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MUCKING MACHINE

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2 Sheets-Sheet 1

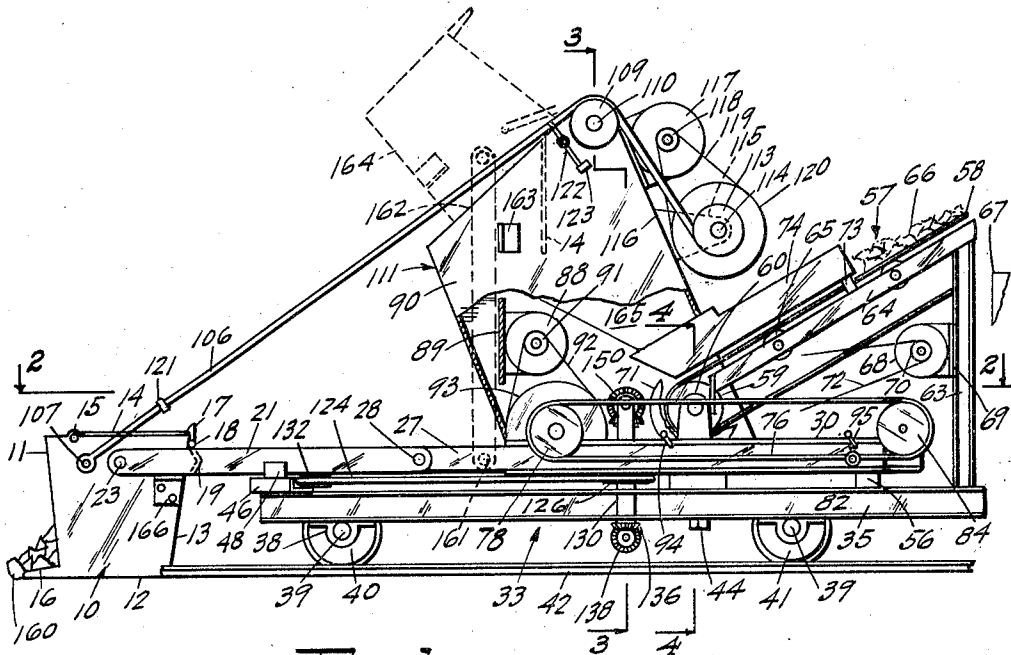


Fig. 1.

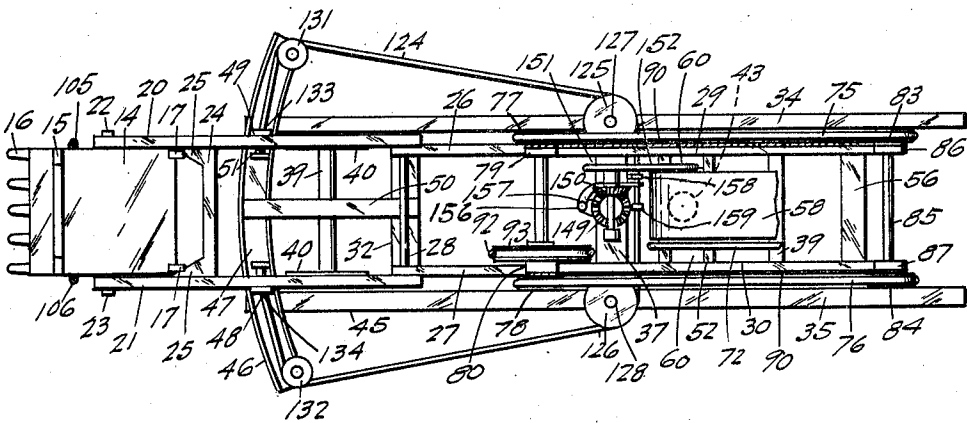


Fig. 2.

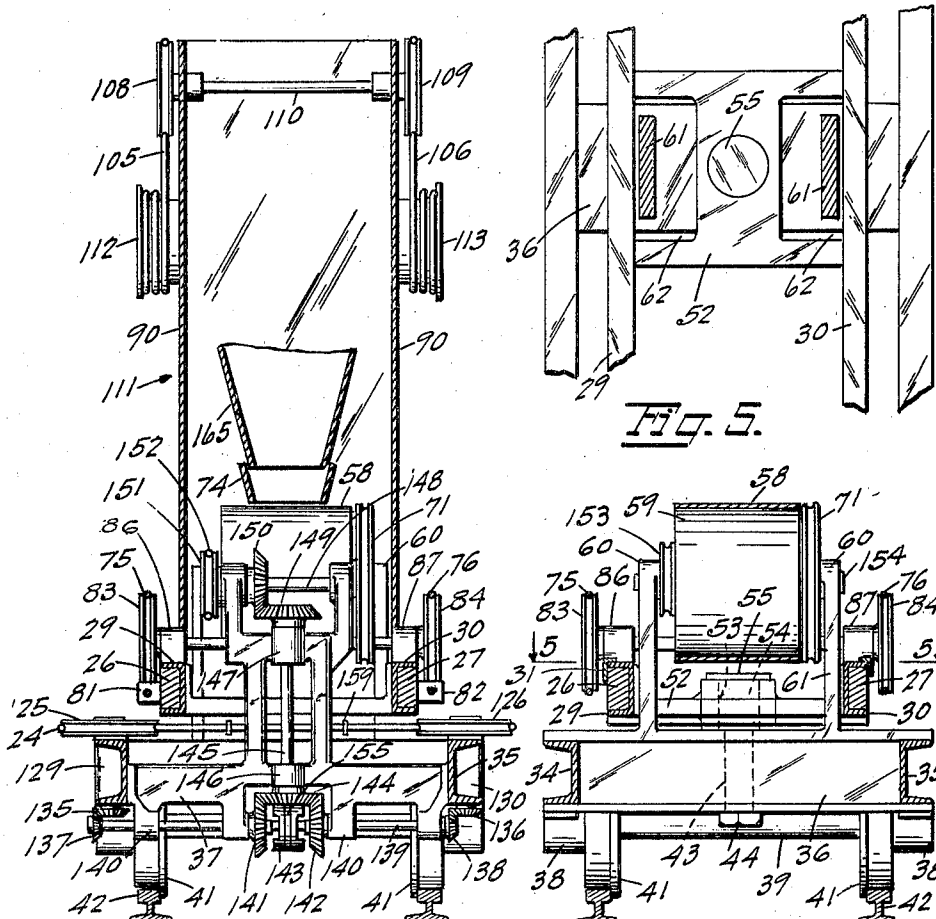
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UNITED STATES PATENT OFFICE

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MUCKING MACHINE

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18 Claims. (Cl. 214—90)

This invention, a mucking machine, is particularly adapted for mucking operations in small tunnels and drifts, and also for excavations of comparatively small area, such as basement excavations for residences, although it can be built in any size desired for larger bores and excavations.

It is well understood that mucking machines of various types have been developed for tunnel work; however, so far as is known, no highly satisfactory machine has yet been produced for operation in comparatively close quarters.

The mucking machine described in this application may be built in sizes suitable for operation in tunnels as small as four feet by six feet, and is particularly suited for mucking operations in tunnels six feet by eight feet or larger.

This invention involves new principles in mucking machines and presents distinct advantages over present types of machines, and the specific objects and advantages are as outlined in the following.

This machine can be built at a very low cost and is efficient and economical in operation.

The machine incorporates a dipper or bucket which is crowded into the muck, and the direction of crowding is controllable at will, so as to permit mucking the entire width of the bore or tunnel.

The dipper is pivoted above its center of gravity between dipper arms, which in turn are pivoted between the crowds or pusher bars.

The crowd is automatically controlled as to travel so as to prevent over-run, and thus obviates any possibility of damage to the bucket or operating mechanism due to over-run, and is also controllable at will as to direction of travel and distance.

The dipper arms swing on a transverse center as related to the truck or carriage, swinging up and over an opening in a hopper, which in turn discharges onto a constantly running conveyor, which delivers the muck to suitable cars, and the dipper has a hinged cover which is automatically released as the dipper reaches its top terminal or unloading position, the unit including the dipper arms and empty dipper being controlled to travel in such manner so as to cause the empty dipper to return through the influence of gravity, obviating the necessity for return cables.

The dipper and all its associated parts and mechanisms including the hopper, are as a unit, pivoted on the truck or carriage, and have a sweep consistent with the greatest width of tunnel to be mucked, and all parts, irrespective of their adjustment or position are always maintained in registrable relation to their associated mechanisms.

The means for swinging the mucking section for mucking in angular relation to the longitudinal axis of the truck is also automatically controlled

against over-run, and controlled at will as to relative angular operation.

The conveyor is supported directly on the carriage or truck, and therefore is always maintained in axial alignment therewith and in suitable alignment with the car back of the truck into which the muck is to be loaded.

All operating mechanisms are suitably controlled at will through the medium of suitable clutches and switches.

Other objects and advantages of the invention will become apparent as the following description is read on the drawings forming a part of this specification, and in which similar reference characters are used to designate similar parts throughout the several views, of which;

Fig. 1 is a side elevation of the invention.

Fig. 2 is a section taken on line 2—2 of Fig. 1.

Fig. 3 is an enlarged section taken on line 3—3 of Fig. 1.

Fig. 4 is an enlarged section taken on line 4—4 of Fig. 1.

Fig. 5 is a section taken on line 5—5 of Fig. 4.

Fig. 6 is an enlarged fragmentary view of the crowd, showing the travel limiting control and manual control.

Fig. 7 is a section taken on line 7—7 of Fig. 6.

The dipper 10 is open at the front 11, closed at the bottom 12, back 13, and has a cover 14 for the top which is hinged at 15, and suitable rakes or teeth 16 project forwardly from the bottom 12.

The cover 14 is releasably secured in closed position through the medium of latches 17 which are hinged at 18 to the back wall of the dipper, and these latches have an integral cam element 19 for automatic release of the cover when the dipper has reached its unloading or dumping position.

The dipper sticks 20 and 21 are identical in form but oppositely disposed, and span the width of the dipper 10, and have one of their ends pivotally secured to the side walls of the dipper as indicated at 22 and 23, and these dipper sticks or arms are tied together and cross-braced as indicated at 24, the gusset plates or corner braces 25 forming the releasing means for cooperation with the cam members 19 of latches 17, although any other suitable latch mechanism may be used.

The dipper sticks have their other ends pivotally secured to the respective crowds or push bars 26 and 27 as indicated at 28, and these crowds are slidably secured in ways 29 and 30 and suitably gibbed as indicated at 31.

Obviously other means of mounting the crowds may be used, such as between rollers or traveling chains, if it should be desirable to reduce friction; however, plain channels are shown for sake of simplicity and economy of manufacture.

Additional bracing is provided, such as that shown at 32, which spaces and braces the crowds 26 and 27.

The ways 29 and 30 coincidentally form the base of the mucking section and guides for the crowds, and these ways are suitably tied together and braced, and pivotally mounted for swinging motion in a horizontal plane, on the truck or carriage 33, which truck includes a frame having side rails 34 and 35 and suitable cross-members 36 and 37.

Suitable boxes or bearings 38 are mounted on the side members or rails 34 and 35 for support of the truck on the axles 39, on which the flanged car wheels 40 and 41 are mounted, and which wheels operate on the rails 42. During operation, the wheels may be blocked or suitable brakes (not shown) may be provided, not requiring description, since they are well known in their various styles and types.

The cross-member 36 forms the pivot anchor for the pivot or king pin 43, which is suitably secured in the cross-member, such as by means of a nut 44, and the entire mucking section or structure is pivoted on this king pin, with the exception of the conveyor to be later described.

Fixedly mounted on the forward ends 45 of the frame side members 34 and 35, is an arcuate way 46, which is shown in the form of a channel, and the arc of which has its axis coincident with the axis of the king pin 43, this way coincidentally forming a tie and brace for the forward end of these side members.

Slidably mounted in this way 46 is an arcuate shoe 47 terminating at its ends in spanning shoulders 48 and 49, which are cooperatively related to the dipper sticks or arms, and maintained in cooperative registry or relation through the medium of the arm 50, one end of which is fixedly secured to the shoe 47, and the other end of which is fixedly secured to the cross-member or brace 32, which brace is fixedly secured to the crowds, thereby making the shoe an integral part of the crowds.

Suitable rollers 51 are mounted on the shoe for rolling support of the dipper sticks during advance and retraction of the sticks.

A combined cross-brace and king-pin-block 52, of H-form is fixedly secured to and between the ways 29 and 30, and this block has a bore 53 rotatably receiving the king pin pivot-section 54, the king pin terminating in a head 55.

A rest 56 is fixed at the rear end of the frame side members 34 and 35, which rest slidably supports the rear end of the ways 26 and 27.

Thus, the mucking section or structure is supported at the king pin 43, 54, 55, and, on the rest 56 and on shoe rollers 51, and the structure may be swung about the pivot 54 to any extent as may be limited by the arcuate way 46.

The conveyor 57 may be made in any suitable type, a belt type conveyor being shown and consisting of a flexible conveyor belt 58 operating over a suitable tail pulley 59 and head pulley, (not shown).

The tail pulley is mounted in bearings 60 which are integral with brackets 61 which are integral with, or mounted on the cross-member and pivot anchor 36, passing through the openings 62 in the king pin block 52 and spanning the king pin. Thus, the conveyor is supported by the truck and maintained in longitudinal axial alignment therewith.

Standards 63 are mounted on the truck-frame side members and support the conveyor frame 64 which in turn supports the idlers 65, and the head end of the conveyor dumps its load 66 into a car 67.

The conveyor is shown as driven by an individual electric motor 68, which is shown as mounted on a plate 69 mounted on the standards 63, and as driving through pulleys 70 and 71 and belt 72, although any other suitable drive may be used, such as through gear trains, speed reducer or chains. The arrangement is shown in its simplest form.

Supported by the frame 64 as shown at 73 is a pair of spaced conveyor aprons 74 which control the feed and spreading of the material or muck 66 on the conveyor belt.

The crowds 26 and 27 are actuated for advance or crowding and for retraction by any suitable means, such as cables, chains, screws, rack-and-pinion, or by air or hydraulic mechanisms, or other means which will provide rectilinear movement of the crowds, and the means for actuation is shown in its simplest form as consisting of cables 75 and 76, operating over sheaves 77 and 78 which are mounted in bearings 79 and 80, which bearings are mounted on the ways 29 and 30.

These cables, as shown, have both of their ends attached, each to a common point, 81, 82 to the respective crowds 26 and 27, and pass about the driven sheaves 83 and 84 which are fixed on opposite ends of a shaft 85, which in turn is rotatably mounted in bearings 86 and 87 which are mounted on the ways 29 and 30.

The sheaves 83 and 84 may be replaced by winches or tuggers with the usual cable connections thereto, which system is well known.

This crowd unit is shown as driven through an individual electric motor 88 mounted on a cross member 89 supported on the side walls 90 of the housing, and which housing is supported on the ways 29 and 30. A sheave 91 on the motor drives the sheaves 77—78 through a belt 92 and thence through a sheave 93 fixed on shaft 85, although in practice, it will be understood that a greater speed reduction, such as through a gear train, may be desirable.

The automatic movement—or traveling-limiting means for the crowds is shown in its simplest form in Fig. 6, in which two levers 94 and 95 mounted in suitable bearings 96 and 97, are connected together by means of a rod 98 so as to operate in unison and one of these levers operates a reversing switch 99 for stopping the motor 88 when a predetermined limit of travel is reached.

A control lever 100 is shown as associated with the levers 94 and 95 for manual control of the crowds.

In operation, when motor 88 is switched in circuit, the sheaves 83 and 84 drive the cables 75 and 76 in the direction of the arrow 101 until lever 100 is manually moved to a vertical position, or until the dog 102 cooperates with lever 94, thus moving switch arm 99 out of contact with terminal 103, breaking the circuit to the motor and locking the switch against manual operation to close again to contact 103. Thus there is no possibility of over-travel of the crowds.

When a reverse movement is desired, or retraction of the crowds, lever 100 is moved clockwise to make contact between 99 and 104, reversing the motor, the reverse movement or travel of the crowds being limited by cooperation of the dog 102 with lever 95. Thus any possibility of overrun or overtravel of the crowds in either direction, is obviated.

The dipper lifting and dumping means consists of a pair of cables 105 and 106 which are

respectively secured to the opposite side walls of the dipper, as shown at 107, and which cables operate over the respective sheaves 108 and 109, which sheaves are fixedly mounted on the opposite ends of a shaft 110, which shaft is suitably rotatably mounted in bearings which are mounted within the side walls of the housing 111.

The cables 105 and 106, after passing over these sheaves wind on winches or tuggers 112 and 113 which are both fixed on a shaft 114, which shaft is rotatable in bearings 115 and shown as mounted on the rear wall 116 of housing 111.

The drive for the winches 112 and 113 is also shown in its simplest form as consisting of an individual electric motor 117 mounted on the back wall 116, and driving through a sheave 118 and belt 119 through a sheave 120 fixed on shaft 114. The housing may be extended backwardly to enclose the motor and drive if desired.

Automatic means for limiting the upward travel of the dipper consists of a dog 121 fixed on the cable 126, this dog cooperating with a switch lever 122 which breaks circuit at contact 123 to motor 117, thus preventing over-run of the dipper or bucket. A separate switch, (not shown) but of standard make is used for manual control of the motor.

Means for changing the angular relation of the mucking section relative to the truck or carriage consists of a chain or cable 124 passing about sprockets or sheaves 125 and 126 which are respectively fixed on the upper end of shafts 127 and 128. These shafts are rotatable in bearings 129 and 130 mounted on the frame side members 34 and 35.

The cables 124 pass about sheaves 131 and 132, which are rotatably mounted at the respective ends of the arcuate member 46, and the ends of the cable are respectively fastened to the opposite ends of shoe 47 as indicated at 133 and 134.

Operating means for the chain or cable 124 consists of bevel gears 135 and 136 which are respectively fixed on the lower ends of the respective shafts 127 and 128, and which gears mesh with mating gears 137 and 138 which are fixed on a shaft 139, which shaft is rotatable in bearings 140 integral with the cross member 37.

Opposed bevel gears 141 and 142 are rotatably mounted on the shaft 139, and an interposed clutch block 143 is slidable and non-rotatable on the shaft 139, and shiftable for selective cooperation with the bevel gears 141 and 142, mating clutching elements of any well known type being provided on the respective gears and clutch block.

A mating gear 144 simultaneously cooperates with both gears 141 and 142 and is fixedly mounted on a shaft 145 which is rotatable in bearings 146 and 147 integral with cross-member 37, and a drive shaft 148 is rotatably mounted in bearings which are also integral with the cross-member 37.

A bevel gear 149 is fixed on the upper end of shaft 145, and a mating gear 150 is fixed on shaft 143, and a sheave 151 fixed on one end of shaft 148 is driven through a belt 152 by means of a sheave 153 which is fixed on the tail pulley shaft 154.

A clutch collar 155 is rotatable on the block 143 and is operated through the medium of shaft 156, at the upper end of which, a clutch lever 157 is secured, this lever being located for selective cooperation with spaced apart dogs 158 and 159 fixed on the chain or cable 124.

With the lever 157 on center or in neutral position, manually shifting lever 157 to the right, (looking forward) will cause clutch block 143 to engage gear 141, moving the scoop or dipper 10 to the right until dog 158 contacts this lever and moves it to neutral position, preventing over-travel. Lever 157 is also used for manual control, and may be manually operated for any intermediate angularity of the mucking section and dipper, and is obviously under instant control.

With the lever 157 moved to the left, the dipper moves to the left until either manually moved to neutral, or until dog 159 engages lever 157 and moves it to neutral.

As will be noted, the machine is moved forward as a unit to proper position for operation and motor 68 is cut in circuit, continuously operating the conveyor. Next, lever 157 is manually moved to proper position to swing the bucket to the desired angle toward the material to be removed.

Motor 91 is next cut in circuit through the manual control of lever 100 to operate the crowds and force the dipper forwardly into the material or muck 160, the movement of which dipper and crowds can be terminated at will by means of lever 100, and which movement will be automatically stopped by dog 102 when the predetermined travel limit of the crowd is reached, thus there can be no over-travel of the crowd or dipper.

Next, motor 117 is cut in circuit, and through the winches 112 and 113 and cables 105 and 106, the dipper is coincidentally raised and retracted against the resistance of the crowd driving mechanism which is idle, (or if desirable, the crowds may first be retracted under their own power), until the dipper stick pivot reaches the position 161, the cables pull at their point of attachment forward of the dipper stick pivot slightly tipping the dipper back, and then swinging the dipper and the dipper sticks about the pivot point 161 until the dipper sticks reach the position 162, in which position the dipper sticks are stopped by abutments 163 fixed to the side walls 90 of the housing, after which further pull of the cables tips the dipper as shown at 164.

During this tipping action, cam surface 19 cooperates with members 25, releasing the latches 17, allowing the cover 14 to open and discharge the contents of the dipper into the hopper 165, which discharges into the apron 74, onto conveyor belt 58, which carries the material up and dumps it into the car 67.

As the dipper is tipped, the dog 121 engages lever 122, breaking circuit at 123 to motor 117, and since the center of gravity of the bucket or dipper is forward of the pivotal connection of the dipper sticks, the dipper will first settle back until the stops 166 engage the undersurface of the dipper sticks, changing the center of gravity of the unit of dipper and dipper sticks forward of the pivot point 161, and the dipper will return through the influence of gravity, being restrained by the frictional resistance of the lifting mechanism.

Suitable manually controlled switches, (not shown), will obviously be provided for all motors, or suitable clutches, controllable at will, will be provided for all drives operated by a single prime mover. These devices are all well known and therefore require no description.

It will also be noted, especially for operation in narrow tunnels, that the shifter shoe 47 may be operated from a point between the dipper sticks, and by means other than that shown, such as through the medium of a rack and pinion, thus

doing away with the projections of way or member 46.

It will be understood that variations in construction and arrangement of parts, which variations are consistent with the appended claims, may be resorted to, without detracting from the spirit or scope of the invention, or sacrificing any of the advantages thereof.

I claim:

1. A mucking machine, in combination, scooping means; rectilinearly acting crowding means and, lifting means automatically converted into dumping means at the terminal of lift, for said scooping means, and means controllable at will changing the angle of approach of said scooping means, said crowding means comprising guided pushing means and dipper sticks having one of their ends pivoted to the approach end of said pushing means and their other end pivotally attached to said scooping means, said scooping means having a hinged cover and releasable securing means therefor, and means releasing said securing means after the limit of lift of said scooping means has been reached and operating through the medium of said lifting means after its conversion to dumping means.

2. A mucking machine, in combination, scooping means; rectilinearly acting crowding means and, lifting means automatically converted to dumping means at the terminal of lift, for said scooping means, means operable at will for changing the angle of approach of said scooping means, and control means controllable at will controlling the travel of said crowding means and lifting means, said control means including means automatically controlling said crowding means and lifting means against over-travel, said scooping means having a hinged cover and releasable securing means therefor, and means releasing said securing means after the limit of lift of said scooping means has been reached and operating through the medium of said lifting means after its conversion to dumping means.

3. A mucking machine, in combination, scooping means; rectilinearly acting crowding means and, lifting means automatically converted into dumping means at the terminal of lift, for said scooping means, means controllable at will for changing the angle of approach of said scooping means, said crowding means comprising guided pushing means and dipper sticks having one of their ends pivoted to the approach end of said pushing means and their other end pivotally attached to said scooping means, control means controllable at will controlling the travel of said crowding means and lifting means, said control means including means automatically controlling said crowding means and lifting means against over-travel, said scooping means having a hinged cover and releasable securing means therefor, and means releasing said securing means following the limit of lift of said scooping means and operating through the medium of said lifting means after its conversion to dumping means.

4. A mucking machine comprising a truck, a mucking section pivotally mounted on said truck to swing about a vertical axis, means controllable at will for angularly adjusting said section relative to the longitudinal axis of said truck, means automatically controlling said section against angular over-travel, said mucking section including scooping means and rectilinear crowding means therefor; manually actuated control means controlling the travel of said crowding means, and means automatically controlling said

manual control means limiting travel of said crowding means; lifting means for said scooping means and manual control means for controlling the travel of said lifting means and associated automatic control means limiting the maximum travel of said lifting means, and means automatically converting said lifting means into dumping means when the scooping means has reached its maximum lift position.

5. A mucking machine comprising a truck, a mucking section pivotally mounted on said truck for angular adjustment in a horizontal plane and means for angularly adjusting said section and means automatically controlling said section against angular over-travel; said mucking section including scooping means and rectilinear crowding means therefor; means manually operated controlling the travel of said crowding means and automatically operated controlling said crowding means against over-travel; lifting means for said scooping means and including arms pivoted to said crowding means, stops on said scooping means cooperating with said arms maintaining said scooping means in predetermined relative position as related to said arms, during lifting; stop means for said arms, said lifting means dumping said scooping means following cooperation of said arms with said stop means.

6. In a mucking machine, a rectilinear crowd and actuating means therefor; control means automatically limiting the travel of said crowd and including means for manual control thereof; a dipper, dipper arms pivotally cooperating between said dipper and said crowd; a cover for said dipper and releasable securing means therefor; lifting means for said dipper; relation maintaining stops cooperating between said dipper and said arms during lifting; lift stops for said arms, said lifting means being automatically converted to means for dumping said dipper when said arms engage said lift stops; means releasing said cover securing means following cooperation between said lift stops and said arms; a truck supporting all of said means; and means manually controlled, and automatically controlled against over-travel, for changing the angular relation of said crowd and associated means relative to the longitudinal axis of said truck.

7. In a mucking machine, a truck, a mucking section horizontally angularly adjustable on said truck; said mucking section including scooping means, rectilinear crowding means, lifting means and means converting said lifting means to dumping means for said scooping means when raised to its highest position of lift, a receiver; a conveyor fixedly maintained in relation to the longitudinal axis of said truck and receiving material dumped into said receiver from said scooping means; manual control means controlling at will the angularity of adjustment of said mucking section and means automatically controlling said mucking section against angular over-travel.

8. In a mucking machine, a truck including a conveyor fixedly mounted thereon; a mucking section horizontally adjustable on said truck and including scooping means, straight line crowding means, lifting means, and means converting said lifting means into dumping means for said scooping means when said scooping means has been raised to its highest position of lift; and a receiver for material dumped from said scooping means and discharging onto said conveyor; and control means manually operable for controlling the movement of said crowding means

and including means automatically controlling said crowding means against over-travel in either direction of movement.

9. In a mucking machine, a truck including a conveyor fixedly mounted thereon; a mucking section horizontally adjustable in angular relation to the longitudinal axis of said truck and including scooping means, rectilinear crowding means, lifting means for said scooping means, means converting said lifting means into dumping means for said scooping means when said scooping means has been raised to its highest position of lift; a hopper receiving material dumped from said scooping means and discharging onto said conveyor; control means manually operable for controlling the movement of said crowding means and including means automatically controlling said crowding means against over-travel; and manual control means controlling at will the angularity of adjustment of said mucking section and including means automatically controlling said mucking section against angular over-travel.

10. In a mucking machine, a truck including a mucking section swivelly mounted thereon, said mucking section comprising a frame, rectilinearly-acting crowding means including dipper sticks pivotally connected thereto, a dipper pivotally connected to said dipper sticks, tilting stops on said dipper maintaining said dipper against tipping forwardly, a lifting cable attached to said dipper ahead of the pivotal connection to said dipper sticks, a hinged cover for the top of said dipper, travel-limiting stops on said frame for said sticks, said lifting cable inverting said dipper after said sticks cooperate with said travel-limiting stops.

11. In a mucking machine, a frame, dipper sticks, rectilinearly acting crowding means, a dipper having side walls, a back wall, and parallel bottom and cover, said cover being hingedly secured adjacent the forward end of said dipper, releasable latching means for said cover, and lifting means and associated means cooperating to invert said dipper and release said latch when said dipper has been lifted to a predetermined position.

12. In a mucking machine, a frame, dipper sticks, rectilinearly-acting crowding means, a dipper having side walls, a back wall, and parallel bottom and cover, said cover being hingedly secured adjacent the forward end of said dipper, releasable latching means for said cover, said dipper sticks being pivotally connected to said dipper and to said crowding means, lifting means cooperating with said dipper forwardly of the dipper stick pivotal connection, and associated means cooperating to invert said dipper and release said latch when said dipper has been lifted to a predetermined position.

13. In a mucking machine, a frame, dipper sticks, rectilinearly-acting crowding means, a dipper having side walls, a back wall and parallel bottom and cover, said cover being hingedly mounted adjacent the forward end of said dipper, releasable latching means for said cover, said dipper sticks being pivotally connected to said dipper and to said crowding means, and lifting means cooperating with said dipper forwardly of the pivotal connections of said dipper sticks on said dipper, stops on said frame limiting the upward swing of said dipper sticks, said lift-

ing means acting to invert said dipper upon cooperation of said sticks with said stops.

14. In a mucking machine, a frame, dipper sticks, rectilinearly-acting crowding means, a dipper having parallel bottom and cover, and side walls with the cover hinged adjacent the forward end of the side walls, releasable latching means for said cover, means maintaining said dipper against tipping forwardly relative to a predetermined relation to said dipper sticks, and lifting means and associated means cooperating to invert said dipper backwardly and release said latch when said dipper has been lifted to a predetermined position.

15. In a mucking machine, a frame, dipper sticks, rectilinearly-acting crowding means, a dipper having side walls, a back wall, and parallel bottom and cover, said cover being hingedly secured adjacent the forward end of said dipper, releasable latching means for said cover, said dipper sticks being pivotally connected to said dipper and to said crowding means, lifting means cooperating with said dipper forwardly of the dipper stick pivotal connections, and associated means cooperating to invert said dipper and release said latch when said dipper has been lifted to a predetermined position, and means maintaining said dipper from tipping forwardly relative to a predetermined relation to said dipper sticks.

16. In a mucking machine, a frame, dipper sticks, rectilinearly-acting crowding means; a dipper having side walls, a back wall, and parallel bottom and cover, said cover being hingedly mounted adjacent the forward end of said dipper; releasable latching means for said cover, said dipper sticks being pivotally connected to said dipper and to said crowding means, and lifting means cooperating with said dipper forwardly of the pivotal connections of said dipper sticks on said dipper, stops on said frame limiting the upward swing of said dipper sticks, said lifting means acting to invert said dipper upon cooperation of said sticks with said stops, and means maintaining said dipper from tipping forwardly relative to a predetermined relation to said dipper sticks.

17. In a mucking machine, a frame, a conveyor, a dipper having a hinged cover and releasable latching means therefor, a crowd, dipper sticks pivotally connecting said dipper and said crowd, stops on said frame limiting the upward swing of said dipper sticks, lifting cables attached to said dipper forwardly of the dipper stick pivotal connections to invert said dipper after the dipper sticks cooperate with said stops, said dipper dumping in inverted position onto said conveyor.

18. In a mucking machine, a frame, a conveyor, a dipper having a hinged cover and releasable latching means therefor, a crowd, dipper sticks pivotally connecting said dipper and said crowd, stops on said frame limiting the upward swing of said dipper sticks, lifting cables attached to said dipper forwardly of the dipper stick pivotal connections to invert said dipper after the dipper sticks cooperate with said stops, said dipper dumping in inverted position onto said conveyor, stops on said dipper cooperatively related to said dipper sticks maintaining said dipper from tipping forwardly while permitting reverse inversion thereof for dumping.

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