Aug. 4, 1942. G. S. ALLIN 2,291,858

WHEELED SCRAPER

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Fig. 1

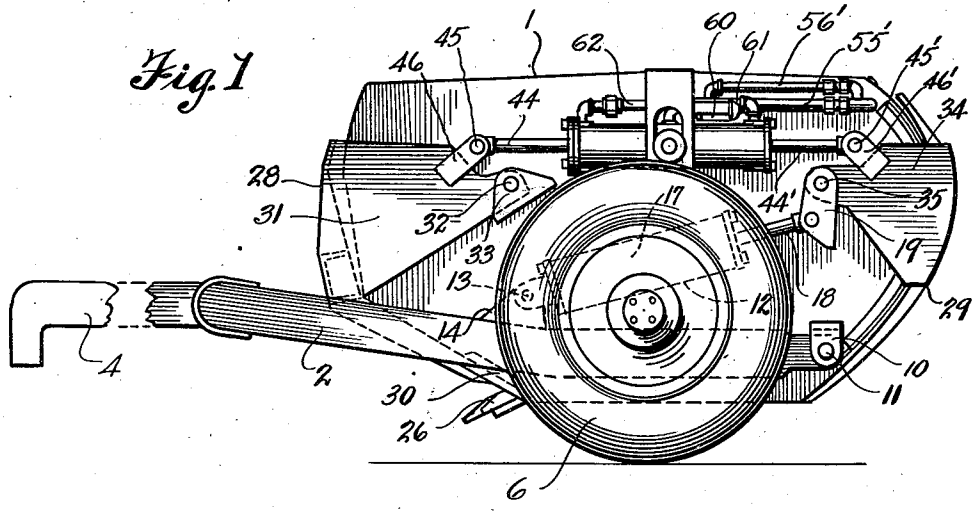
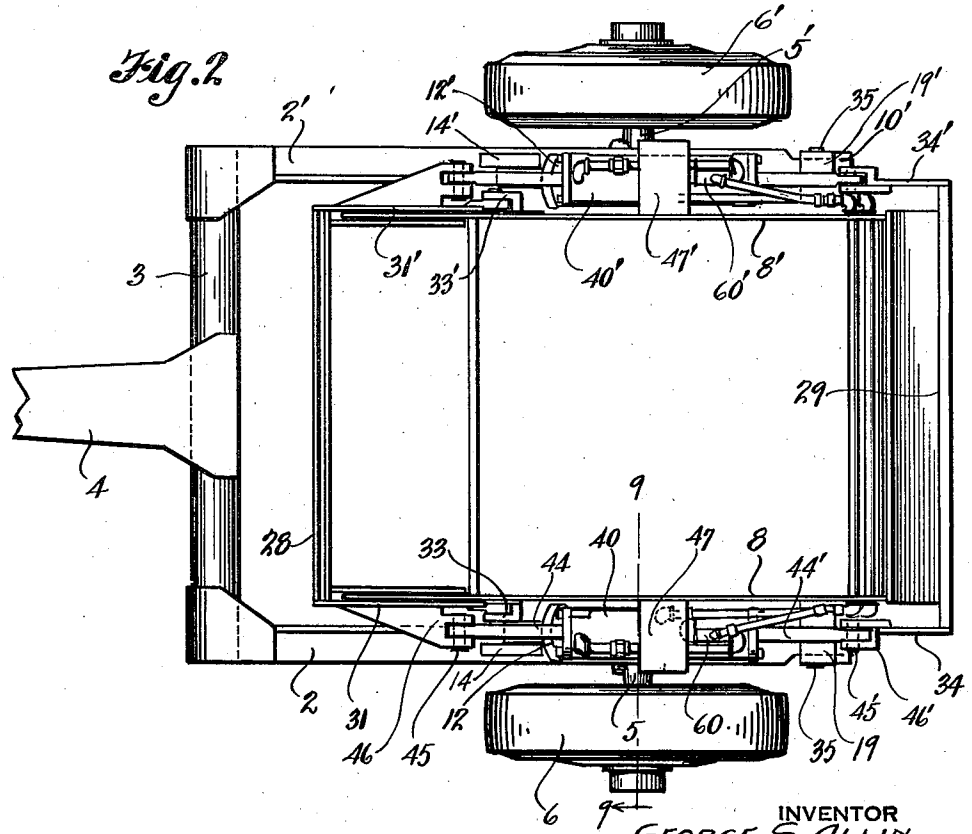


Fig. 2



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Fig. 3

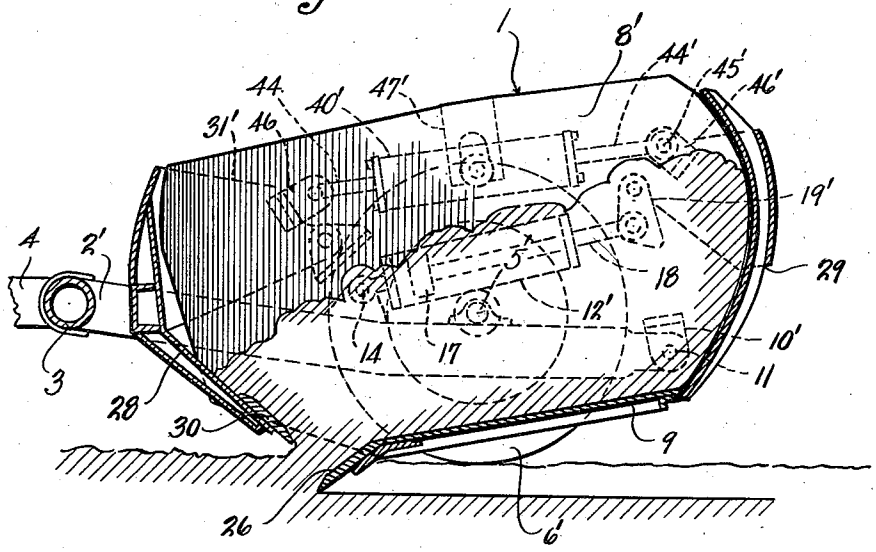
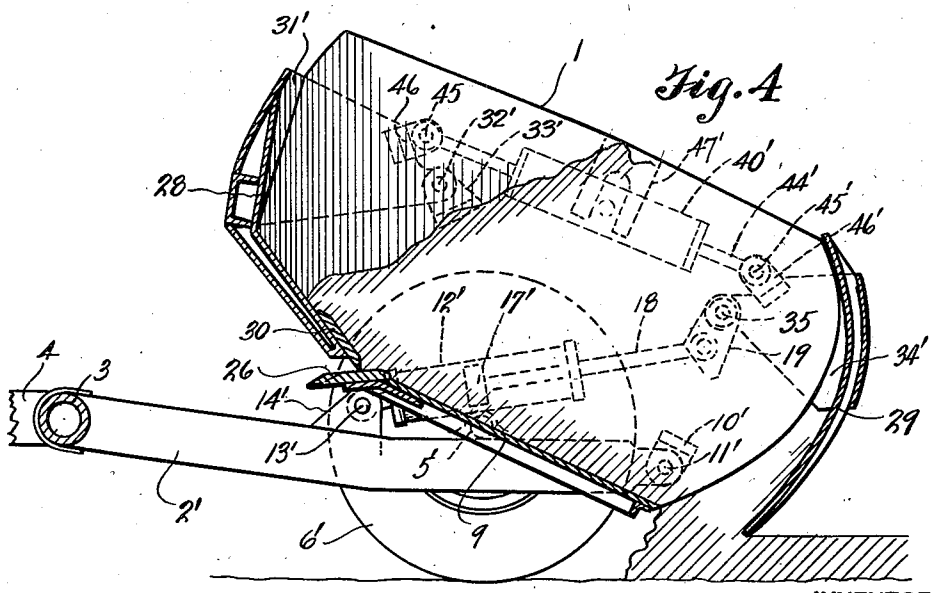


Fig. 4



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Fig. 5

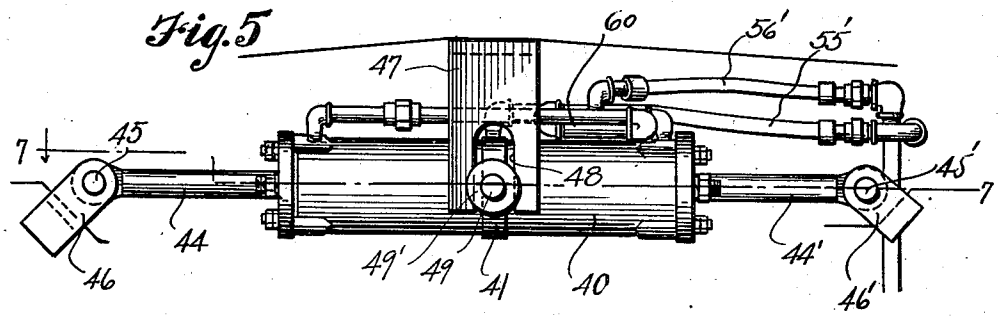


Fig. 6

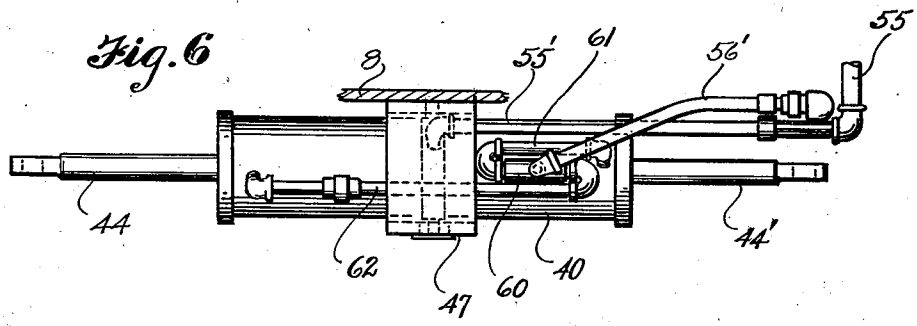


Fig. 7

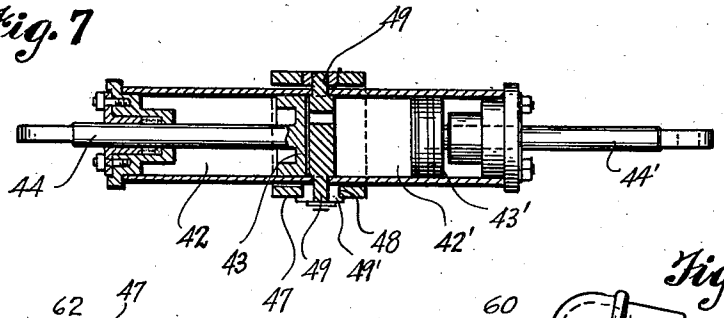


Fig. 8

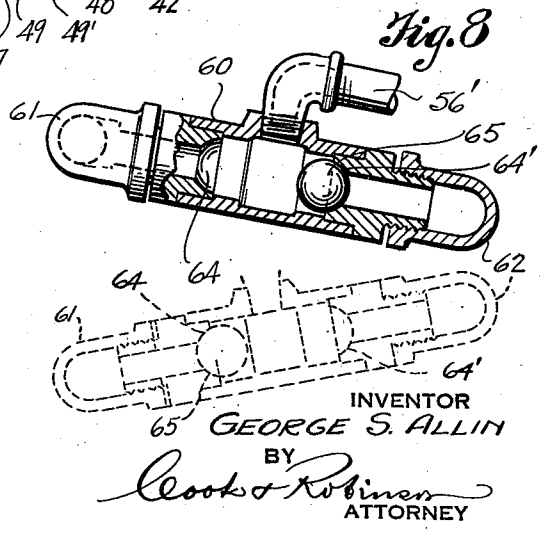
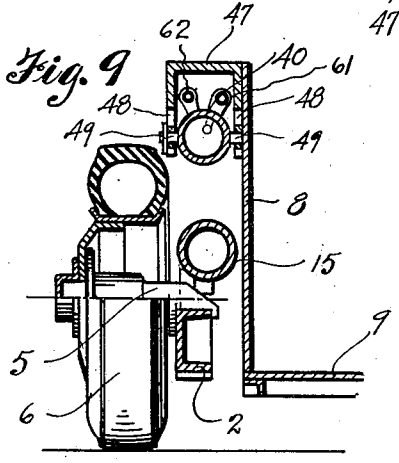


Fig. 9



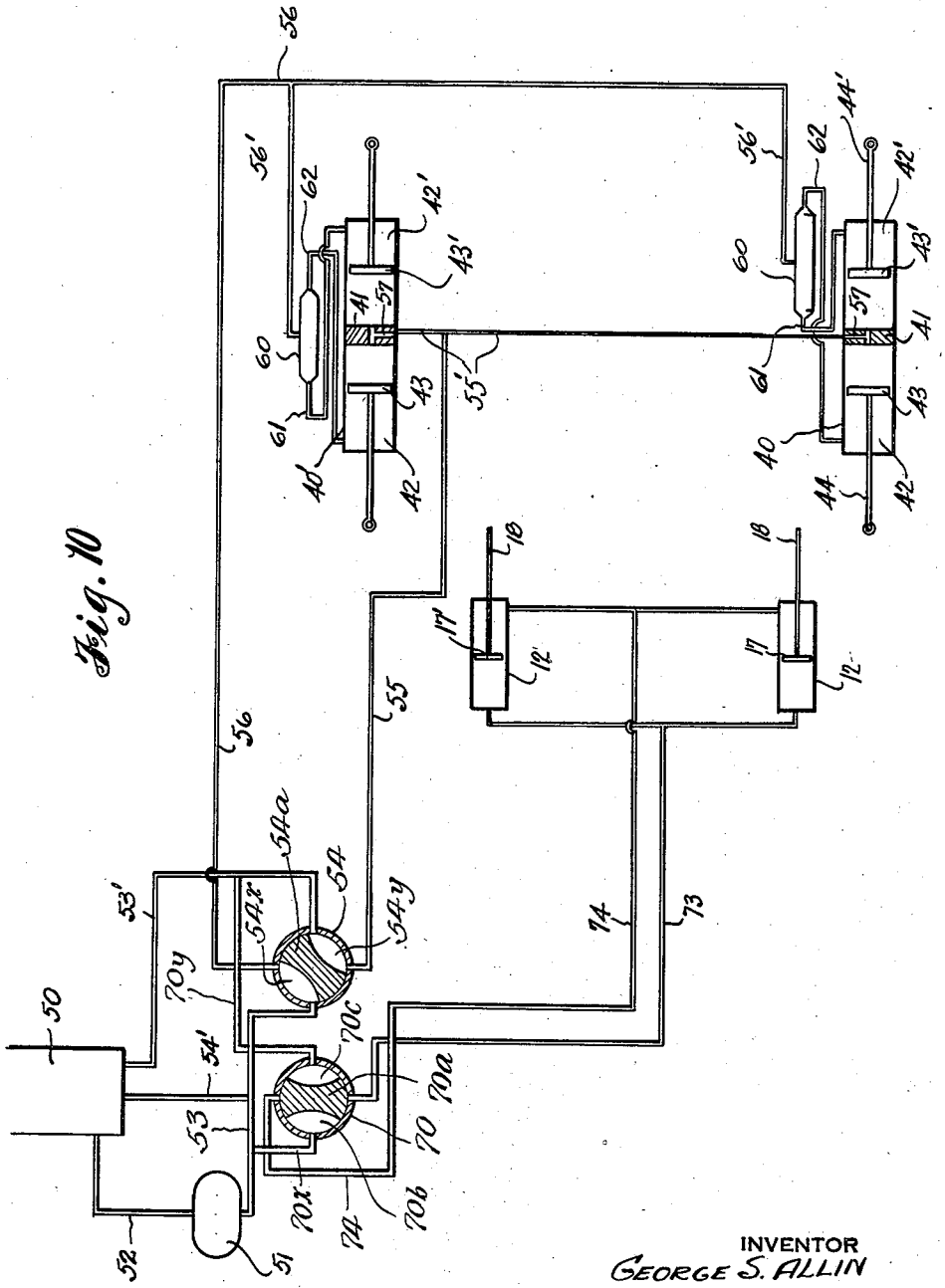
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Fig. 10



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UNITED STATES PATENT OFFICE

2,291,858

WHEELED SCRAPER

George S. Allin, Seattle, Wash., assignor to Isaacson Iron Works, Seattle, Wash., a corporation of Washington

Application August 19, 1940, Serial No. 353,205

11 Claims. (Cl. 37—133)

This invention relates to scrapers, and has reference more particularly to improvements in wheel supported scrapers of that type adapted to be drawn by a prime mover, such as a tractor, or the like, and having a load carrying bowl tiltably mounted and designed to be filled through an open front end while the scraper is traveling forward with the bowl downwardly and forwardly tilted, and to discharge its load from the rear end of the bowl when the latter is tilted rearwardly and downwardly; the bowl being equipped at its front and rear ends with gates for retaining a load therein during transit.

It is the principal object of the present invention to provide an improved means, and of a simplified character, for the control of the gates of scrapers of the above character. Furthermore, to provide a common means of control for both gates, through which an automatic selection of the proper gate to be opened will be effected in accordance with the rearward or forward inclination, or tilt of the bowl.

More specifically stated, the objects of the present invention reside in the provision of an improved form of scraper, of the above stated character, wherein the bowl is pivotally mounted on its supports for forward tilting for filling, and rearward tilting for discharge of its load, and is equipped at front and rear ends with swingingly mounted gates which coact with the bowl for retaining a load therein in transit and which are both under a common means which includes paired hydraulic cylinders and gravity actuated valves associated therewith for an automatic selection or determination of the opening of the gates in accordance with the direction of tilt of the bowl.

Other objects of the present invention reside in the details of construction of parts and in their combination, as will hereinafter be fully described.

In accomplishing these and other objects of the invention, I have provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings, wherein—

Fig. 1 is a side view of a wheeled scraper embodying improvements in accordance with the present invention; the scraper bowl being shown in load transporting position, with both gates closed.

Fig. 2 is a plan, or top view of the scraper as seen in Fig. 1.

Fig. 3 is a vertical, sectional view lengthwise of the bowl, showing the bowl tilted forwardly and with the front end gate partly opened, for filling the bowl.

Fig. 4 is a similar view of the scraper, showing the bowl tilted rearwardly and the rear gate partly opened for the discharge and spreading of a load as the scraper moves forwardly.

Fig. 5 is an enlarged, side view of one of the paired gate control cylinders, and associated parts, as mounted at one side of the bowl.

Fig. 6 is a top view of the parts as shown in Fig. 5.

Fig. 7 is a horizontal section, taken on line 7—7 in Fig. 5, illustrating the division and internal structure of the hydraulic cylinder.

Fig. 8 is a detail of the automatic gravity control valve as used with each of the paired hydraulic cylinders, for control of the gate action; showing the parts in full line, as positioned when the bowl is tilted rearwardly, and in dotted lines as positioned when the bowl is forwardly tilted.

Fig. 9 is a vertical section on line 9—9 in Fig. 2.

Fig. 10 is a diagrammatic showing of the piping of the hydraulic system for the gate and bowl control; the control valve mechanism being in section and enlarged in scale.

Referring more in detail to the drawings—

The bowl of the present scraper is designated, in general, by reference character 1, and it is operatively supported by a frame structure comprising coextensive side beams 2 and 2', horizontally directed along opposite sides of the bowl and rigidly joined across their forward ends by a cross beam 3 to which a tongue 4 is fixed. The tongue 4 may be of any suitable length, and equipped at its forward end with means for effecting proper operative connection with a tractor, or other prime mover, for pulling the scraper.

Fixed to the opposite side beams 2 and 2' of the frame, in proper transverse alinement, are axles 5 and 5', on which ground wheels 6 and 6' are mounted for the support of the frame, and preferably these wheels would be equipped with pneumatic tires of such diameter and with a tread of such width as to facilitate operation of the scraper in soft ground.

The bowl 1 comprises opposite side walls 8 and 8', in parallel, vertical planes, and a flat bottom wall 9 joining the side walls between their lower edges. Fixed to the side walls, at the outside of the bowl and near the lower edges and close to the rear end thereof, are brackets 10 and 10' to which the rear ends of the beams 2 and 2' are

pivotally attached by suitable bolts or pivots, as designated at 11, thereby providing a connection between frame and bowl that is necessary for the upward or downward tilting of the latter, as for example, for movement from the substantially level position in which it is shown in Fig. 1, to the position noted in Fig. 3, or to that in which it is shown in Fig. 4.

The selected position in which the bowl is to be held, as well as its tilting motion, is under control of paired hydraulic cylinders 12 and 12', disposed lengthwise of and above the beams 2 and 2' at opposite sides of the bowl. These cylinders have pivotal connections 13 at their forward ends, respectively, with brackets 14 and 14' that are secured upon the beams 2 and 2'. Reciprocally contained in the cylinders 12 and 12' are pistons 17 and 17', each with a piston rod 18 extended rearwardly from its enclosing cylinder. These rods, at their rearward ends, are pivotally connected to the lower portions of brackets 19 and 19' that are fastened to the opposite side walls of the bowl at positions about midway between top and bottom edges of the bowl and above the brackets 10 and 10'. Hydraulic pressure medium for actuation of the pistons 17 is applied to the cylinders at their opposite ends under valve control, as later will be described, and the tilting of the bowl to various positions relative to the frame, is determined by the application to or release of the pressure medium from the opposite ends of these cylinders.

The flat bottom wall 9 of the bowl is equipped at its forward edge with a downwardly and forwardly inclined ground cutting blade 26, which will be brought into ground contact by the downward tilting of the bowl, as will be understood by reference to Fig. 2. The digging depth may be accurately determined and maintained by the application of pressure medium to the cylinders 12 and 12'. The side walls 8 and 8' of the bowl extend somewhat forwardly, and also rearwardly of the front and rear edges of the bottom wall, as noted best in Fig. 3, and at its forward and rearward ends, respectively, the bowl is equipped with gates 28 and 29 for retention of a load.

The gate 28 is equipped across its lower edge with a blade 30 adapted to close against the top of the blade 26 as noted in Fig. 3, and at its opposite side edges, this gate is equipped with mounting plates 31 and 31', which overlap the forward portions of the side walls of the bowl, and which are pivotally secured by pivots 32 to brackets 33 and 33' rigidly fixed to these walls. Likewise, the rear gate 29 has opposite end plates 34 and 34' overlapping the rearward portions of the side walls of the bowl and secured by pivots 35 to the upper portions of the brackets 19 and 19' that are fixed on the side walls of the bowl. The pivots 33 and 35 at one side of the bowl, and also those pivots 33' and 35' at the other side, are located above the bottom wall approximately two-thirds of the distance between top and bottom of the bowl, and so support the gates that, in opening, they will swing upwardly and away from the end openings, as will be understood by reference to Figs. 2 and 3.

It will be understood by reference to Figs. 2 and 3, that the front gate 28 is angularly shaped to conform to the shape of the bowl and when closed, serves to support a substantial part of the load directly thereon. The gate 29, likewise, is vertically curved to conform to the curved rear end edges of the side walls of the bowl.

The two gates are both under a common control system comprising a pair of hydraulic cylinders 40 and 40', located respectively at opposite sides of the bowl, substantially in horizontal positions and somewhat above the line or level of the supporting brackets for the gates. As will be understood by reference to Figs. 5, 6 and 7, each hydraulic cylinder is divided by a central transverse partition 41, separating it into opposite end chambers 42 and 42'. Contained in these chambers, respectively, are pistons 43 and 43', and extending from the pistons through front and rear end walls and the cylinders, are piston rods 44 and 44' which connect pivotally at their outer ends, respectively as at 45 and 45', with brackets 46 and 46' secured to the top edges of the end plates of the forward and rearward end gates 28 and 29.

By reason of the fact that both gates have downward and upward swinging action, and are to be actuated under control of the hydraulic cylinders 40 and 40', it is necessary to provide for what might be termed a "floating action" of these cylinders 40 and 40', while retaining them against endwise shifting. Therefore, as will be noted by reference to Figs. 1, 5 and 9, inverted, U-shaped brackets 47 and 47' are fixed to the top edges of the side walls of the bowl at the outside of the latter, and above the top of the wheels 6 and 6'. The two leg portions of these U-shaped brackets are vertically slotted, as at 48, and the cylinders are contained within the brackets between the slotted portions of these legs, as noted in Figs. 7 and 9, and trunnion-like studs 49 extend from opposite sides of the partition members 41 of the cylinders and are equipped with bushings 49' adapted for guided travel in the vertical slots 48, thus to permit the necessary vertical movement of the cylinders while retaining them against endwise motion.

Referring now more particularly to Fig. 10, in which I have diagrammatically illustrated the hydraulic control system for the present equipment; 50 designates a tank for a supply of hydraulic pressure medium, and 51 a pump, which may be operated by the prime mover, and which is connected by a pipe 52 with the supply, and by a pipe 53 with a four-way valve. A pressure relief by-pass 54' leads from pipes 53 to the source 50. From the valve 54, distributing pipes 55 and 56 extend to the scraper bowl for control of the gate operating devices, and there is a return connection 53' from the control valve back to tank 50. Flexible extensions 55' lead from the ends of pipe 55 to the cylinders 40 and 40' and connect with bores 57 formed in the partition walls 41 of these cylinders, which passages in each case open laterally to the inner ends of both chambers 42 and 42' in their respective cylinders. Valve 54 has a rotary plug 54*a*, and this is formed with passages 54*x* and 54*y* which, by rotation of the plug, may be caused to divert pressure medium from the pipe 53 through the pipe 55 to the cylinders 42 and 42' and to allow return of medium through the pipe 56 and valve, to the tank 50. Thus, by a proper adjustment of valve 54, pressure medium may be simultaneously applied through pipe 55 and its extensions 55' to the chambers 42 and 42' of both cylinders to move all pistons outwardly, and thus actuate both gates 28 and 29 toward closed position. By holding the pressure in the cylinders, the gates will be held against opening. Thus, insofar as closing the gates is concerned, they will both be forced shut by application of pressure administered through the control valve 54.

Likewise, flexible extensions 56' extend from the pipe 56 at opposite sides of the bowl, and these connect respectively with valve housings 60 and 60' associated with and rigidly supported parallel with the cylinders 40 and 40', as seen in Fig. 8. Each valve housing 60 and 60', has its forward and rearward ends connected, respectively, with the rearward and forward ends of the corresponding cylinders 40 and 40'.

The pipe 56' in each case, opens into the corresponding valve housing 60 or 60' at a medial point, and within the opposite ends of the housing are valve seats 64 and 64', against which a ball valve 65, located in the housing and free to roll by gravity between said seats, may seat to close the outlets to one or the other end of the housing, depending upon the direction toward which the bowl and valve housing is tilted. When the bowl is tilted forwardly, as for receiving a load, the balls 65 will roll to the forward ends of their respective valve housings, as noted in dotted lines in Fig. 8, and will close the outlet to pipe 61, and will open the opposite end port. Thus, when valve 54 is adjusted for the application of hydraulic pressure medium through pipe 56, the pressure will be transmitted through the pipes 56', housings 60 and 60', and pipes 62, to the forward ends of the chambers 42' of both cylinders, and will cause the pistons 43 therein to be retracted, thus to move gate 28 to open position; the extent of opening of this gate being dependent on the amount of pressure medium admitted.

When the pistons 43 are thus retracted, hydraulic medium at the inside of the pistons is expelled from the chambers through the passages 47 and pipes 55' and 55, back through valve 54 to the source of supply.

Likewise, when the bowl 1 is tilted rearwardly as for unloading, then the ball valves 65 roll to the opposite ends of their housings, against the seats 64' and the hydraulic pressure will then be applied through the pipes 61 to the rearward ends of chambers 42', thus to effect the retraction of the pistons 43' whereby the gate 29 will be lifted to an extent determined by the amount of medium applied, while exhaust medium from the inner ends of these chambers flows back to the source through pipe 55.

It will be understood that when a load is being discharged, the depth of spread may be controlled by the position of the rear gate, since the height of its edge above ground level determines the height of the fill. This will be understood by reference to Fig. 4.

To effect the opening of either gate, the operator merely adjusts the valve 54 to apply the pressure medium through pipe 56, and the gate on which it acts will be automatically determined in accordance with the direction of tilt of the bowl.

The positive control of the opening action of each gate is important in that, in filling, it is necessary that the gate be held in a proper position to admit dirt but not so far open as to allow any of the load to run forward and spill out at the sides. This adjustment is determined by digging depth and dirt conditions. For unloading, it is important that positive control be had for maintaining control of the load during an unloading operation, either for quick dump, or spreading of the load.

For control of the tilting action of the bowl 1, a four-way control valve 70 is employed. This is connected with pipes 53 and 53' in parallel with valve 54, by pipes 70x and 70y, and it has a rotary plug 70a formed with passages 70b and 70c, and has pipes 73 and 74 leading to the bowl and connected respectively with opposite ends of the cylinders 12 and 12'. By manipulation of the valve plug 70a, pressure medium may be applied to actuate the pistons 17 and 17' in their cylinders in a manner to obtain the desired tilting or the level position of the bowl, and it may be held at that position by closing the valve, as indicated in Fig. 10.

The feature of this invention resides in the provision of a common means of control of both gates and the automatic opening of the proper gate for the filling or unloading of the bowl, as is determined by its tilt or disposition relative to a horizontal position. Thus, the operation and control is greatly simplified and its adjustments expedited.

Having thus described my invention, what I claim as new therein and desire to secure by Letters Patent is—

1. In a scraper of the character described, a bowl, open at its forward and rearward ends and mounted for tilting toward the forward or toward the rearward end, load retaining gates at the open ends of the bowl, pressure actuated power devices for individually controlling the opening and closing actions of the gates, a manual means for selectively applying gate opening or gate closing pressure to the power devices, and gravity controlled means automatically operable by and in accordance with the direction of tilt of the bowl, for diverting the applied gate opening pressure to one or the other of said power devices.

2. In a scraper of the character described, a bowl, open at its forward and rearward ends and supported for tilting from a neutral position toward the forward or toward the rearward end, load retaining gates at the open ends of the bowl, power devices, operable by fluid pressure medium, connected individually with said gates for actuating them to open positions, a supply of fluid pressure medium, a manually operable valve for effecting the applications of pressure medium from said supply to the power devices for opening the gates, and another means automatically operable for diverting the pressure medium when applied for opening the gates, to one or the other of said power devices as determined by the direction of tilt of the bowl at the time of application.

3. In a scraper of the character described, a bowl, open at its forward and rearward ends and mounted for tilting from a neutral position toward the forward or toward the rearward end, load retaining gates at the said open ends of the bowl, power devices operable by fluid pressure medium for individually actuating the gates between open and closed positions, a supply of fluid pressure medium, a manually operable device for selectively effecting gate opening or gate closing applications of said pressure medium to the power devices, and a gravity controlled means associated with the power devices automatically operable to direct the pressure medium as applied for opening the gates, to one or the other of the power device as determined by the direction of tilt of the bowl.

4. In a scraper of the character described, a frame, a bowl, open at its forward and rearward ends and supported on the frame for forward and rearward tilting from a neutral position, means on the frame for controlling the position and the

tilting actions of the bowl, a load retaining gate at each end of the bowl, power devices operable by application thereto of fluid pressure medium, for actuating the gates between open and closed positions, a source of supply of fluid pressure meduim, a control valve connected with the said source of supply and having connections with said power devices for the selective application of gate opening or gate closing pressures thereto, and a gravity controlled valve interposed in the connection provided for the application of gate opening pressure, operable in accordance with the tilting of the bowl to automatically direct the application of pressure medium to effect the opening of the gate at the downwardly tilted end of the bowl only.

5. In a scraper of the character described, a frame structure, a bowl, open at its forward and rearward ends, mounted in the frame structure and adapted to be forwardly tilted for loading and to be rearwardly tilted for unloading, means on the frame for effecting the tilting and for retaining the operating positions of the bowl, a load retaining gate at the forward end of the bowl, a load retaining gate at the rearward end thereof, a control device for each gate comprising a pressure medium cylinder, a piston in the cylinder operatively connected with the corresponding gate, and movable in opposite directions for opening and for closing the gate, a source of supply of pressure medium, a main control valve, having a connection with the source of supply and connections with the said control devices, for the application of gate closing pressure, and having another connection accommodating both devices for the application of gate opening pressure, and a gravity valve in the latter connection, operable in accordance with the direction of tilt of the bowl, to divert the gate opening pressure to the control device for the gate at the lower end of the tilted bowl.

6. In a scraper of the character described, a frame, a bowl supported in the frame for tilting forwardly or rearwardly from a neutral position; said bowl being open at its forward and rearward ends, a gate at each end of the bowl, gate control means comprising a pair of rigidly joined cylinders, a piston in each cylinder, piston rods extended from the cylinders and operatively connected, respectively, with the gates, means on the bowl for retaining the cylinders against endwise shifting while permitting that movement due to gate opening or closing action, a source of fluid pressure medium, a main control valve connected with said source and with said cylinders for application of the medium to the cylinders to close or open said gates, and a gravity valve mounted on the bowl and interposed in the connection provided for applying the pressure medium for gate closing operation, and operable to automatically divert the pressure medium to the cylinder to open the gate at the lower end of the bowl.

7. In a scraper of the character described, a wheel supported frame, a bowl mounted in the frame for forward or rearward tilting about a medial, transverse axis, load retaining gates swingingly mounted at the forward and rearward ends of the bowl, a pressure medium cylinder that is divided to provide power cylinders at its opposite ends, pistons in the opposite end cylinders, rods operatingly connecting the pistons respectively with the gates and thereby supporting the pressure medium cylinder, a bracket on the bowl and means on the cylinder, engaging the bracket to hold the cylinder against endwise movement incident to gate actuation, while permitting its movement that is due to the piston rod connections with the gates, a source of supply of fluid pressure medium, a main control valve having connection with said source and having connections with the two power cylinders; said valve being operable for application of the pressure medium to the cylinders to cause opening or closing actions of the gates, and a gravity valve in the connection for the application of gate closing pressure, and movable to different positions in accordance with tilt of the bowl for diverting the pressure medium to open the gate at the downwardly tilted end of the bowl only.

8. In a scraper of the character described, a bowl having load retaining gates at its forward and rearward ends, a pressure cylinder extending lengthwise of the bowl and centrally divided to provide opposite end power cylinders, pistons in the cylinders, rods extending from the pistons and connected, respectively, to the gates for their actuation, a bracket on the bowl for retaining the cylinder against endwise movement, and permitting movements incident to the gate actuation, and means for applying fluid pressure medium to the power cylinders for actuation of the gates.

9. A scraper as recited in claim 8, wherein the bracket has a guide slot therein, transverse to the direction of the cylinder, and the cylinder has a trunnion thereon, retained in the slot as the means for holding the cylinder against endwise movement.

10. In a scraper of the character described, a wheel supported frame, a dirt hauling bowl mounted in the frame for tilting forwardly or rearwardly about a medial, transverse axis; said bowl being open at forward and rearward ends, a gate for each of the open ends of the bowl mounted on the bowl for upward and downward swinging about transverse, horizontal axial lines, a cylinder at each side of and extending in a horizontal direction and longitudinally of the bowl, means dividing the cylinders to provide power cylinders in their opposite ends, a piston in each power cylinder, rods extending from the pistons and operatively connected with the gates, brackets fixed on the side walls of the bowl, and formed with vertically directed guideways, trunnions on the cylinders retained in said guideways, a source of supply of pressure medium, a main control valve for applying said medium to the cylinders for opening or closing the gates and a gravity valve in the connection with each cylinder for applying the gate opening pressure, said gravity valve being operable automatically to divert the pressure to the cylinders to open the gate at the lower end of the bowl only.

11. In a scraper of the character described, a bowl, open at its forward and rearward ends and supported for selective tilting from a neutral position toward the forward or the rearward end, load retaining gates at the said open ends of the bowl, power devices operable by fluid pressure medium and functionally connected with the gates to control their positions, and a manually operable valve common to said power devices for control of the application of pressure medium thereto for closing and holding both gates closed at any position of the bowl, and an automatic means operable with the application of gate opening pressure, to select the gate to be opened in accordance with the direction of tilt of the bowl.

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