

Jan. 7, 1941.

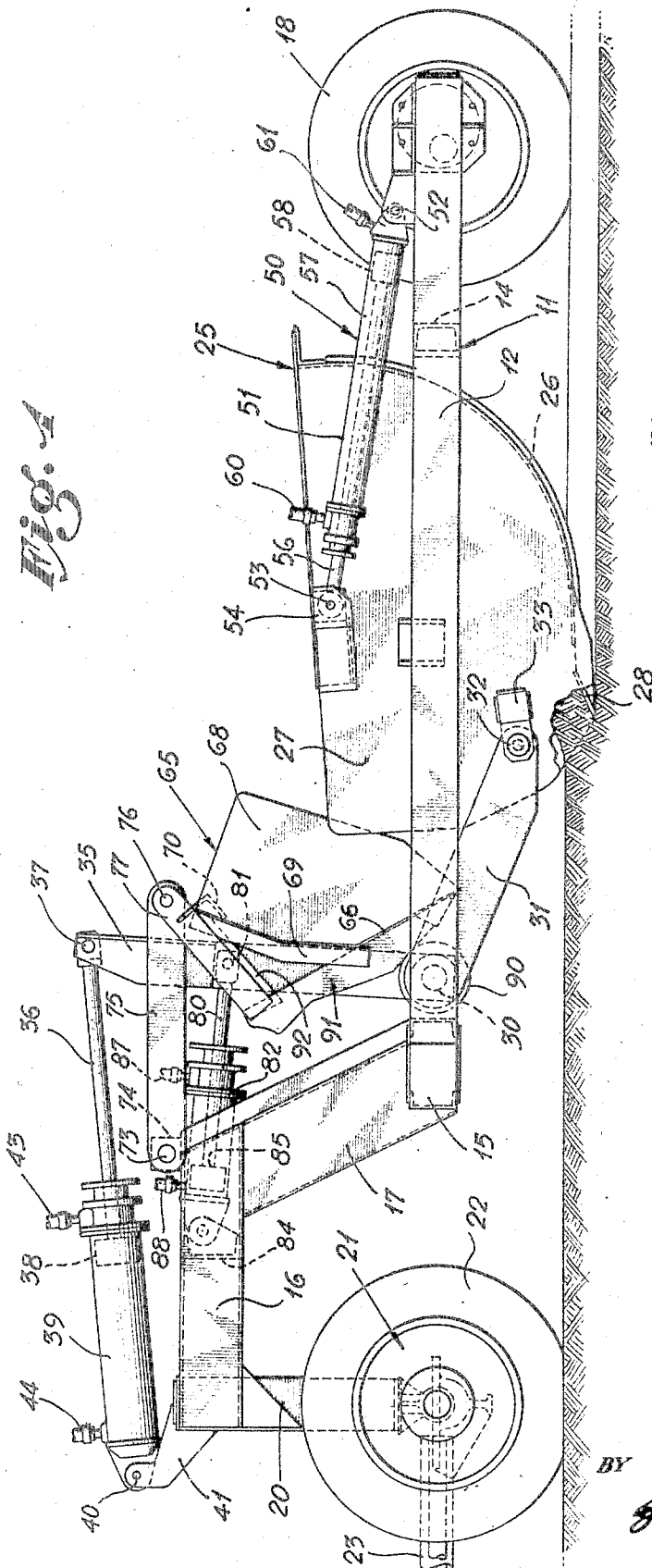
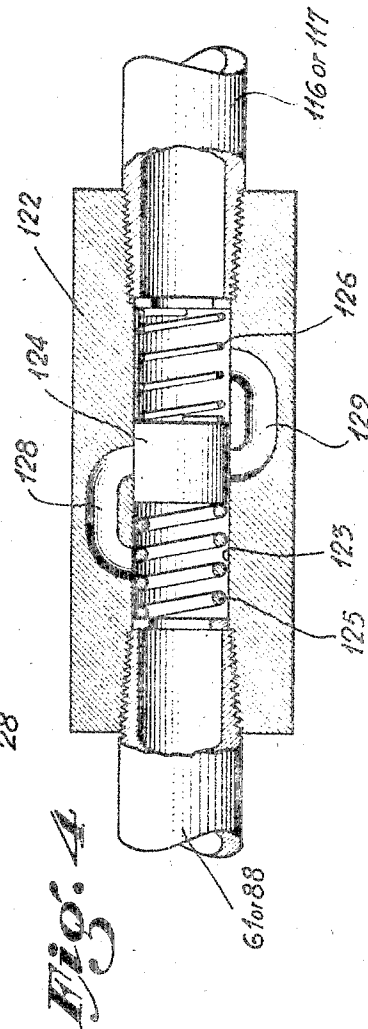
L. BERNER

2,227,433

SCRAPER

Filed Sept. 17, 1938

4. Sheets-Sheet 1



Jan. 7, 1941.

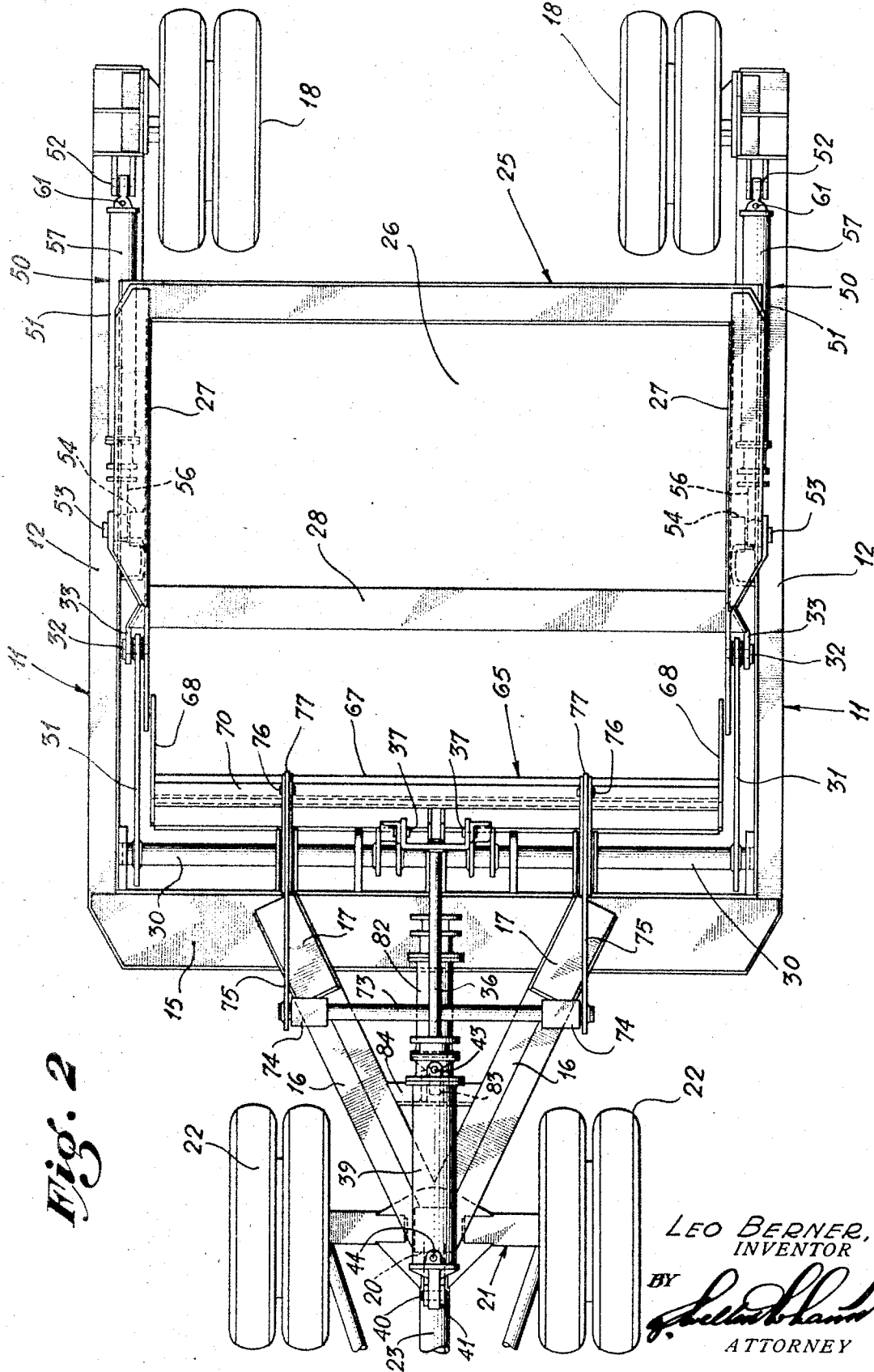
L. BERNER

2,227,433

SCRAPER

Filed Sept. 17, 1938

4 Sheets-Sheet 2



Jan. 7, 1941.

L. BERNER

2,227,433

SCRAPER

Filed Sept. 17, 1938

4 Sheets-Sheet 3

Fig. 3

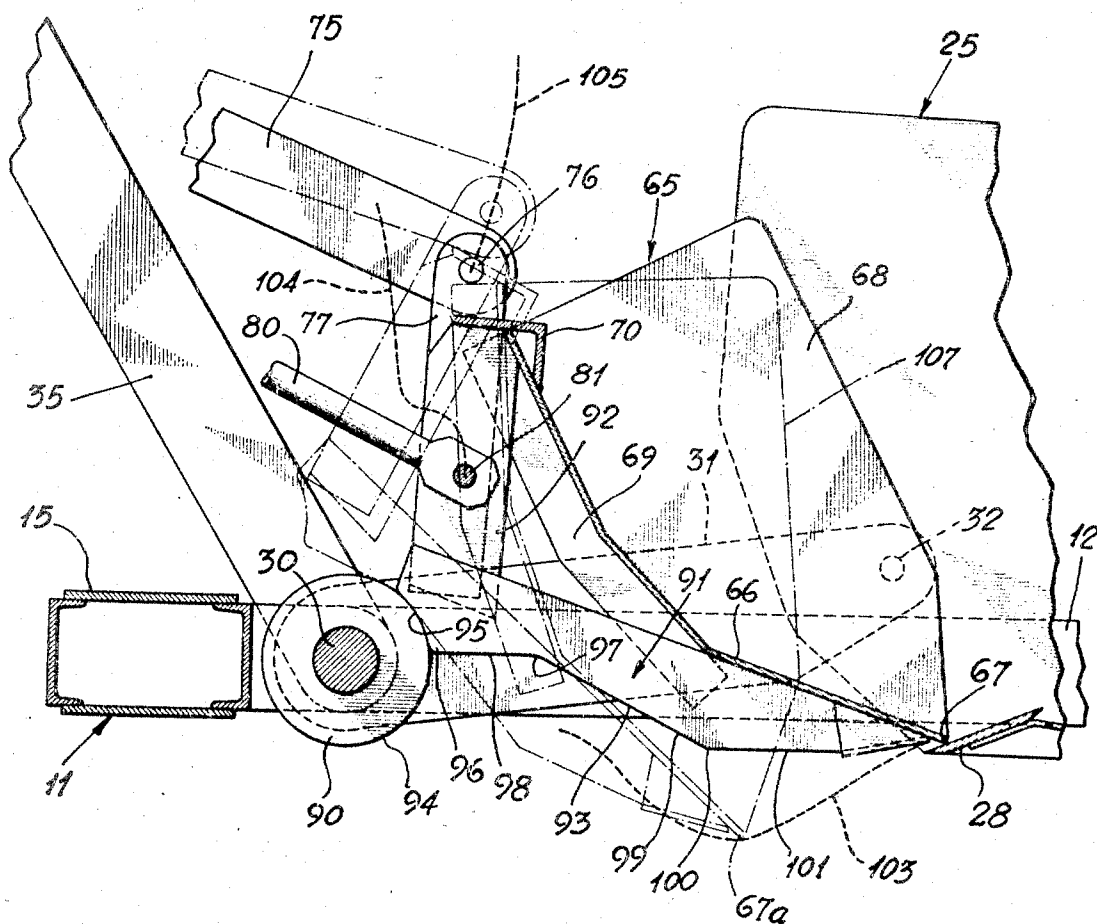
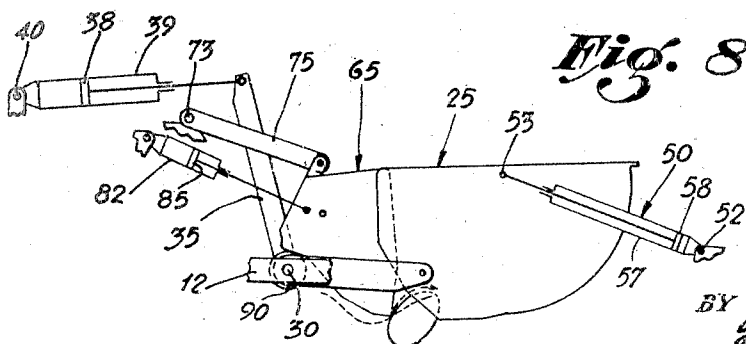


Fig. 8



LEO BERNER,
INVENTOR

BY *John H. Lane*
ATTORNEY

Jan. 7, 1941.

L. BERNER

2,227,433

SCRAPER

Filed Sept. 17, 1938

4 Sheets-Sheet 4

Fig. 6

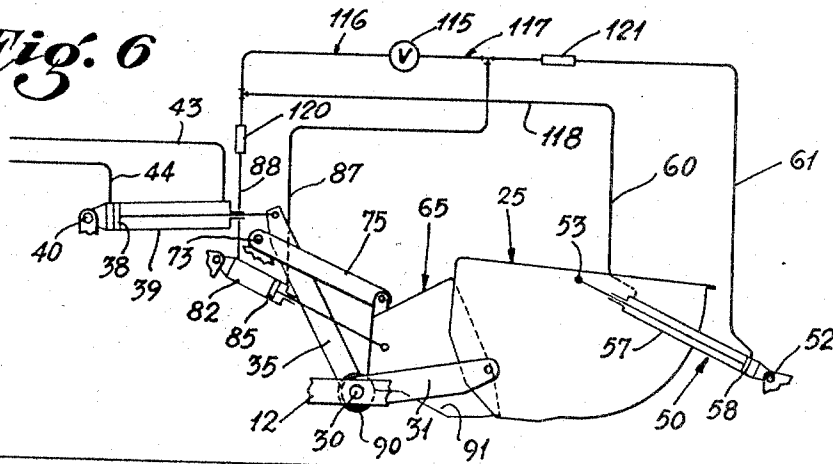


Fig. 5

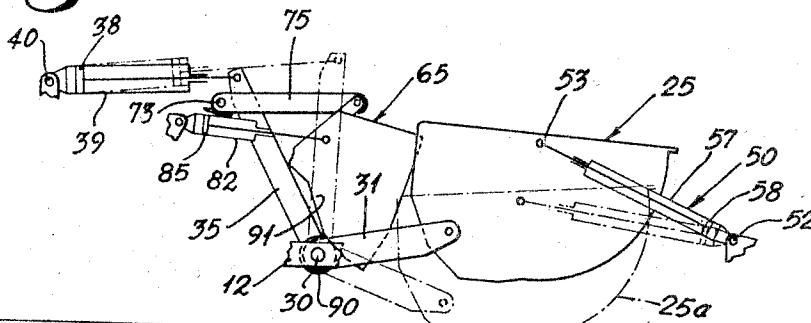
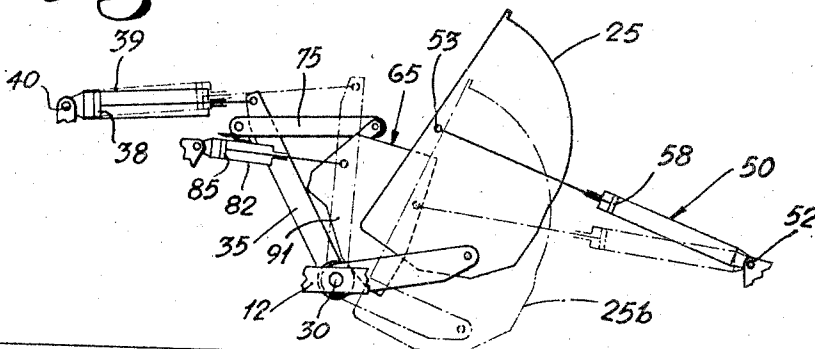


Fig. 7



LEO BERNER,
INVENTOR

BY

Sheldon Hand
ATTORNEY

UNITED STATES PATENT OFFICE

2,227,433

SCRAPER

Leo Berner, Huntington Park, Calif., assignor, by mesne assignments, to Be-Ge Manufacturing and Welding Works, Gilroy, Calif., a copartnership comprising Albert G. Gurries and James A. Bussert

Application September 17, 1938, Serial No. 230,438

7 Claims. (Cl. 37-126)

My invention relates to earth scrapers of the general type employed for digging, scraping, and transporting earth for the purpose of levelling ground, building roads, excavating, grading, etc.

5 My invention in its preferred form consists of a wheeled or wagon scraper having a bowl and apron which have certain unique features of construction and operation, and which uniquely co-
10 operate to produce a new combination. Not only is my invention new in its entirety, but the several subcombinations and elements thereof are new and susceptible of independent use. I there-
15 fore desire patent protection on my invention as a whole and also on its several subcombinations and elements as defined in the appended claims.

It is an object of my invention to provide a scraper which will require a minimum of power to move the loaded bowl from digging into carry-
20 ing position. In my invention the bowl is moved relative to the frame, and when moving the bowl into its various operating positions it is not necessary that the frame of the scraper be moved. This is an important consideration because it is
25 usually necessary to move the bowl while the scraper is being pulled forwardly, at which time the available power is being used for that purpose.

It is a further object of my invention to provide a scraper in which a preselected digging angle for the blade of the scraper may be maintained
30 for any depth of cut. In my invention the digging efficiency of the scraper blade may be maintained for a light cut, heavy cut, or medium cut.

It is a still further object of my invention to provide a scraper in which the bowl is supported
35 in substantially horizontal position in both digging and carrying positions. By virtue of this feature of my invention the bottom of the scraper will be substantially horizontal during loading so that but a minimum of force is required to
40 push the earth which has been removed by the blade rearwardly into the bowl. Furthermore, when the bowl is in carrying position the earth is not dumped forwardly by any change of the bowl from a substantially horizontal position.

45 It is a still further object of my invention to provide a scraper in which the bowl is supported by a pair of link means which approximate a parallel structure whereby the bowl does not, to any material extent, change its horizontal po-
50 sition when moved into its various digging positions or into carrying position.

It is a still further object of my invention to provide a scraper in which the bowl is supported
55 by link means pivotally connected to the bowl and to the frame of the scraper, and in which one of

the link means is operated to raise and lower the bowl, and in which the other of the link means is operated to move the bowl from its normal or horizontal position into a dumped or tilted position.

It is a still further object of my invention to provide a scraper in which there is no overhead structure above the bowl. By virtue of this construction it is possible to readily fill the bowl from above, if desired.

It is another object of my invention to provide a scraper which employs an apron adapted to cooperate with the bowl in order to carry the earth which is gathered in the bowl, which apron has a scooping action when it moves toward bowl closing position which enables the scraper to carry a larger load.

It is another object of my invention to provide a scraper having a bowl and an apron which may cooperate therewith in which the apron is floatably supported by the frame of the scraper and is readily raised if it is engaged by an obstruction during the operation of the scraper.

It is a still further object of my invention to provide a scraper having a bowl and an apron which cooperates therewith in which the apron is so supported that if during its movement into a position to close the forward end of the bowl it engages an obstruction positioned forwardly of the scraper blade, it will either lift the obstruction into the bowl, thus enabling it to fully close, or it will be deflected from its normally closing path and move into a closing position by passing above and around the obstruction.

Another object of my invention is to provide a scraper having a bowl and apron cooperating therewith in which the lip of the apron, when the apron is in a closed position, rests within the bowl and above the blade which is attached to the bowl.

It is a still further object of my invention to provide a scraper having a bowl and apron in which the apron is moved between open and closed position and in which a cam means is employed for determining the path of travel of the apron.

It is a further object of my invention to provide a scraper as defined in the preceding paragraph in which the cam means includes two parts, one of which is associated with the frame, and the other of which is associated with the apron, and in which these parts may be separated from each other so that the apron may float, if the apron or any part thereof engages an obstruction during either its opening or closing movement.

It is another object of my invention to provide

a scraper having a bowl and apron in which there is a common operating means for operating the apron and for dumping the bowl.

It is also an object of my invention to provide a scraper of the character referred to in the preceding paragraph in which the common operating means can not move the apron toward closed position unless the bowl is in a normal position or in which the bowl can not be moved toward a dumped position unless the apron is in an open position.

Other objects, features, and advantages of my invention will be referred to in the course of the following detailed description of a preferred form of my invention which I have chosen to describe and illustrate in order that those skilled in the art may be taught how to practice my invention.

Referring to the accompanying drawings:

Fig. 1 is an elevational view partly in section of a preferred form of my invention.

Fig. 2 is a plan view of Fig. 1.

Fig. 3 is a fragmentary sectional view showing the apron which constitutes an important part of my invention and the various positions thereof.

Fig. 4 is a sectional view of a unique valve which I employ in the hydraulic operating system of my invention.

Fig. 5 is a diagrammatic view illustrating the scraper in unloaded position.

Fig. 6 is a view illustrating the scraper in carrying position.

Fig. 7 is a view illustrating the scraper in dumped position.

Fig. 8 is a diagrammatic view showing the manner in which the apron operates when an obstruction lies forwardly of the blade.

Referring to the drawings, and particularly Figs. 1 to 3 inclusive, the scraper of my invention which I have chosen for the purpose of illustration includes a frame 11 having side beams 12, a rear transverse beam 14, and a forward or front transverse beam 15. The forward part of the frame 11 is in an elevated plane and consists of two horizontal beams 16 which converge at their forward ends, and which are connected to the transverse beam 15 by downwardly extending beams 17. The side beams 12 project rearwardly of the transverse beam 14 and carry supporting wheels 18. Projecting downwardly from the juncture point of the beams 16 is a pedestal 20 which carries a front truck 21 having wheels 22. Extending forwardly from the truck 21 is a draft bar 23. This portion of the scraper constitutes the frame and earth engaging means whereby the frame may be moved over the surface of the ground.

The numeral 25 represents a bowl which is positioned between the side beams 12 and the rear and front beams 14 and 15. The bowl has a bottom and back wall 26 and a pair of parallel side walls 27. The forward lower part of the bowl 25 supports a transverse digging blade 28 which is adapted to engage the earth and perform the digging or cutting operation, the earth passing rearwardly above the blade 28 and into the bowl 25.

For the purpose of raising and lowering the bowl between digging positions and carrying position, my invention provides a raising and lowering means. The raising and lowering means includes a cross-shaft 30 which extends transversely of the frame 11 between the side beams 12 and just to the rear of the front beam 15. Connected to the ends of the shaft 30 and inside the side beams 12 are arms 31 which constitute

front link means. The rearward ends of the arms 31 are pivotally connected by pivots 32 to the forward lower part of the bowl 25. As shown in Figs. 1 and 2, the arms 31 extend rearwardly outside the side walls 27 of the bowl 25 and the pivots 32 are supported by brackets 33 which are secured to the side walls 27. Connected to the central part of the shaft 30 and extending upward therefrom is an arm 35 to which a piston rod 36 is pivotally connected by means of a pivot 37. The piston rod 36 extends to a hydraulic operating means which includes a piston 38 which operates in a cylinder 39, the forward end of the cylinder 39 being pivotally connected at 40 to a bracket 41, the bracket 41 being secured to the forward part of the frame 11. Fluid conduits 43 and 44 are connected to the rear and front ends of the cylinder 39 for the purpose of moving the piston 38 either forwardly or rearwardly in the cylinder 39. These conduits may extend to the draft vehicle where they are associated with a control valve which controls the flow of fluid through the conduits 43 and 44 in a conventional manner.

Cooperating with the front link means 31 in supporting the bowl 25 is a rear link means 50 which includes links 51 on each side of the bowl which are pivotally connected at 52 to the rearward ends of the side beams 12, and which are pivotally connected at their forward ends by pivots 53 to the side walls of the bowl 25, there being suitable brackets 54 for attaching the pivot to the side walls 27. The front link means 31 and the rear link means 50 constitute a structure which in its action approximates the action of a parallel link system whereby the bowl is maintained in a substantially horizontal position when in its various digging positions or in its carrying position.

The link means 50 incorporates a dump means or tilting means for the bowl whereby the bowl may be rotated on the pivots 32 from a horizontal or normal position into a tilted or dumped position, such as is shown in Fig. 7. In the preferred form of my invention illustrated herein each link 51 is provided in the form of a piston rod 56 connected to the pivot 53, a hydraulic cylinder 57 connected to the pivot 52, and a piston 58 within the cylinder 57 and to which the rod 56 is connected. Conduits 60 and 61 are connected to the forward and rearward ends of each of the cylinders 57 whereby the piston may be moved in either direction for the purpose of lengthening or shortening the length of the links 51 in order to accomplish the movement of the bowl between dumped or tilted position or normal or horizontal position.

Adapted to cooperate with the bowl 25 is an apron 65 which includes a forward and bottom wall 66 having a rearward lip 67 and side walls 68 which extend rearwardly from the bottom wall 66 and which telescope within the side walls 27 of the bowl 25, and thus act as an aligning means for the apron and bowl. The apron is suitably reinforced by upright reinforcing bars 69 and a transverse reinforcing angle 70. The upper part of the apron is guided by a guide means, which is preferably provided in the form of a cross-shaft 73 which journals in bearings 74 carried by the converging beams 16, and arms or links 75 secured to the ends of the shaft 73 and extending rearwardly to the upper part of the apron 65 where they are pivotally connected thereto by pivots 76 secured to the apron 65 by attachment flanges 77. The guide links 75 are

free to move pivotally with the shaft 73 and permit the apron 65 to be raised and lowered or pivoted around the pivot 76 relative to the frame 11. The guide means just described constitutes a means which allows the apron to be raised or lowered or to pivotally move.

For the purpose of moving the apron forwardly and rearwardly, I provide an operating means including a rod 80 pivotally connected at 81 to the forward part of the apron 65, a hydraulic cylinder 82 pivotally connected at 83 to a cross-member 84 to the frame 11, and a piston 85 within the cylinder 82 to which the rod 80 is connected. Conduits 87 and 88 are connected to the rear and front ends of the cylinder whereby fluid may be introduced or removed in order to move the piston in the cylinder and thus move the rod 80 back and forth, which in turn moves the apron 65 forwardly or rearwardly.

For the purpose of guiding the apron through a predetermined path I provide a cam means which includes cam rollers 90 and cams 91. The cam rollers 90 are conveniently mounted to rotate on the cross-shaft 30 and the cams 91 are mounted on the lower part of the apron 65. The forward parts of the cams 91 are preferably welded directly to the wall 66, and the rearward ends thereof are supported by brace members 92 which extend upwardly and are secured to the upper part of the wall 66, the reinforcing bars 69, and the reinforcing angle 70. The cams 91 each have a cam surface 93 which is adapted to engage a cylindrical surface 94 of the roller 90 which cooperates therewith. Each cam surface 93 is provided with a forward curved portion 95 which at its rearward end terminates in a peak 96, a trough 97 formed by relatively plane surfaces 98 and 99, and a rearward peak 100 formed by the plane surface 99 and a plane surface 101. The cam surface 93 is so formed that the lip 67 has a path of travel indicated by the dotted lines 103. When the operating means of the apron is operated so as to move the apron 65 forwardly from the position shown in Fig. 3 into the position shown in Fig. 1, the lip 67 follows the path 103. The pivot 81 follows a path indicated by dotted lines 104 and the pivot 76 follows a path indicated by dotted lines 105.

The path of movement of the apron is a very important part of my invention, as will be more particularly pointed out during a discussion of the operation of my invention. It is to be noted, however, that when the apron is moved from the full line position as shown in Fig. 1 into the full line position as shown in Fig. 3 the lip 67 moves downwardly and forwardly to a lowermost position, at which time the apron 65 is in a position indicated by dotted lines 107, the lip 67 at this time occupying a position 67a. During further rearward movement of the apron 65 the lip 67 moves upwardly and during the last part of its travel moves forwardly, as indicated, so that the lip 67 may move into a position within the bowl 25 and above the forward edge of the blade 28.

The operating means for the apron and the dump means for the bowl are connected to a single control means so that the operator may operate the apron and move the bowl between normal and tilted positions by a single operating lever. As shown in Fig. 6 wherein I diagrammatically illustrate the common control means, the numeral 115 represents a conventional fluid

control valve whereby fluid may be delivered to either of the conduits 116 or 117 and withdrawn through either of these conduits. The conduit 116 is connected to the conduit 88 of the cylinder 82 and is also connected to a conduit 118 which is in turn connected to conduits 60, one of which is extended to the forward part of each of the cylinders 57. The conduit 117 is connected to the conduit 87 of the cylinder 82 and is also connected to conduits 61, one of which is connected to the rear end of each of the cylinders 57. Provided in the conduit 116 below the point where the conduit 118 connects thereto is a control valve 120, and connected in the conduit 117 below the point where the conduit 87 is connected thereto is a control valve 121. These control valves are of the same type and are illustrated in section in Fig. 4. Each of the valves includes a body 122 having a passage 123 in which a valve piston 124 is slidable. This valve piston is held in a central position by springs 125 and 126, and when in this central position prevents the passage 123 from communicating with the passage 129. When the valve piston 124 is in the position shown in Fig. 4, the conduit 116 or 117 is out of communication with the conduit 61 or 88, and no fluid can flow from one to the other. The spring 125 is of such a strength that fluid pressure of approximately 250 lbs. in the conduit 116 or 117 is required to move the valve leftwardly to connect the passages 128 and 129 and thus allow fluid to flow from the conduit 116 or 117 through the valve 120 or 121 and into the conduit 61 or 88. The spring 126, however, is made relatively light so that a very small pressure, such as 2 lbs. pressure, will move the valve piston 124 rightwardly to connect the passages 128 and 129 and allow fluid to flow through the valve.

I will now describe the operation of the scraper. In Fig. 5 I have shown the parts in a normal elevated position in which the scraper is unloaded. The bowl 25 is at this time in a raised position, the piston 38 being moved forwardly in the cylinder 39. The apron 35 is in an open position which is a forward position, the piston 85 being in a forward position in the cylinder 82. The operator first moves the bowl into a digging position, as illustrated in full lines in Fig. 1 and by dotted lines 25a in Fig. 5. This is done by delivering fluid through the conduit 44 and withdrawing it through the conduit 43, thus moving the piston 38 rearwardly in the cylinder 39. During this movement the bowl is moved downwardly, being supported by the front and rear link means 33 and 50, respectively, and by virtue of the relationship between these link means and the points of pivotal connection, the bowl 25 is maintained in a generally horizontal position. Any depth of cut may be obtained by operating the hydraulic operating means, and regardless of the depth of cut the bowl will have approximately the same relative cutting position and the angle of the blade with respect to the ground will not materially change for each cutting position. The scraper is moved forwardly with the parts in the positions shown in Fig. 1 until the bowl is filled and at this time not only is the bowl filled, but earth is piled in front of the bowl. The operator then moves the parts from the positions shown in Fig. 1 into carrying position, as shown in Fig. 6. This is done by returning the bowl 25 to its original position, as shown in Fig. 5, and by moving the apron into a relatively closed position. This is

done by supplying fluid through the conduit 88 and withdrawing it through the conduit 87, thus moving the piston 85 rearwardly in the cylinder 82. As the apron moves rearwardly it first moves downwardly into a lowermost position, as illustrated by dotted lines 107 in Fig. 3, and then moves upwardly and rearwardly and at this time acts to scoop up the earth which is piled in front of the blade 28, and in this way a relatively large load is carried in the bowl. This operation of moving the parts from digging to carrying position may be performed by raising the bowl slightly, then moving the apron rearwardly, then again raising the bowl a slight amount, and again moving the apron rearwardly an additional amount until the bowl is in a raised position and the apron is in a rearward closing position. If desired, the bowl may be completely raised first or the apron may be moved to closed position first in accordance with the particular material being worked on.

When it is desired to dump the earth, the apron 65 is again moved into open position and the bowl is moved into a dumped position, as shown in Fig. 7. This is accomplished by supplying fluid through the conduits 61 and withdrawing fluid through the conduits 60 in order to move the pistons 58 forwardly in the cylinders 57. This swings the bowl around the pivots 32 from normal position into dumped or tilted position. If it is desired to employ the blade 28 as a levelling means, the bowl may be lowered into a position indicated by dotted lines 25b of Fig. 7, at which time the load will be spread or levelled over the ground.

The raising and lowering of the bowl 25 is accomplished independently of the operation of the apron 65 or of the dumping of the bowl, and the control means for the hydraulic piston and cylinder arrangement 38 and 39 is independent of the control means for the apron and dumping means. The apron operating means and the dumping means, however, are interrelated so that the apron can not be moved into a closed position when the bowl is in a dumped position and so that the bowl can not be moved into a dumped position unless the apron is in an open position. This interrelation of operation is accomplished as follows: When the control means 115 is operated to supply fluid through the conduit 116 and withdraw it through the conduit 117, fluid will first flow through the conduit 118 and the conduits 60, thus forcing the pistons 58 rearwardly in the cylinders 57 and moving the bowl into and retaining it in a normal position. No fluid can be supplied to the conduit 88 until a relatively high pressure has been built up in the forward parts of the cylinders 57. In practice I find that 250 lbs. is the desired pressure. After this pressure has been built up the valve 120 is then opened and fluid under pressure is supplied to the cylinder 82, thus moving the piston 85 rearwardly. It will be seen, therefore, that it is impossible to move the apron into a closed position unless the bowl is in a normal or horizontal position. When the control means 115 is operated to supply fluid under pressure to the conduit 117 and withdraw it through the conduit 116, the fluid is first delivered through the conduit 87 to the cylinder 82 and the piston 85 is moved forwardly. No fluid can be supplied to the conduits 61 until a high pressure has been built up in the conduit 87 and rearward part of the cylinder 82 sufficient to move the piston 85 forwardly. After this pressure has been built up

the valve 121 then opens and fluid may be supplied through the conduits 61 to the rearward parts of the cylinders 57 and at this time force the pistons 58 forwardly in order to move the bowl into dumped position.

The apparatus which I have heretofore described is a preferred form of my invention, but it should be understood that my invention is not limited to the details of construction shown and described but may be embodied in other forms, and my invention therefore should be construed in accordance with the statement of invention and the appended claims. During the course of the preceding description I have inserted explanations and broadening statements with a view of defining the true breadth of my invention, but my failure to do so in any particular respect is not to be construed as a disclaimer of any rights which I may be entitled to over the prior art. The combination of my invention in its entirety provides a superior structure, but various parts and subcombinations of the whole of my invention might be eliminated and only a part of the advantages and new results enjoyed. For example, the particular bowl and control mechanism might be used with another type of apron and control mechanism. The apron and control mechanism of my invention might be used with some other type of bowl and bowl mechanism. It is my intention to cover by the appended claims the combination as a whole and to separately claim all subcombinations or parts which are patentably new and capable of use in a scraper other than that shown herein.

I claim as my invention:

1. A scraper including a wheel-mounted frame, a bowl supported by said frame having a normal position and a dump position, an apron supported by the frame to cooperate with the bowl at the front thereof and having an open position and a closed position relative to the bowl, apron moving means, bowl operating means to move the same between normal and dump positions, and control connections between said moving means and operating means and including means to effect an apron closing movement only if the bowl is in or below normal position and to effect a bowl dumping movement only after the apron is open.

2. A scraper including a wheel-mounted frame, a bowl supported by said frame having a normal position and a dump position, an apron supported by the frame to cooperate with the bowl at the front thereof and having an open position and a closed position relative to the bowl, apron moving means, bowl operating means to move the same between normal and dump positions, and control connections between said moving means and operating means and including means to effect an apron closing movement only if the bowl is in or below a normal position and to effect an apron opening movement irrespective of bowl position; and to effect a bowl dumping movement only after the apron is open.

3. A scraper including a wheel-mounted frame, a bowl supported by said frame having a normal position and a dump position, an apron supported by the frame to cooperate with the bowl at the front thereof and having an open position and a closed position relative to the bowl, apron moving means, bowl operating means to move the same between normal and dump positions, and control connections between said moving means and operating means and including means to ef-

fect an apron closing movement only when the bowl is in or below normal position, to effect a bowl dumping movement only when the apron is open, and to effect a bowl return movement irrespective of apron position.

4. A scraper including a wheel-mounted frame, a bowl supported by said frame having a normal position and a dump position, an apron supported by the frame to cooperate with the bowl at the front thereof and having an open position and a closed position relative to the bowl, apron moving means, bowl operating means to move the same between normal and dump positions, and control connections between said moving means and operating means and including means to effect an apron closing movement only when the bowl is in or below a normal position and to effect an apron opening movement irrespective of bowl position; and to effect a bowl dumping movement only when the apron is open and a return movement irrespective of apron position.

5. A structure as in claim 1, in which the apron moving and bowl operating means comprise separate hydraulic units, each including a cylinder, conduits leading to and from the cylinders, a manual valve connected to said conduits to control the flow to the cylinders alternately, and means including other conduits connecting the first named conduits arranged with respect thereto and to the cylinders so that when the valve is operated to deliver fluid to the bowl operating cylinder to tilt the same, such fluid will first be fed to the apron moving cylinder in a direction to open the same, and when the valve is operated to deliver fluid to the apron moving cylinder to close the apron, the fluid will first be fed to the bowl operating cylinder in a direction to return the bowl to or hold the same in a normal position.

6. A scraper including a wheel-mounted frame, a bowl supported by said frame having a normal position and a dump position, an apron supported by the frame to cooperate with the bowl at the front thereof and having an open position and a closed position relative to the bowl, apron moving means comprising a hydraulic unit including a cylinder, bowl operating means to move the same between normal and dump positions and comprising a hydraulic unit including a cylinder, a fluid feed conduit leading to that end of the apron cylinder which will cause the apron to be closed, a second fluid feed conduit leading to that end of the bowl cylinder which will cause the bowl to be tilted, a valve connected to said conduits to alternately control the feed of fluid therethrough, a return conduit from the other end of the apron cylinder to the second conduit intermediate its ends, a second return conduit from the other end of the bowl cylinder to the first conduit intermediate its ends, and means in the first and second conduits to cause the fluid, when the valve is operated to feed through either of such conduits, to the corresponding cylinder to first feed to the other cylinder through the return conduit thereof.

7. A structure as in claim 6, in which said last named means comprises a relatively high pressure yieldable check valve in the first conduit between the apron cylinder and the point of connection of the second return conduit, said first conduit opening toward said cylinder and a similar check valve in the second conduit opening toward the bowl cylinder and interposed between said cylinder and the point of connection of the first return conduit with said second conduit.

LEO BERNER.