecting a source of fluid under pressure to either side of a fluid motor while connecting the other side thereof to exhaust or for closing off both lines of a fluid motor for holding it against movement in either direction. The valve 129A either connects the fluid actuated brake 29 to a source of fluid under pressure or to exhaust.

The present mucking apparatus includes a safety dog latch assembly to prevent downward movement of the mucking apparatus in the shaft in the event that the auxiliary power actuated lifting means disposed above the mucking apparatus for raising and lowering the entire apparatus in the shaft by means of the cable 25 should fail or if the cable itself should break. This safety assembly includes a pair of latch dogs 163 at either side of the outer cage 5 provided with ratchet teeth 165 adapted to engage with cooperating ratchet teeth 167 carried by steel plates 169 on either side of the vertical guides 3. The latch dogs 163 are fixed to the ends of the horizontal shafts 171 which are pivotally mounted in openings formed in support brackets 173 welded at opposite sides of the cage to the adjacent I-beams 9. Springs 175 are connected at one end to the outer end of arms 177 rigid with the shafts 171 and at their other end to brackets 179 fixed to the lower portion of the support brackets 173 for resiliently urging the ratchet teeth 165 of the latch dogs 163 into operative engagement with the ratchet teeth 167 of the steel plates 169. Bell crank arms 181 are fixed on the shaft 171 midway between the opposite ends thereof and are connected with a cable clamp 183 fastened to the lifting cable 25 by chains 185. By means of this arrangement, when tension is applied to the lifting cable 25 for raising or lowering the entire mucking apparatus in the shaft, the chains 185 are pulled upwardly and the latch dogs 163 are pivoted out of engagement with the teeth 167 on the steel plates 169 against the action of the tension springs 175. When

the tension on the lifting cable 125 is relaxed, the tension springs 175 swing the latch dogs 163 into operative engagement with the steel plates 169, thus preventing downward movement of the mucking apparatus in the shaft.

While the hydraulic fluid pump or air compressor with driving motor has been disclosed as being mounted on the operator's cage for the purpose of illustrating a preferred form of the invention, it is also contemplated to furnish the required air or hydraulic fluid under pressure to the mucking apparatus by lines connected to a suitable pressure source, not shown, not carried by the mucking apparatus. It is also within the purview of this invention to employ suitable electric motors and electric controls for actuating the various components of the mucking apparatus in place of the fluid motors and fluid controls which have been described and shown.

We claim:

1. A mucking apparatus adapted to be moved vertically in a shaft provided with vertical guides by power operated lifting means disposed above the mucking apparatus, comprising: an outer cage adapted to be moved vertically in the shaft; fastening means on the outer cage for connecting it to the external lifting means; means rigid with the outer cage for cooperation with the shaft vertical guides for guiding the outer cage vertically in the shaft; a vertically movable operator's cage disposed within the outer cage; first power means connected between the outer cage and the operator's cage for moving the operator's cage vertically within operative limits relative to the outer cage; a turntable rotatably mounted in the floor of the operator's cage, second power means operably connected with the turntable for rotating it through 360° relative to the operator's cage; a mucking bucket; means mounting the bucket on the turntable for rotational movement about a horizontal axis; third power means operably connected with the bucket for rotating the bucket about said horizontal axis; and control means mounted on the operator's cage and operably connected with said first, second and third power means for selectively actuating said first, second and third power means.

2. A mucking apparatus according to claim 1 in which said first, second, and third power means each comprises an air motor; said operator's carriage carrying a motor, an air compressor operably connected with said motor and a storage tank for air under pressure operably connected with the compressor and with said control means for said first, second and third air motors.

3. A mucking apparatus according to claim 1 including a safety cable, means connecting one end of the safety cable to the operator's cage and means connecting the other end thereof to the outer cage.

4. A mucking apparatus according to claim 1 in which the shaft vertical guides include steel racks fixed thereto having ratchet teeth thereon, and the outer cage carries a safety dog latch assembly comprising at least one dog latch having ratchet teeth thereon for cooperative engagement with the ratchet teeth on the steel racks, means pivotally mounting the dog latch on the outer cage, bell crank means operably connected with said dog latch, resilient means connected with the latch dog biasing it into engagement with the steel racks for preventing downward movement of the operator's cage relative to the outer cage, and means connected with the bell crank means and connectable with the external lifting means for pivoting the latch dog out of engagement with the steel racks as a result of tension applied to the external lifting means connected to said fastening means of the outer cage.

5. A mucking apparatus according to claim 1 in which said first, second and third power means each comprise a fluid motor; a source of fluid under pressure is carried by the operator's cage; said control means comprises a fluid control panel disposed in the operator's cage and conduit means connecting the fluid control panel with the first, second and third fluid motors; and conduit means including a rotary swivel connects the fluid control panel for rotation in the operator's cage with the source of fluid under pressure.

6. A mucking apparatus according to claim 1 in which said first, second and third power means include a common source of power carried by the operator's cage, said control means comprises a power control panel disposed in the operator's cage, and power conducting means including a rotary swivel connects the power control panel for rotation in the operator's cage with the source of power.

7. A mucking apparatus according to claim 1 in which the turntable comprises a pair of spaced apart, parallel circular plates connected together for rotation; a bull gear having teeth and a bearing race on the upper and lower sides thereof fixed to the operator's cage and disposed between said pair of spaced circular plates, the surface of the plates opposite the bull gear having bearing races formed therein cooperating with the bull gear bearing races, antifriction bearing means mounted in the opposed bearing races of the bull gear and plates rotatably supporting the plates, a pinion gear rotatably mounted on the turntable and having teeth thereon in engagement with the teeth of the bull gear, and said second power means comprises a reversible rotary fluid motor carried by the turntable and operably connected with the pinion gear.

8. A mucking apparatus according to claim 7 in which the bull gear is in the form of an annular ring and the teeth thereon are formed on the inner periphery thereof.

9. A mucking apparatus according to claim 1 in which the operator's cage is cubical in configuration and said first power means comprises a reciprocating fluid motor connected at one end to each corner of said operator's cage adjacent the lower end thereof and at the other end thereof to the upper end of the outer cage.

10. A mucking apparatus according to claim 9 in which the operator's cage includes safety stop means fixed to the outer sides thereof and the outer cage carries fixed stops which are engaged by the safety stop means when the operator's cage moves downwardly within the outer cage to the limit of its operative travel for stopping downward movement of the operator's cage relative to the outer cage.

11. A mucking apparatus according to claim 9 in which a vertical guide track is fixed to the outer cage enclosing the cylinder of each of the reciprocating fluid motors and track guide shoes are fixed on the operator's cage in cooperating relation to said vertical guide tracks for guiding the operator's cage vertically within the outer cage.

12. A mucking apparatus according to claim 1 wherein the turntable includes a base and link means, the link means being pivotally connected with the base and with the mucking bucket; fourth power means connected between the base and the link means for pivoting the link means and the bucket laterally with respect to the base; and a control means mounted on the operator's cage and operably connected with

said fourth power means for selectively actuating it.

13. A mucking apparatus according to claim 12, in which the third power means is reversible for rotating the bucket in either direction and is mounted on the link means.

14. A mucking apparatus according to claim 13, in which the mucking bucket includes a pivot pin at either side thereof, and the third power means comprises, a rotary fluid motor, a rotatable drive shaft operably connected intermediate its ends with said fluid motor, a sprocket fixed to either end of the drive shaft, a sprocket fixed to each of the bucket pivot pins; and a drive chain connecting each of the drive shaft sprockets with one of the pivot pin sprockets.

15. A mucking apparatus according to claim 14 in which the mucking bucket is substantially semispherical in configuration and a plurality of digging teeth are rigidly mounted on one edge thereof intermediate said pivots.

16. A mucking apparatus according to claim 14 in which the link means comprises a pair of spaced apart, generally diamond shaped plates and a rigid framework disposed between the plates intermediate the opposite ends thereof and fixed to the plates, one end of each plate being pivotally connected to one of the bucket pivot pins and the other end thereof being pivotally connected to said base at diametrically opposite sides thereof; and said fourth power means comprises a pair of reciprocating fluid motors pivotally connected at one end to said base at opposite sides thereof midway between the pivotal connections of the other ends of the plates and at the other end thereof being pivotally connected to the said rigid framework at opposite sides thereof and midway between the spaced apart plates.

17. A mucking apparatus according to claim 14 in which brake means is mounted on the link means and is engageable with the drive shaft for selectively holding the drive shaft against rotation and control means is mounted on the operator's cage and is operably connected with the brake means for selectively actuating it.

18. A mucking apparatus according to claim 17 in which the bucket is mounted for rotation in either direction through 360°.

19. A mucking apparatus according to claim 17 in which the first, second, third and fourth power means each comprise a hydraulic fluid motor means, the brake means for the drive shaft is actuated by hydraulic fluid under pressure, and the operator's cage carries a tank for storing hydraulic fluid, a pump connected with the tank for pumping the hydraulic fluid and a motor connected with the pump, the tank being connected by conduit means with the control means for the first, second, third and fourth power means and with the brake control means.

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