Aug. 18, 1953 W. R. ANDERSON 2,648,920

CARRY-TYPE SCRAPER AND DIGGING FRONT APRON ARRANGEMENT

Filed April 4, 1947 4 Sheets-Sheet 1

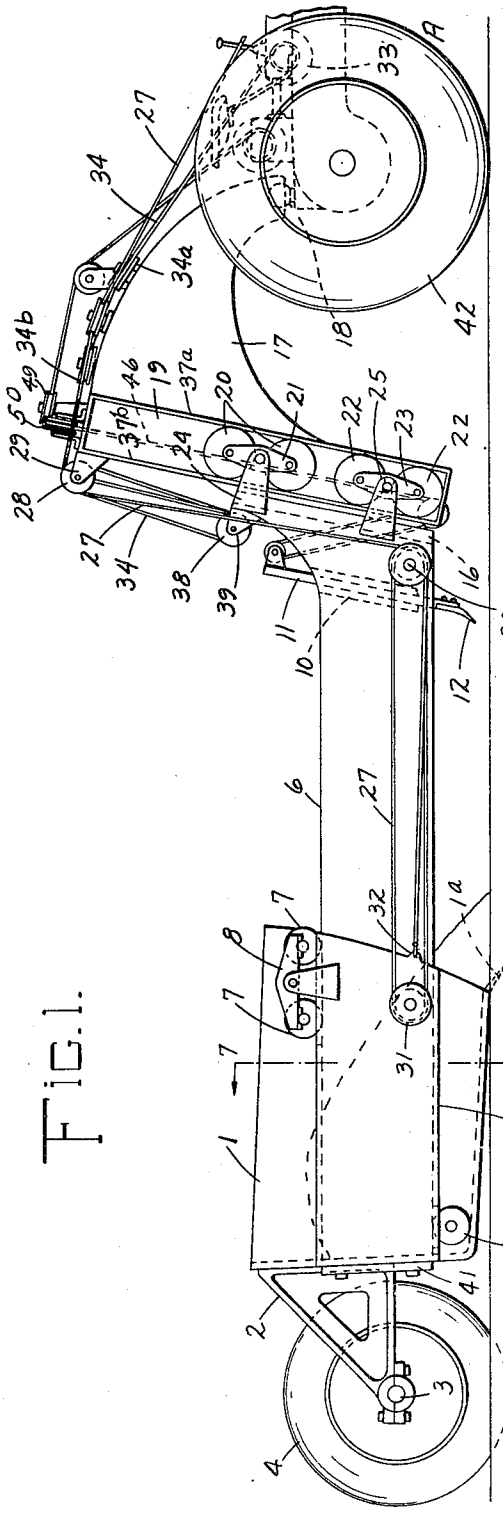

FIG. 1.

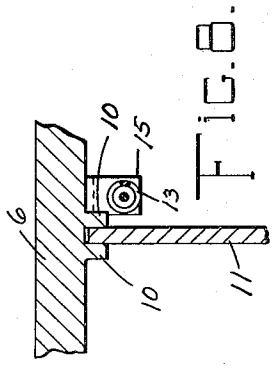

FIG. 8.

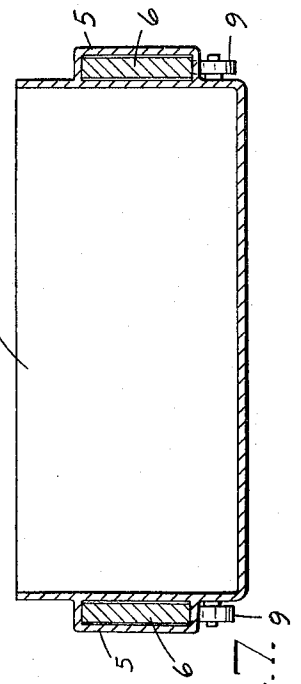

FIG. 7.

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CARRY-TYPE SCRAPER AND DIGGING FRONT APRON ARRANGEMENT

Filed April 4, 1947 4 Sheets-Sheet 2

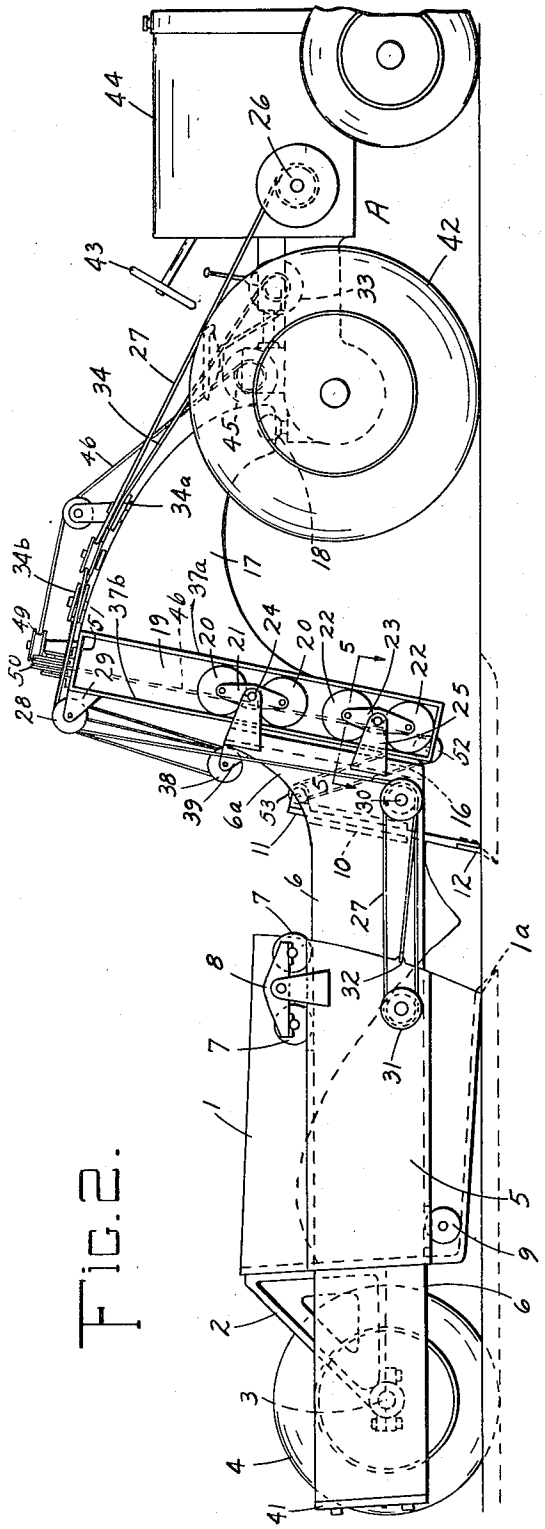

Fig. 2.

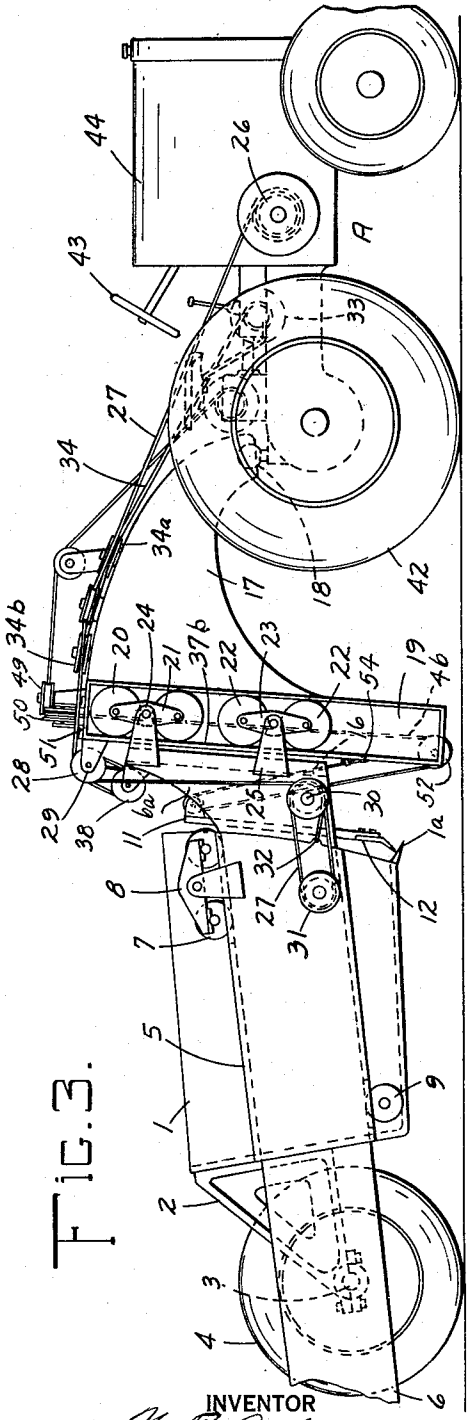

Fig. 3.

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Aug. 18, 1953 W. R. ANDERSON 2,648,920

CARRY-TYPE SCRAPER AND DIGGING FRONT APRON ARRANGEMENT

Filed April 4, 1947 4 Sheets-Sheet 3

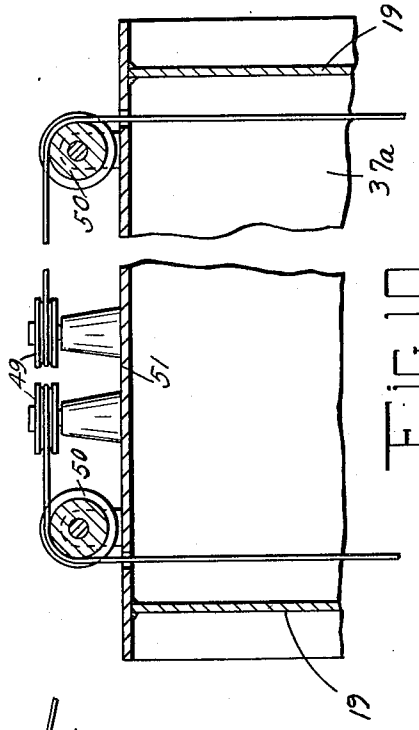

FIG. 10.

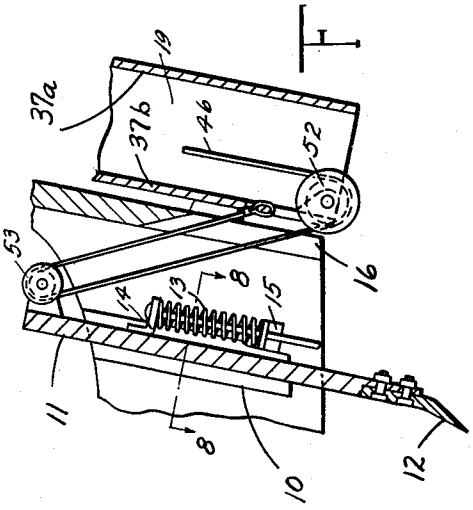

FIG. 6.

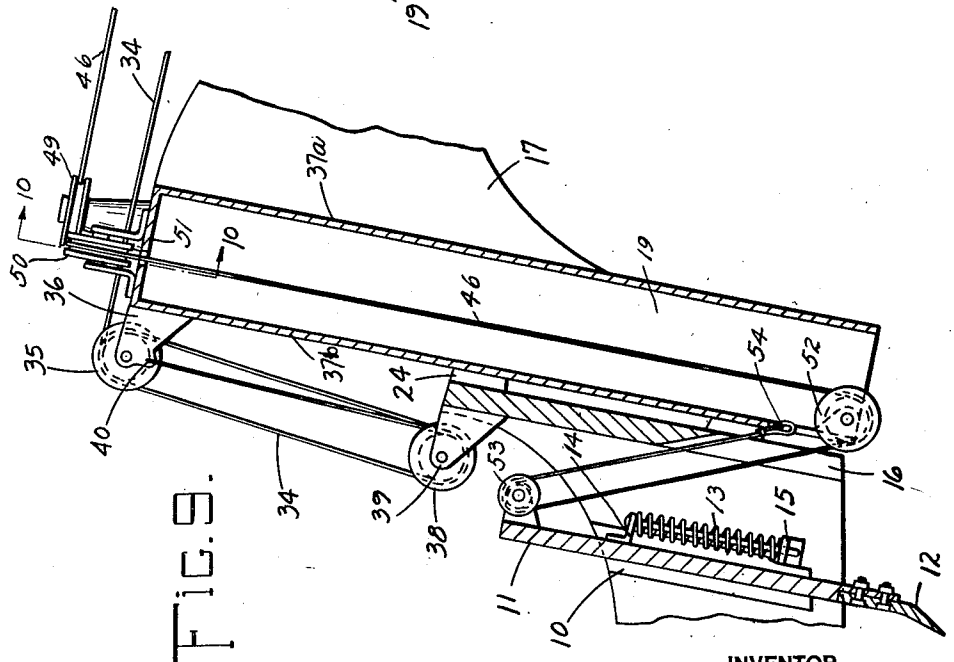

FIG. 9.

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Aug. 18, 1953 W. R. ANDERSON 2,648,920

CARRY-TYPE SCRAPER AND DIGGING FRONT APRON ARRANGEMENT

Filed April 4, 1947 4 Sheets-Sheet 4

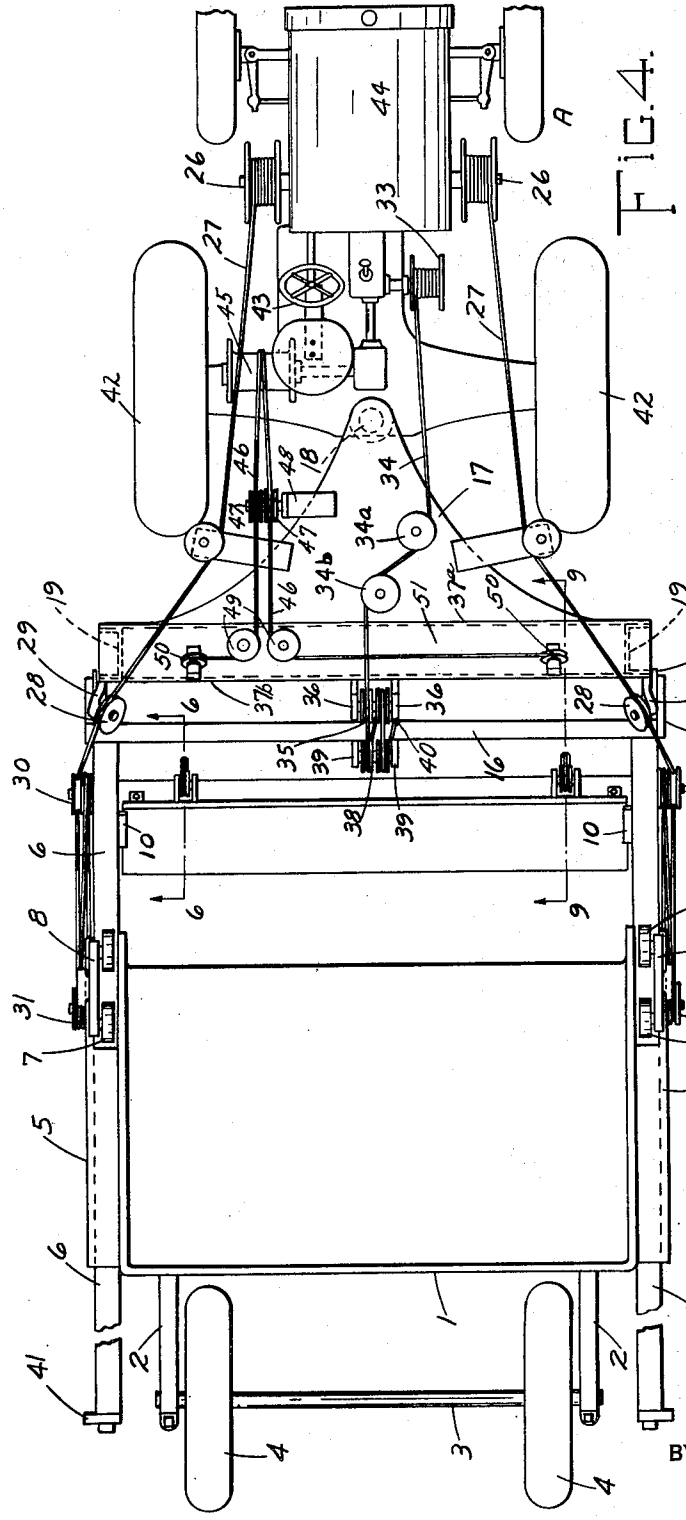

FIG. 4.

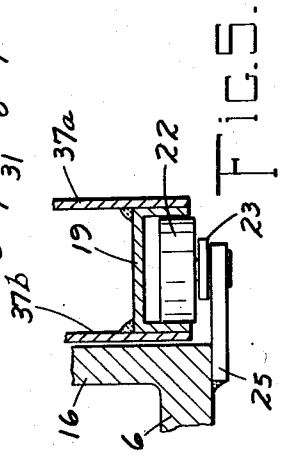

FIG. 5.

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UNITED STATES PATENT OFFICE

2,648,920

CARRY-TYPE SCRAPER AND DIGGING FRONT APRON ARRANGEMENT

Walter R. Anderson, Cleveland, Ohio, assignor to Koehring Company, Milwaukee, Wis., a corporation

Application April 4, 1947, Serial No. 739,386

16 Claims. (Cl. 37—126)

1

My present invention embodies a novel construction of dirt digging, scrapping and loading machine, commonly known in the art as a dirt scraper. This invention involves a machine of the improved type disclosed in my co-pending application Ser. No. 414,862 field October 13, 1941, now Patent No. 2,418,813 issued April 15, 1947, but utilizing a pulling tractor vehicle and wheeled scraper body, a six-wheel unit, as distinguished from my previous machine comprising a four wheel machine.

My machine of this application operates in accordance with a novel principle of action employed in the scraper of my said application, by which, under the self contained power of the machine, the bowl or body in which the dirt is to be loaded is driven forward by traction to load it as much as possible by the traction effort. When the loading by traction is no longer effective due to meeting of heavy digging resistance there is brought into action a secondary scraper which digs and scrapes undug earth in advance of the bowl scraper to carry such material into the bowl to complete the loading of the latter with a full pay-load.

In carrying out my present invention the operation of the main body scraper and the secondary scraper is controlled from the pulling tractor, and the power of the latter is used for this purpose, as well as to drive the whole machine at high speed to and from the side of digging and scraping for the respective digging and dumping operations necessary to be performed.

My present invention involves a novel operating machine of the type above set forth, utilizing a pulling tractor, and in which the load carrying bowl may be partly filled by forward scraping action under traction, and finally fully filled with the complete payload by operation of a rearwardly operating digging scraper moving toward the bowl, the last mentioned action taking place independently of traction effort of the pulling traction, or if desired, under power supplied independently of traction supplemented by the rearward or reverse driving traction of tractor.

A full understanding of the improvements of this invention will be had on reference to the following description, and to the accompanying drawings, in which:

Figure 1 is a side elevation of my scraping machine, the front end portion of the front pulling tractor being broken away, the main scraper and digging element of the bowl or body being shown as when in operation, and the front scraping and

2

digging element shown disposed in inactive position.

Figure 2 is a view similar to Figure 1 but illustrating substantially my entire machine including the front tractor, this view showing the front scraper in its digging position and as when moved rearwardly toward the rear bowl scraper in the operation of digging and loading material into the latter.

Figure 3 is a view similar to Figure 2 but showing the front scraper in juxtaposed position closing the main body or bowl of the machine, and the latter elevated to its loaded position above the ground ready to be carried off with relatively high speed operation of the machine, to a place of dumping of the load.

Figure 4 is a top plan view of my machine bringing out more clearly certain of the cable operating instrumentalities by which the loaded bowl of the machine may be elevated when filled, and lowered when empty; also the operating cable means for producing the relative longitudinal movement of the front frame section of the machine, respecting the rear wheeled body section.

Figure 5 is a sectional view taken on the line 5—5 of Figure 2 looking in the direction of the arrows.

Figure 6 is a fragmentary vertical sectional view taken on the line 6—6 of Figure 4.

Figure 7 is a vertical sectional view taken about on the line 7—7 of Figure 1.

Figure 8 is a fragmentary sectional view taken about on the line 8—8 of Figure 6.

Figure 9 is a fragmentary section taken on the line 9—9 of Figure 4 showing the front scraper cable operating means.

Figure 10 is a vertical section on the line 10—10 of Figure 9.

I describe the construction of my machine in detail as follows:

My machine comprises a main body rear section comprising the body 1 having attached to its rear closed end suitable brackets 2 for supporting a rear axle 3 on which the rear wheels 4 are mounted, said wheels being located of course behind the body 1, which is a dirt or load receiving bowl.

The body 1 is equipped at its opposite sides with tubular guides 5 extending longitudinally thereof and receiving therein longitudinal frame members 6 which are adapted to slide freely in said guides 5, the friction between the parts 5 and 6 in a vertical direction being relieved in part by employing the upper anti-friction rollers

7 supported by equalizing beams 8, and engaging the upper edge portions edge portions of the members 6 through slots in the upper sides of the tubular guides or channels 5. Also I provide lower anti-friction rollers 9 carried by the lower portion of the body 1 at opposite sides, similarly riding against the lower edges of the guide sections 6 at the rear portion of my machine.

The front frame and guide sections 6, as before stated slide freely through the guide members 5, and mounted near the front ends of the members 6 in vertical guide channels provided by spaced ribs 10 projecting from the inner faces of the members 6, is a front scraper 11 having the digging blade 12 at its lower edge.

The front scraper 11 is movably mounted at the front ends of the frame member 6 of my machine, and is adapted to be lowered so as to project a greater or less distance from the lower edges of the members 6, by cable means to be later herein described. Normally the scraper 11 is held in upraised position relatively to the side members 6 by springs 13, each disposed between a bracket 14 on the scraper 11 and a bracket 15 on the lower front portion of the adjacent frame member 6.

The front ends of frame members 6 are connected by a cross plate 16 extending transversely of the machine, and said front end portions of the parts 6 are also extended upwardly as shown at 6a. In advance of the members 6 and 16, I provide a mounting arm 17 of front narrow dimension equipped at its front end with a suitable socket to receive the ball 18 on the rear end of the pulling tractor vehicle A. In this way a ball and socket substantially universal connection is provided at 18 between the arms 17 and the vehicle A, and the arm 17, as seen in Figure 4 primarily is dimensioned so that it widens rearwardly toward its rear end where it carries at opposite sides of the machine a pair of vertical guide channels 19. The guide channels 19 receive therein an upper pair of guide rollers 20 mounted on an equalizing beam 21, and a lower pair of such rollers 22 mounted upon an equalizing beam 23.

Each of the parts 19 receives therein upper and lower rollers as above described and the beam 21 of the rollers 20 is pivoted to a bracket 24 rigid with the front end of the adjacent frame section 6a, while the beam 23 of each lower pair of rollers is pivoted to a bracket 25, beneath the bracket 24, and also carried by the front end of the adjacent frame member 6 or 6a. In the above manner it will be apparent that the riding of the rollers 20 and 22 upwardly in their channel 19 will admit of vertical movement of the front end portions of the members 6, either upwardly or downwardly.

The operating means for controlling longitudinal movement of the frame members 6 and scraper 11 relative to the bowl 1 includes a pair of winch drums 26 mounted upon the front portion of the pulling tractor A. As seen from the drawings from each of the drums 26 there passes a cable 27 leading over guide roller means on the mounting arm 17 rearwardly over a sheave 28 on a bracket 29 at the top of the guide channel 19 on the side of the arm 17 at which the winch drum 26 is located. From the sheave 28 each cable 27 leads downwardly over one of two sheaves mounted upon a stub shaft 30 projecting outwardly from the front end of the adjacent member 6. From the last mentioned sheave the cable 27 leads rearwardly around a sheave 31 on the adjacent outer side and near the front end of the guide member 5. Thence the cable 27 leads forwardly around a second sheave on the stub shaft 30 and thence extends rearwardly and is deadended at 32 on the front end of the adjacent side of the part 5.

It is contemplated of course that the winding up operations of the cables 27 on the winches 26 shall be simultaneous, and the winch drums shall be unclutched simultaneously from the driving shaft means therefor, in the operation of my machine. The winding up of the cables 27 on the drums 26 will of course tension such cables so as to cause a relative movement of the scraper 11—12 toward the bowl 1. Under these conditions the tractor A may travel rearwardly with brakes released so the scraper 11—12 moves in the direction of the open bowl 1 seen in Figure 2, for the rearward digging movement of the scraper 11—12.

For controlling the elevation of the bowl 1 with the rear scraper 1a, which is attached to the front edge of the bottom of the open bowl 1, and the members 6 which support the bowl, as well as the lowering of these parts, I provide on the tractor A a windlass drum 33 of a suitable winch operable from the engine of the tractor A. A cable 34 winds and unwinds on the drum 33 and leads rearwardly therefore around a pulley 34a and a second pulley 34b to one of upper multiple sheaves 35 which are supported on brackets 36 attached to a rear cross plate 37a that connects the vertically disposed channels 19 previously referred to, being spaced from the front similar cross plate 37b. Cable 34 then passes downwardly around one of lower multiple sheaves 38 on brackets 39 fixed to the member 16, thence upwardly around a second one of the upper multiple sheaves 35, and down around a second one of the multiple sheaves 38 and thence upwardly to a point of deadending indicated at 40 on the bracket 36, and shown clearly in Figure 9, of the drawings.

It will be apparent from the foregoing that by letting out of the cable 34 the winds of the cable between the multiple sheaves 35 and 38 will lengthen and permit the lowering of the arms 6, since the multiple sheaves 38 are mounted on the bracket means 39 that are attached to the rear face or side of the cross plate 16 which connects the front ends of the arms 6. The lowering of the arms 6 by the letting out of the cable 34 in the manner stated will of course enable the rear scraper 1a of the bowl 1 to enter the ground to a predetermined desired depth, the front scraper 11—12 being at such time maintained at an upward adjusted position as seen in Figure 1. Under the conditions shown in Figure 1 the rear scraper 1a only is effective to perform digging and scraping work in the undug earth as the machine progresses forwardly, or when the bowl 1 is moved relatively toward the scraper 11—12 as later described.

I provide means to cause the front scraper 11—12 to positively diggingly engage the undug ground ahead of the bowl 1 a considerable distance ahead of the bowl, so that by a movement of said scraper relatively toward the bowl, the scraper 11—12 will contribute a large amount of freshly dug and scraped material to accumulate in the bowl with that dug and scraped by the main scraper 1a.

For the above purpose I use a power drum or winch 45 on the tractor A, same adapted to be driven by a power take-off from the engine 44

of said tractor. From the drum 45 lead two cables 46 arranged to wind and unwind on drum 45, said cables extending rearwardly over guide sheaves 47 on a bracket 48 on the arm of gooseneck 17. Thence cables 46 lead around sheaves 49 in opposite directions outwardly over sheaves 50 on a top closing plate 51 connecting the upper ends of the guides 19. From the sheaves 50 cables 46 extend down through openings in said plate 51 underneath sheaves 52 on the lower portions of the rear plate 37a attached to channel guides 19. Thence cables 46 lead through the front plate 37b upwards over sheaves 53 on the front upper portion of the scraper member 11 and back to points of dead ending 54 on the front plate 37b.

By operation of the drum 45 to wind up the cables 46 it will be seen that the front scraper 11—12 may be forced into the earth to a depth determined by the operator and held at such depth while the bowl 1 and the front scraper 11—12 are caused to move relatively toward one another by operation of the drums 26 and cables 27. Relieving of the pull on the cables 46 will permit the upward movement of the scraper 11—12, relatively to the arms 6 by the expansion of the coil springs 13 previously mentioned.

So great is the power obtainable from the motor 44 at the winch or drum 45, that the entire weight of the forward portions of the arms 6, parts 16, 19, 37 and the rear end of the tractor A may be applied to the blade 12 of the scraper 11, in effecting its earth penetrating action.

In order that during the forward travel of the machine of my invention the pulling load may not be carried by the cables 27 when the parts of the machine are adjusted as shown in Figure 1, I provide on the rear ends of the arms 6 outwardly projecting abutment members 41 which are adapted to engage the outer sides of the guide members 5 so that the pulling stresses of the tractor vehicle A will be transmitted directly to the digging bowl 1 through the arms 6 which of course are mechanically tied to the arms 17 of the pulling tractor A through the medium of the coupling guide rollers 20 and 22 the brackets 24 and 25 supporting said rollers, and the channels 19.

With the foregoing understanding of the construction of my machine, and noting that the operator will be stationed on the tractor A seated on the seat 42 adjacent to the steering wheel 43, and the engine 44, I will now set forth the operation of my machine as regards its preferred performance.

The cable 34 will be slackened out or paid out from the drum 33, when the machine arrives at the site where the digging and scraping operations are to be performed in its condition seen in Figure 3. The above action will permit the bowl 1, its scraping blade or member 1a, and the arms 6 that carry said bowl, to lower until the blade 1a, which is the rear scraper of the machine, penetrates the undug earth. Next the tractor A will be propelled forwardly by its engine 44 and the cables 27 will be paid out by unclutching the drums 26 from the driving shaft for the same. Thus in the forward movement of the machine initially, by means of the tractor A, the bowl 1 and the rear wheels 4 will be temporarily stationary until the arms 6 are drawn forwardly in the guide members 5, and the abutment parts 41 at the rear ends of said arms strike the rear ends of the parts 5. The continued forward movement of the machine by the traction of the tractor A will then cause the digging action of the rear scraper 1a of the bowl 1 after the manner illustrated in Figure 1. During this operation the front scraper 11—12 is out of action and the scraping, digging and loading of the rear section of the vehicle or machine is being performed solely by means of the scraper 1a working under the forward traction effort of tractor A. After the machine has proceeded forwardly to the extent of loading a major portion of the pay load into the bowl A by means of the scraper 1a the operator on the tractor A will start the operation of the drum 45 for winding therein the cables 46 at about the time that traction of the tractor A becomes ineffective to move bowl 1 and the scraper 1a forward, due to the spinning of the rear traction wheels of said tractor. The action of cables 46 causes front scraper 11—12 to penetrate the earth. Forward travel of the tractor is now discontinued.

The front scraper blade 12 having penetrated the undug earth in advance of the bowl 1 to the desired depth the operator will now clutch in the winch drums 26 and thereby cause relative movement of the bowl 1 and its scraper 1a, and the front scraper 11—12 so that the latter moves in the direction of the bowl 1 as illustrated in Figure 2 of the drawings, under the self contained power of the driving of the drums 26 from the engine 4, and independently of the traction of the machine. In this operation the brakes of the tractor will be released so the tractor can roll rearwardly. If traction is to be used, the reverse gear of the tractor transmission is utilized, and the traction acts to back the tractor toward the bowl 1. The movement of the front scraper 11—12 is continued in the manner shown in Figure 2 until this member reaches a position in which the part 12 is adjacent to the rear scraper 1a of the bowl 1. Thereupon the operator will release the pulling drives on the cables 27 and the member 11—12 will stop just in front of the bowl but closing the open front end portion of the latter to retain in the bowl not only the earth which has been dug and scraped up into the bowl by the rear scraper 1a, but all of the freshly dug and scraped material which is operated on by the member 11—12. Under these conditions it will be apparent that the front scraper 11—12 performs a tangible part of scraping undug earth in advance of the rear scraper 1a and the bowl 1 by carrying a substantial portion of the pay load into the bowl, ready to be elevated with the bowl so as to be carried off. Blade 12 digs in a manner analogous to blade 1a.

The parts now having assumed the positions last described namely with the machine in somewhat the condition shown in Figure 2 but with the member 11—12 closing the front end of the bowl, the operator at the tractor A will throw in the clutch for the winch 33 and by operating the cable 34 he will elevate the bowl 1, the arms 6 and the front scraper 11—12 so that the parts of the machine are in substantially the condition of Figure 3. Thereupon the operator will drive the tractor A off under its traction with the bowl 1 filled with the scraped up material, as seen in Figure 3, until the place of deposit of the truck load in the bowl 1 is reached. Arriving at such place the operator will then unclutch the drums of the winches 26 and permit the bowl 1 gradually to separate from the front scraper 11—12 while the members 5 are lowered as much as desired so as to deposit the load of materials with thus controlled operation upon the ground.

Then the operator will cause operation of the drum 45 to elevate the front scraper 11—12 to its position of Figure 1 relatively to the arms 6, for traveling back to the site where the digging and scraping is to be performed. The scraper machine parts may be in the condition of Figure 1, with the bowl 1 and members 6 elevated, however when they travel back, or if it is not desired that the front and rear scraper sections of the machine be in their extended positions of Figure 1 they can be brought together as in Figure 3 to utilize the shorter wheel base during such travel movement by operating the cables 27 to pull the arm section 17 and the bowl together.

From the foregoing it will be seen that I have devised a machine of the pulling tractor scraper bowl type adapted to effect a scraping digging and loading of the bowl under traction movements of the machine, and a further loading of the bowl independently of such traction movement or simultaneously therewith in order to make sure that a complete pay load of material is in the bowl before it travels away from the site of excavation for unloading.

The tractor A is a conventional type of tractor, driven by the engine 4 at variable forward speeds and in reverse direction with at least one speed, similarly to an automobile.

When the cables 27 are being wound on the drums 26 by the power of engine 4, through conventional clutches, it is desirable that the transmission gearing for the driving of the rear wheels of the tractor A shall be in neutral so the tractor will move backwardly as the cable reeves between the pulleys or sheaves on the stub shafts 30 and the sheaves 31 shorten under the winding of the cables on drums 26. Thus the power of engine 44, independent of traction effort, may be applied for rearward movement of the scraper 11—12 toward the bowl 1.

On the other hand, the transmission gearing of the tractor, during the winding of cables 27 on the drums 26, may be put in reverse to cause the tractor A to move rearward under traction as the scraper 11—12 is driven rearwardly by the cables 27, so that the combined pulling power of the cables 27, and the rearward traction of the tractor A may be simultaneously used, the latter being applied to the scraper 11—12 directly throughly the interlocked channels 19 and rollers 20 and 22 acting on the arms 6 carrying the last mentioned scraper.

Thus I have in my scraper a new principle of action, namely, the forward moving digging and scraping means 1a operating under traction, and the rearward moving digging and scraping means 11—12 operating, either independently of traction, or supplemented by rearward traction of the tractor vehicle used.

Engine equipped tractors such as A have ample surplus power for the operations above noted. When the forward traction is not being used obviously the whole engine power may be directed to the moving of the front scraper. And when the rearward traction is used obviously the engine 4 has ample power for rearward cable driving movement with supplementing rearward traction driving, of the front scraper 11—12.

The speed of the tractor A is high for travel, to and from the site of digging, and slower speed necessarily used for digging and scraping.

Under some conditions, if desired, the bowl 1 being partially filled during forward traction of the vehicle A, may be additionally moved forward when the traction alone is insufficient, in the following manner. The brakes on the tractor may be applied to the rear wheels 42 by the usual brake lever. Then the power of the drum 45 and cables may be used to dig the scraper 12 into the undug earth ahead of the bowl 1, to provide an anchoring function for the tractor and the front sections 6—16 and 17 of the entire machine. Then by operating the cable 27 from drums 26 the bowl 1 and its scraper may be advanced again toward the anchored secondary or front scraper, and the tractor A, thereby to completely fill the bowl.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:

1. In a dirt scraper, in combination, a rear vehicle frame section comprising a load receiving bowl open at its front end, wheels connected to the bowl to support the same, a forwardly operating rear scraper at the lower open end of the bowl, longitudinal frame members slidably connected to the bowl, parts carried by the frame members to abut with the bowl to move the latter forwardly with the frame members, a tractor in advance of the said vehicle section and draft connected to support the frame members at the front ends and to pull the frame members and bowl, a motor on the tractor for driving the same, means to engage the rear scraper in undug earth, a scraper mounted on and between said frame members for positive movement in a vertical direction independently of the frame members and located in front of the rear scraper, said front scraper adjustable to a digging position a considerable distance in advance of the rear scraper when the frame members are pulled forwardly on the bowl, means on the tractor operable to actuate the frame members to cause relative movement of the bowl scraper and front scraper toward each other for enabling undug earth ahead of the bowl to be dug and scraped into the latter by the front scraper, and means for pushing the front scraper downward on and relative to the frame members for effecting downward digging penetration of the front scraper into undug earth ahead of the bowl and maintaining same at a controlled depth in the earth during said movement relatively to the bowl.

2. In a power scraper, in combination, a rear wheeled vehicle section comprising a bowl having a forwardly disposed rear scraper, a front scraper on the vehicle section bodily slidable upwardly and downwardly in guide members carried by the vehicle section and movable toward and from the rear scraper with the vehicle section and arranged to penetrate the undug earth in advance of the rear scraper, a tractor unit separate from and connected to said vehicle section in advance thereof and operable by traction to move the front scraper toward the rear scraper, a motor to drive the tractor, operating mechanism on the tractor connected to the front scraper to cause the latter to dig into the earth and hold it at digging depth while the tractor moves it rearwardly to scrape undug earth into the bowl, and motor operated instrumentalities for moving the rear scraper toward the front scraper to supplement the together movement of the scrapers effected by traction of the tractor.

3. In a power scraping, dirt digging and loading machine, a rear vehicle section comprising a wheel supported bowl open at the front end, a rear digging scraper carried by the bowl at the said front open end, frame members connected to the bowl to move horizontally and longitudi-

nally thereof, a front vertical digging scraper supported by said frame members so as to move therewith toward the rear scraper, a tractor supporting said frame members at their front ends and disposed in advance thereof, motor operated means on the tractor connected to the front scraper to move it vertically into undug earth in advance of the rear scraper and hold it at predetermined digging depth, a motor to drive the tractor rearwardly to cause the traction of the latter to move the frame members and the front scraper toward the rear scraper while the front scraper is digging undug earth, and operating instrumentalities to move the rear and front scrapers together independent of the traction effort of the tractor.

4. In a power scraper, in combination, a wheeled vehicle section comprising a bowl and scraper section, a frame, and a lift section, a tractor unit separate from said vehicle section, in advance thereof and universally connected to the lift section, the bowl and scraper section aforesaid comprising a bowl having a digging scraper thereon, the frame being longitudinally movable relative the bowl and scraper section, and movably connected to the lift section, a separate digging scraper carried by said frame and movable toward and from said bowl, and means connecting said bowl and scraper sections to the lift section for effecting relative movement therebetween.

5. The combination as claimed in claim 4, wherein the bowl and digging scraper sections thereon are slidably mounted on the frame and means are provided for effecting relative movement of said bowl and frame, independent of traction movement of the power scraper as a whole.

6. The combination as claimed in claim 4, wherein the separate digging scraper on the frame is movable toward and from the bowl by traction movement of the tractor vehicle when the bowl and scraper thereon are stationary.

7. The combination as claimed in claim 4, wherein the separate digging scraper is movable into and out of digging engagement with the earth independently of digging operation of the scraper on the bowl.

8. The combination as claimed in claim 4, wherein the bowl is provided with rear supporting wheels, the frame is slidably engaged with the bowl, and means are provided to effect movement of the frame relative to the lift section to move the scraper on said bowl into and out of engagement with undug earth by pivotal movement of said bowl on the supporting wheels.

9. The combination as claimed in claim 4, wherein the frame is slidably connected to the lift section, means are provided for effecting vertical movement of said frame on said lift section, the separate scraper is movable with and independently of the movement aforesaid, to positively effect digging penetration of said separate scraper into undug earth, and means are provided for effecting and maintaining said digging penetration.

10. The combination as claimed in claim 4, wherein the frame comprises transversely spaced rearwardly extending side frame members and a cross member connected to the forward ends thereof, the said frame being connected to the lift section adjacent said cross member for vertical sliding movement relative thereto, and the bowl is slidably engaged with the spaced frame members.

11. The combination as claimed in claim 10, wherein the separate digging scraper extends transversely between the side frame members and is supported for vertical sliding movement.

12. The combination as claimed in claim 9, wherein means are provided for effective bodily movement of the bowl and digging scraper relatively toward said separate digging scraper, independent of traction movement of the tractor when the said digging scrapers are in earth penetrating digging position.

13. In a dirt scraper, in combination, a rear vehicle frame section comprising a load receiving bowl open at its front end, wheels connected to the bowl to support the same, a forwardly operating rear scraper at the lower open end of the bowl, longitudinal frame members slidably connected to the bowl, parts carried by the frame members to abut with the bowl to move the latter forwardly with the frame members, a tractor in advance of said vehicle section and draft connected to support the frame members at the front ends and to pull the frame members and bowl, a motor on the tractor for driving the same, means to engage the rear scraper in undug earth, a scraper mounted on and between said frame members for positive movement in a vertical direction independently of the frame members and located in front of the rear scraper, said front scraper adjustable to a digging position a considerable distance in advance of the rear scraper when the frame members are pulled forwardly on the bowl, means on the tractor operable to actuate the frame members to cause relative movement of the bowl scraper and front scraper toward each other for enabling undug earth ahead of the bowl to be dug and scraped into the latter by the front scraper, and means for pushing the front scraper downward on and relative to the frame members for effecting downward digging penetration of the front scraper into undug earth ahead of the bowl and maintaining same at a controlled depth in the earth during said movement relatively to the bowl, the draft connection of the tractor to the vehicle section including pivotal means affording relative pivotal movement of the tractor and vehicle section, and the means for effecting downward movement of the front scraper including instrumentalities to apply the weight of the tractor to the front scraper independently of the weight of the vehicle section and bowl thereon.

14. In a dirt scraper, in combination, a rear vehicle frame section comprising a load receiving bowl open at its front end, wheels connected to the bowl to support the same, a forwardly operating rear scraper at the lower open end of the bowl, longitudinal frame members slidably connected to the bowl, parts carried by the frame members to abut with the bowl to move the latter forwardly with the frame members, a tractor in advance of the said vehicle section and draft connected to support the frame members at the front ends and to pull the frame members and bowl, a motor on the tractor for driving the same, means to engage the rear scraper in undug earth, a scraper mounted on and between said frame members for positive movement in a vertical direction independently of the frame members and located in front of the rear scraper, said front scraper adjustable to a digging position a considerable distance in advance of the rear scraper when the frame members are pulled forwardly on the bowl, means

on the tractor operable to actuate the frame members to cause relative movement of the bowl scraper and front scraper toward each other for enabling undug earth ahead of the bowl to be dug and scraped into the latter by the front scraper, and means for pushing the front scraper downward on and relative to the frame members for effecting downward digging penetration of the front scraper into undug earth ahead of the bowl and maintaining same at a controlled depth in the earth during said movement relatively to the bowl, said frame section being equipped with vertically arranged roller guiding means at its front end and an arm mounted on the tractor having vertically extending guide members in which said rollers operate, and the pushing means includes an adjustable connection between the front scraper and the guide members aforesaid.

15. In a dirt scraper, in combination, a rear vehicle frame section comprising a load receiving bowl open at its front end, wheels connected to the bowl to support the same, a forwardly operating rear scraper at the lower open end of the bowl, longitudinal frame members slidably connected to the bowl, parts carried by the frame members to abut with the bowl to move the latter forwardly with the frame members, a tractor in advance of the said vehicle section and draft connected to support the frame members at the front ends and to pull the frame members and bowl, a motor on the tractor for driving the same, means to engage the rear scraper in undug earth, a scraper mounted on and between said frame members for positive movement in a vertical direction independently of the frame members and located in front of the rear scraper, said front scraper adjustable to a digging position a considerable distance in advance of the rear scraper when the frame members are pulled forwardly on the bowl, means on the tractor operable to actuate the frame members to cause relative movement of the bowl scraper and front scraper toward each other for enabling undug earth ahead of the bowl to be dug and scraped into the latter by the front scraper, and means for pushing the front scraper downward on and relative to the frame members for effecting downward digging penetration of the front scraper into undug earth ahead of the bowl and maintaining same at a controlled depth in the earth during said movement relatively to the bowl, said frame section being equipped with vertically arranged roller guiding means at its front end and an arm mounted on the tractor having vertically extending rigid channel guide members in which said rollers operate, the said pushing means being connected to the guide members and operable from the motor aforesaid.

16. In a dirt scraper, in combination, a rear vehicle frame section comprising a load receiving bowl open at its front end, wheels connected to the bowl to support the same, a forwardly operating rear scraper at the lower open end of the bowl, longitudinal frame members slidably connected to the bowl, parts carried by the frame members to abut with the bowl to move the latter forwardly with the frame members, a tractor in advance of the said vehicle section and draft connected to support the frame members at the front ends and to pull the frame members and bowl, a motor on the tractor for driving the same, means to engage the rear scraper in undug earth, a scraper mounted on and between said frame members for positive movement in a vertical direction independently of the frame members and located in front of the rear scraper, said front scraper adjustable to a digging position a considerable distance in advance of the rear scraper when the frame members are pulled forwardly on the bowl, means on the tractor operable to actuate the frame members to cause relative movement of the bowl scraper and front scraper toward each other for enabling undug earth ahead of the bowl to be dug and scraped into the latter by the front scraper, and means for pushing the front scraper downward on and relative to the frame members for effecting downward digging penetration of the front scraper into undug earth ahead of the bowl and maintaining same at a controlled depth in the earth during said movement relatively to the bowl, and means for raising and lowering the frame section and bowl including an arm extending rearwardly from the tractor and vertical guiding means intermediate said arm and the front of the frame section to permit relative movement thereof, the said pushing means being connected for operation by the motor and including a part for applying the weight of the tractor directly to the front scraper.

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