Dec. 8, 1942. S. F. ARMINGTON ET AL 2,304,527

SCRAPER

Filed Aug. 16, 1939 5 Sheets-Sheet 1

FIG.-1

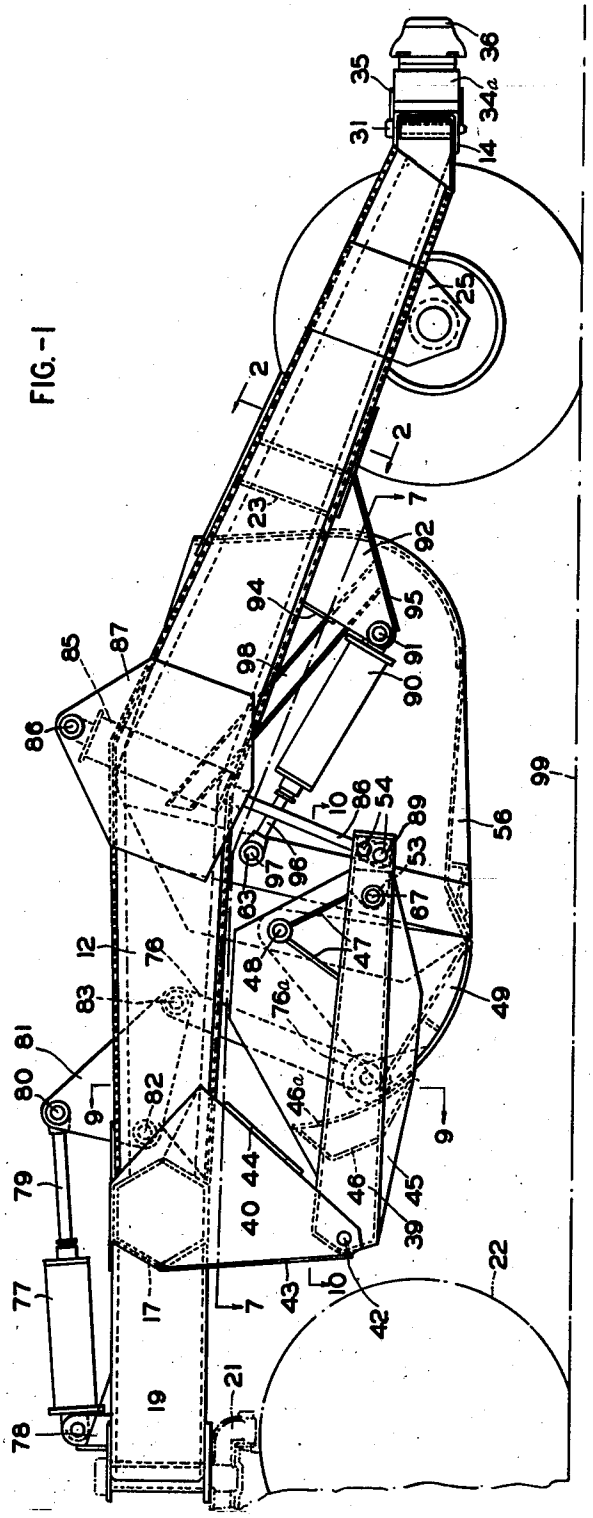


FIG.-3

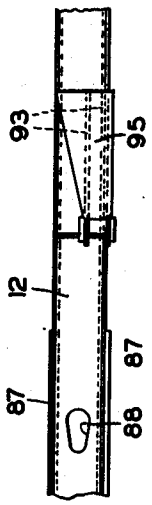
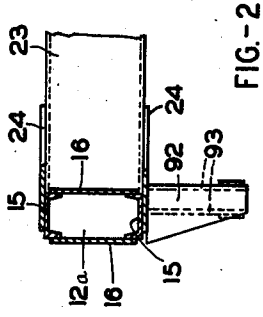


FIG.-2



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SCRAPER

Filed Aug. 16, 1939 5 Sheets-Sheet 2

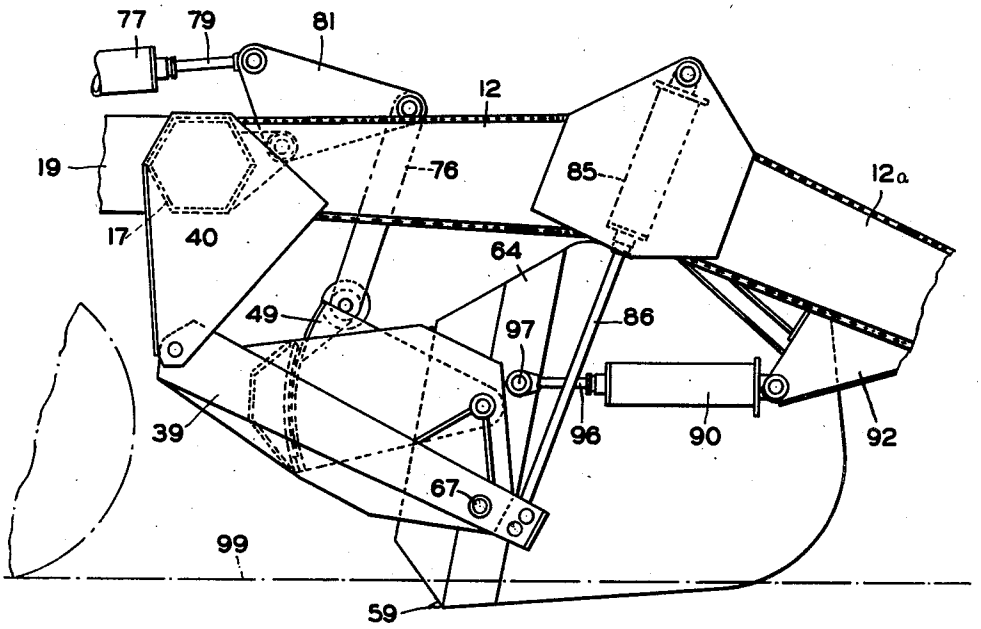


FIG.-4

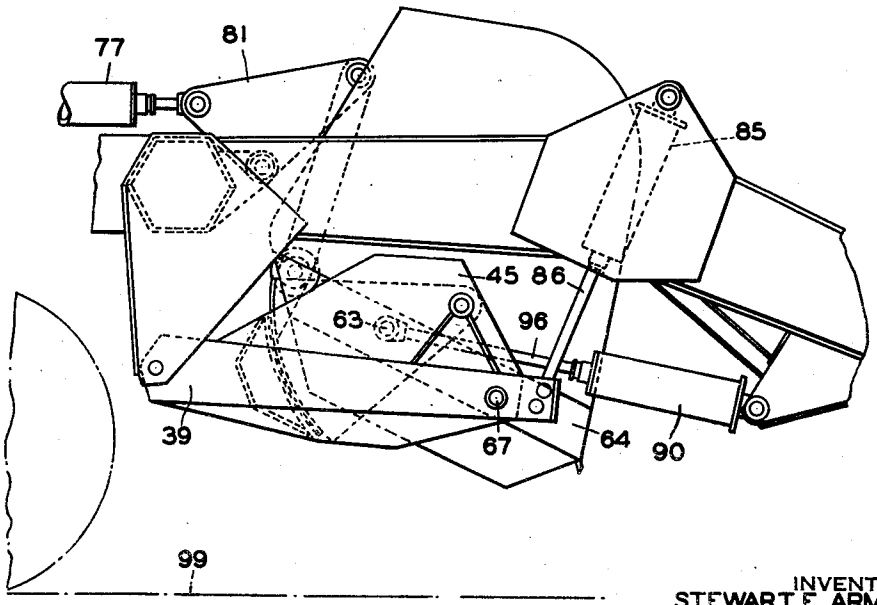


FIG.-5

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SCRAPER

Filed Aug. 16, 1939 5 Sheets-Sheet 3

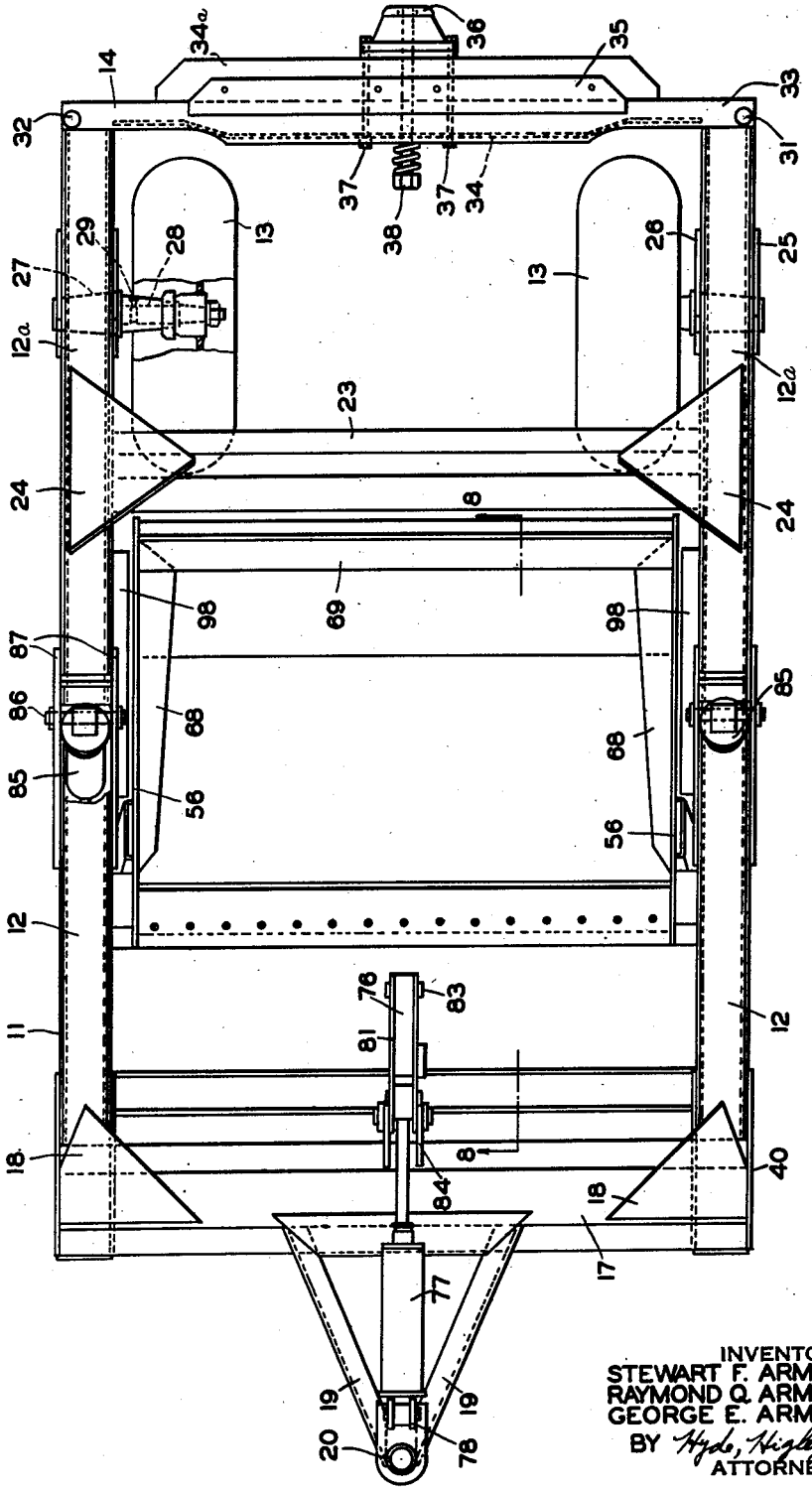


FIG. - 6

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SCRAPER

Filed Aug. 16, 1939 5 Sheets-Sheet 4

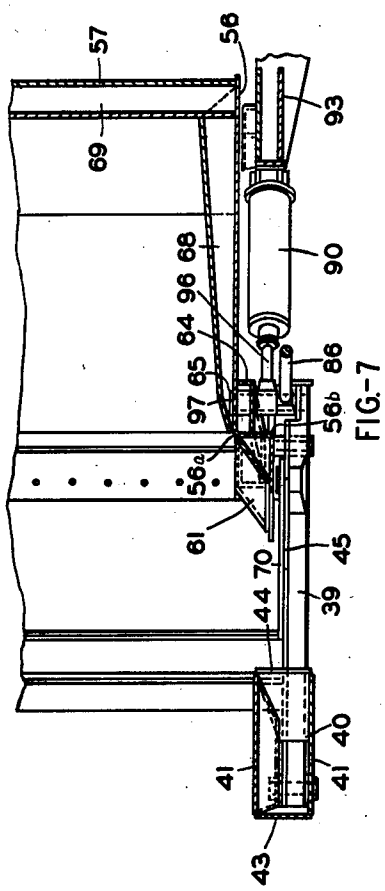


FIG.-7

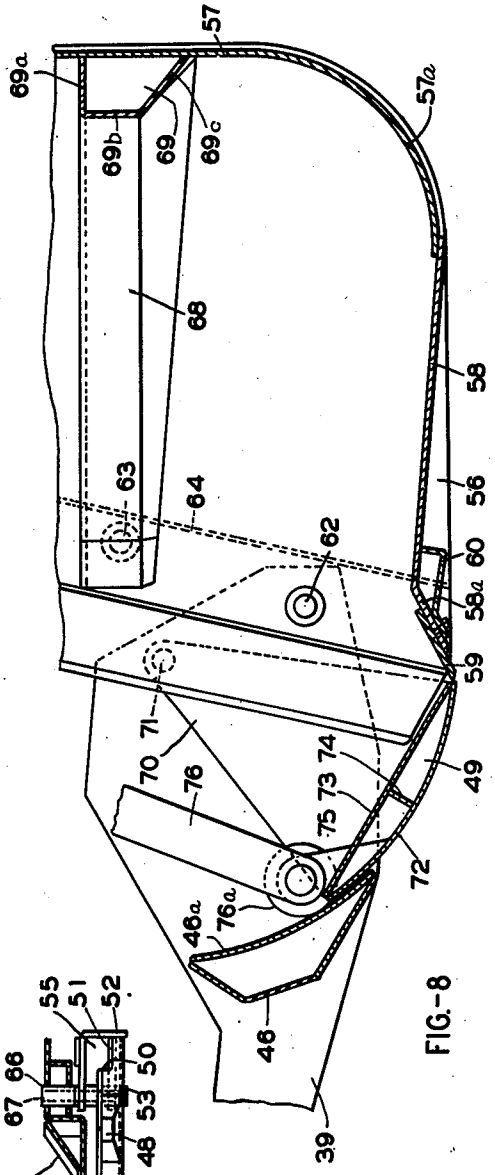


FIG.-8

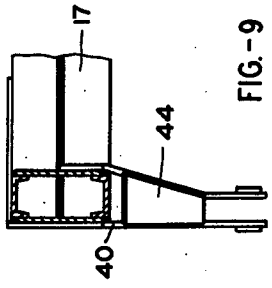


FIG.-9

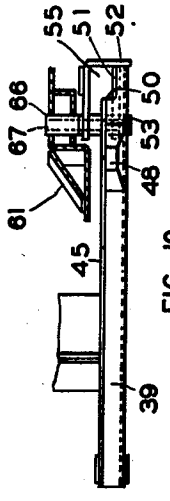


FIG.-10

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Filed Aug. 16, 1939 5 Sheets-Sheet 5

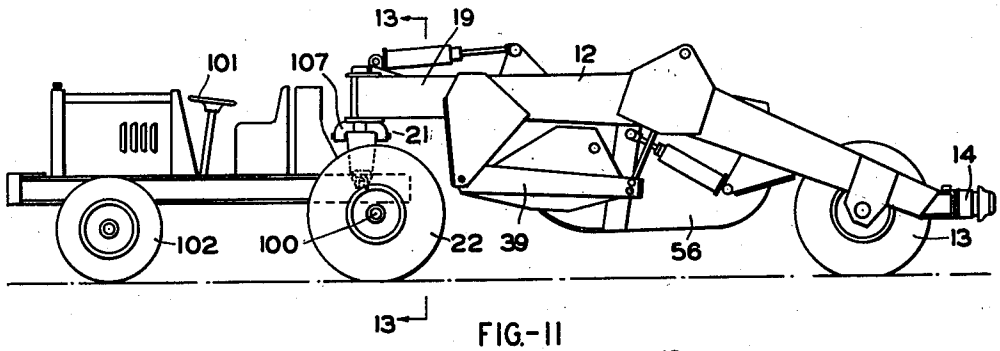


FIG.-11

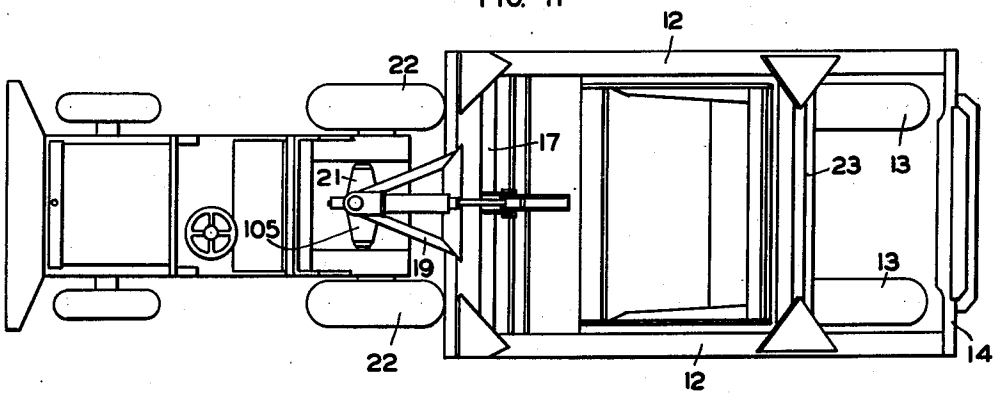
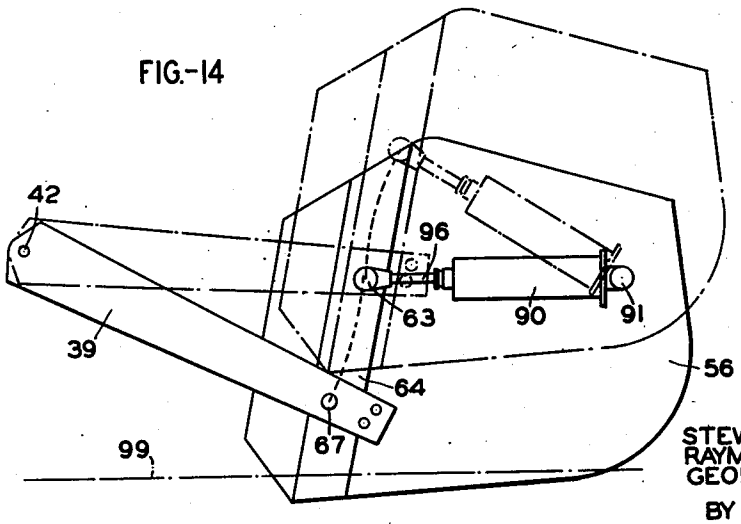


FIG.-12

FIG.-14



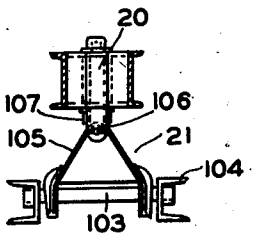


FIG.-13

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UNITED STATES PATENT OFFICE

2,304,527

SCRAPER

Stewart F. Armington, Willoughby, Raymond Q. Armington, Shaker Heights, and George E. Armington, South Euclid, Ohio, assignors to The Euclid Road Machinery Company, Euclid, Ohio, a corporation of Ohio

Application August 16, 1939, Serial No. 290,392

5 Claims. (Cl. 37—124)

This invention relates to improvements in wheeled scrapers of the type adapted to handle dirt, loose rock, sand and the like.

One of the objects of the present invention is to provide a strong scraper structure adapted for digging, transportation and dumping, wherein a minimum number of parts are required, all of which are very simply arranged, rugged in construction and so placed as to run a minimum risk of injury to the end that the device may be cheaply constructed and efficiently maintained and operated.

Another object of the present invention is to provide power jacks for hoisting and dumping which are directly connected to the bucket.

Another object of the invention is the provision of novel reinforcing means for the walls of the bucket so that the power jacks may efficiently act through the walls of the bucket to perform their operating functions.

Another object of the present invention is to provide a novel frame structure which is extremely rigid and sturdy to stand up under extremely heavy duty and so proportioned and arranged as to most efficiently combine with the direct acting jacks above referred to.

Another object of the invention is to provide novel and strong construction of various parts of the frame and the connecting links to the bucket and the arrangement of reinforcing members between them. Among the novel features is the general use of hollow sheet metal members welded together.

Another novel feature of the invention is the use of a telescoping gate to close the normally open end of the bucket.

Still another feature of the invention is the novel arrangement of the rear wheels and bumper whereby the wheels are housed within the protecting frame and removable inwardly and rearwardly by reason of the novel pivoted arrangement of the rear bumper.

Other novel features of our invention will be apparent from the accompanying drawings and specification and the essential features thereof will be summarized in the claims.

In the drawings, Fig. 1 is an elevation of a scraper embodying our invention with the bucket in transporting position; Fig. 2 is a fragmental sectional view taken along the line 2—2 of Fig. 1; Fig. 3 is a fragmental bottom plan view of one of the side frame members of Fig. 1; Fig. 4 is a fragmental elevation similar to Fig. 1 but showing the bucket in digging position; Fig. 5 is a fragmental elevation similar to Fig. 1 and showing the bucket in dumping position; Fig. 6 is a top plan view of the device of Fig. 1; Fig. 7 is a fragmental sectional view taken along the line 7—7 of Fig. 1; Fig. 8 is an enlarged sectional view taken along the line 8—8 of Fig. 6; Fig. 9 is a fragmental sectional view taken along the line 9—9 of Fig. 1; Fig. 10 is a fragmental top plan view of one of the drag links taken from approximately the position 10—10 of Fig. 1; Figs. 11 and 12 are elevational and top plan views respectively showing the scraper hitched to a tractor; Fig. 13 is an enlarged sectional view taken along the line 13—13 of Fig. 11; while Fig. 14 is a diagrammatic view illustrating the link suspension of the bucket for substantially straight-line movement.

Our invention is applicable to any size of scraper but is illustrated in connection with one intended for very heavy duty and having a capacity of twelve yards. Our invention is also applicable to a self-propelled scraper but is here shown embodied in a scraper of the trailer type adapted to be drawn behind a tractor or the like.

The frame is of extremely rigid and rugged construction to adapt it for very heavy duty and for transporting a heavily loaded bucket for considerable distances at high speeds. The frame indicated generally at 11 comprises two side frame members 12 each extending substantially horizontally from the front of the frame to approximately the mid portion of the bucket and then having downwardly inclined portions 12a toward the rear which support a pair of wheels 13 to the rear of the bucket and the back end of these frame members is joined by a heavy bumper 14. These side frame members as best seen in Fig. 2 comprise mutually facing top and bottom channel members 15 connected together by the side plates 16 which are welded to the channel flanges. This provides a very strong hollow beam construction which gives a rigid arched frame as viewed from the side. The members 12 are rigidly connected together at the front end of the frame by the hexagonal hollow beam 17. This beam is composed of metal plates suitably bent and welded together. The gusset plates 18 are welded between beam 17 and the side frame members 12 to reinforce the frame at the forward corners. At the mid portion of beam 17 a triangular frame arrangement is provided by welding channel members 19 to the beam 17 at one end and bringing the channels together and welding them to a pin receiving tube 20 at their forward end. This tube 20 receives the pin of a suitable universal hitch connection 21 adapted to connect the trailer scraper to a tractor, a rear wheel of which is in-

dicated at 22. Any suitable hitch may be used at this point, the one here shown being that disclosed in a copending application Serial No. 177,518, filed December 1, 1937, by G. E. and S. F. Armington.

The hitch 21 comprises a bar 103 carried by the tractor chassis 104. A member 105 is mounted on this bar for fore-and-aft rocking motion and carries at its upper end a pin 106 at right angles to bar 103. Tiltably mounted on pin 106 is a yoke 107 having an upright post rotatably fitting within tube 20, a shoulder on the yoke supporting the weight of the scraper frame.

It will be noted that the overhanging arrangement of the hitch with respect to the rest of the scraper permits better than 90° turning radius of the tractor with respect to the scraper.

The side frame members are connected together at the rear of the bucket by means of the cross frame member 23 which is a hollow beam of welded plates generally rectangular in section and rigidly connected as by welding at its ends to the portions 12a of the side frame members with a reinforcing gusset plate at each end as indicated at 24. It will be noted that the side frame members 12 and the cross members 17 and 23 are entirely clear of the confines of the bucket so as to leave it open and unobstructed at the top for overhead loading if desired.

Suitable wheel means is provided at the rear end of the frame and in the present instance each of the frame portions 12a has a plate 25 welded to its outer face and a plate 26 welded to its inner face. Through suitable openings in these plates passes a steel casting axle bracket 27 which is suitably secured to the plates and extends inwardly from the side frame members to receive the stub axle 28 which supports the wheel 13. This stub axle is held in the axle bracket by any suitable means, such as the set screw 29. Thus the wheels are entirely to the rear of the bucket and protected inside of the side frame members and removable inwardly and to the rear when necessary.

The rear ends of the side frame members are connected together by the heavy bumper 14 which has removable pivot connections at 31 and 32 with the side frame members so that to remove one of the wheels 13 rearwardly it is only necessary to remove the pivot pin 31 or 32 on that side and thereafter swing the bumper about the other pivot pin. This rear bumper is of very heavy and rugged construction so that a bulldozer may be used behind the scraper when necessary. The main frame of the bumper comprises a channel 33 reinforced by a plate 34 welded between the flanges of the channel and generally parallel to the web of the channel which is turned toward the rear of the scraper. A heavy wooden beam 34a is bolted to the channel 33 by bolts passing through top and bottom plate members 35 which are welded to the flanges of channel 33. A central bumper head 36 is secured to the bumper by suitable bolts 37 and 38.

For guiding and supporting the bucket and for efficiently exerting a pull on the bucket during a digging operation, two drag links 39 are provided one at each side of the frame and since both are alike one only will be described. For supporting the forward end of the drag link a built up welded plate bracket 40 is provided comprising side plates 41 welded at their upper ends to frame members 12 and 17 and converging toward their lower ends where they support a pivot pin 42. The plates 41 are fastened together front and rear by plates 43 and 44 respectively welded to them. Mounted on the pin 42 is the drag link 39 which is a hollow beam formed of welded plate and having welded to its inner face a plate 45 which performs several functions as will presently appear. Rigidly connected between the drag links 39 and more specifically being welded between the plates 45 is a hollow torque beam 46 which ties the drag links together so that they act in unison and reinforce each other and at the same time the rearwardly facing plate 46a of this beam forms a fixed portion of a telescoping gate later described. It will be noted that the plate 45 extending above and below the drag link 39 and reinforced by the beam 46 provides a trussing effect for the drag link 39. Near the rear end of each drag link reinforcing plates 47 are welded to the drag link and to the plate 45 to hold the tubular bearing 48 in place which is a pivoting means for the movable gate portion 49. The plates 45 perform another function as will be obvious from an inspection of Figs. 1 and 8, namely, they coact with the gate portions 46a and 49 to enclose material loaded into the bucket which may have a tendency to spill forwardly and laterally.

Referring to Fig. 10, the rear end of the drag link 39 is cut away as at 50 and reinforced by a flat vertical plate 51 and a bent vertical plate 52 which extends across the rear end of the drag link and then parallel to the link on the inside and connected to the tubular member 53 which is also welded to the vertical walls of the drag link so as to provide a pivotal connection for attaching the bucket to the drag link. The reinforcing plates 51 and 52 are provided with one or more alined openings 54 for receiving the pivot pin 89 for the piston rod of a hoisting jack. The end of this rod is received in the space 55 indicated on Fig. 10 and may be adjusted to either the upper or lower position depending upon the depth to which one intends to dig. In Fig. 1 the connection is shown as made in the lower opening.

The bucket comprises side walls 56, a rear end wall 57 and a bottom 58 all welded together in the position shown in the various views to form a bucket open at the top and at the front end. As best seen in Fig. 8 the bottom slopes upwardly toward the front where it is bent downwardly at 58a to provide a lip portion to which a digging blade 59 is fastened. A reinforcing member 60 is connected between the digging lip and the bottom plate to the rear thereof and secured at each end as by welding to the bottommost portions of the side walls 56 so as to reinforce the digging lip, making a very strong construction at this point. The end wall is preferably curved as at 57a where it joins with the bottom both to add strength to the bucket and for ease in dumping. Each side wall at its forward end is bent sharply outwardly at 56a and again bent parallel to the main side wall portions as at 56b and across the right angle thus formed a plate 61 is welded giving a flaring lip to the bucket which is substantially a hollow triangular beam. This beam slopes downwardly and forwardly as shown in the various views.

For the purpose of reinforcing each bucket side will in line with the thrust of the hoisting jack and connecting point 62, where the bucket is pivotally mounted on the drag links, and the point 63, where the dumping jack is secured to the bucket side wall, a strong reinforcing member is provided. This comprises an L-shaped plate 64

having one leg turned inwardly and welded to the side wall of the bucket. The other leg of plate 64 is welded to the lip of plate 56 between 56a and 56b. This reinforcing member has the same slope as the triangular flanged lip above described. It will also be noted that the member 64 is shallower at the top of the bucket and deeper at the bottom, that is to say, it gradually flares outwardly toward the bottom of the bucket. This gives a very strong construction for withstanding stresses developed during later described operations. A tubular bearing member 65 passes through the side wall 56 and the member 64 to form a bearing for the pin which connects the dumping jack to the side wall of the bucket. Another tubular bearing member 66 most clearly seen in Fig. 10 is welded to member 64 and is alined with the bearing member 53 in the drag link, and a pin 67 passes through the drag link and the bearing 66 to form a pivotal mounting for the bucket on the drag link.

As will later appear the entire dumping force when the bucket is tilted to the position of Fig. 5 is applied at the point 63 on each of the bucket side walls. To transmit the lifting force from this point to the bucket in an efficient manner so as to lift the tremendous loads involved, additional reinforcing of the side walls of the bucket is necessary and desirable. To this end an uninterrupted reinforcement is provided extending along each side wall of the bucket as at 68 and across the end wall at 69 so as to extend from one of the points 63 on one side wall clear around the top of the bucket to the corresponding point 63 on the other side wall. It will be noted also that this reinforcement 68 is connected to the bucket side wall opposite the reinforcement 64 so that they cooperate together. The particular form of reinforcement here shown comprises plate members bent outwardly at right angles to the wall of the bucket as at 69a, then at right angles giving the parallel portion 69b and then bent back toward the side wall of the bucket as at 69c. These plates are welded to the side walls of the bucket giving a hollow beam reinforcement. The portions 68 are also welded to the portion 69. Referring to Figs. 7 and 8 it will be noted that the reinforcing members 68 are deeper toward the rear of the bucket where the load becomes greater.

The movable gate portion 49 comprises two end sector portions 70 pivotally mounted at their vertexes by pins 71 which pass through the sector portions and also through the bearings 48 already described. Secured to the outer ends of the sector portions and extending entirely across the width of the bucket is an arcuate plate 72. The curvature of this plate is an arc about the point 71 and corresponds to the curvature of the plate 46a already described so that as the movable gate portion 49 swings about the points 71, plate 72 telescopes alongside the plate 46a. To reinforce the plate 72 a flat plate 73 which is also the full width of the bucket is welded to the opposite edges of the plate 72. Also a long narrow reinforcing plate 74 is welded centrally of plates 72 and 73 between them. Midway between the ends 70 of th movable gate member a suitable bracket 75 is provided for attachment of a link 76 by which this gate is manipulated. The lower end of link 76 carries a roller 76a which thrusts against plate 46a. Link 76 is moving at an angle to the general plane of gate 49 when the gate is closed, as best seen in Fig. 8. At this time the plate 46a is held rigid with reference to the frame and the roller 76a absorbs the thrust of link 76 and prevents deflection of the wide gate portion 49, thus permitting the movable gate portion to close without deflecting into engagement with plate 46a.

The means for actuating the movable gate portion 49 comprises a jack 77 which is mounted on a trunnion secured to a bracket 78 which in turn is welded to the forward end of the channel members 19. This and other jacks will be mentioned hereinafter and while we contemplate using hydraulic jacks which are well known in this art we do not desire to be limited to any particular type of jack. The jack 77 has its movable member or piston rod 79 pivotally connected at 80 to a bell crank 81 which is formed of two triangular parallel plates. These plates have a fixed pivotal mounting on the frame at 82 and a pivotal connection at 83 with the link 76. The mounting at 82 is accomplished by means of a bracket 84 which is welded to the beam 17 in the center of the frame.

There are two hoisting jacks 85, one on each side of the frame and exactly alike. Each jack has a pivotal mounting at 86a between plates 87 which are welded one on each side of the frame member 12. The cylinder of the hydraulic jack thus is housed within the hollow frame member 12. The piston rod 86 of the jack 85 passes downwardly through the opening 88 in the bottom wall of beam 12 and is pivotally connected by a pin 89 which passes through the bearing 54 in the drag link. It will be noted that the pin 89 is farther along the drag link than the pin 67 so that the hoisting jack has a certain mechanical advantage when acting through the drag link to raise or lower the bucket.

There are two dumping jacks 90, one on each side of the bucket and exactly alike. The arrangement of the frame and the bucket is such that these jacks may be directly connected between them. Each jack is pivotally mounted at 91 on a bracket 92 which is secured to the sloping side frame portions 12a. Because of these inclined frame portions a very short bracket is all that is necessary for mounting the jack. The bracket comprises a pair of triangular parallel plates 93 welded to the lower face of the beam portion 12a and connected together by plates 94 and 95. The piston rod 96 of each jack is connected by a pin 97 with the side wall of the bucket. This pin passes through the bearing 65 previously described. Referring to Fig. 7 it will be noted that the flaring lip on the bucket provides a space rearwardly thereof so that the cylinder of the jack 90 may be placed close up against the side wall of the bucket. The reinforcing member 64 then extends out sufficiently to provide a pivotal connection with the piston rod 96 with very little cantilever. It will also be noted in Fig. 7 that the piston rod 86 of the hoisting jack and rod 96 of the dumping jack lie almost in the same plane. As a matter of fact the actual clearance in this large size machine is only about one inch at this point. These two jacks apply the forces to the bucket and because they lie so nearly in a common plane there is little tendency to twist the side walls of the bucket.

Particular attention is called to the arrangement of piston rods 86 and 96 substantially at right angles to each other whereby during a hoisting action there is no movement of the piston rod 96 relative to its cylinder and during a dumping action there is no movement of the piston rod 86 relative to its cylinder. Referring to Figs. 1 and 5 it will be noted that we get maxi-

mum dumping speed by dumping slowly at the beginning of the stroke of jack 90 when greatest force is required and dumping progressively faster as the bucket tilts upward and less force is required. Referring to Fig. 4 it will be noted that jack 90 is in substantially horizontal position during a digging operation so as to better resist the tendency for the bucket to tilt upwards when digging. This arrangement is made possible by placing the point 63 as shown in Fig. 1 approximately the same amount above horizontal as the amount of lowering of the bucket from hoisting to digging position. This brings the point 63 down to the horizontal in the digging position of Fig. 4. It will also be noted that the jack 85 has almost a vertical thrust downwardly on the drag link 39 and along the line of the side wall reinforcing member 64 which pushes directly on the reinforced digging lip of the bucket in the digging position of Fig. 4.

A bucket guide member 98 is provided on each side. These are channels having their webs turned toward the bucket and having their flanges welded at one end to the side frame member 12 and at the other end to the bracket 92. These guide members keep the bucket centered and at the same time form a strong brace for the bracket 92 during a dumping operation.

The operation of our improved scraper should now be clear. The line 99 in the various views represents the ground line. When the bucket is in carrying position as shown in Fig. 1 the jacks 85 and 90 are contracted and the jack 77 is extended so as to close the front end of the bucket. When the bucket is to be loaded jacks 85 are extended and jack 77 is contracted to open the movable gate portion 49. The jacks 85 then force the digging lip 59 into the ground and the drag links 39 are in an efficient position for transmitting the pull of the frame to the lower front edge of the bucket. The use of a telescopic gate permits a wide opening of the gate without obstructing the view from the tractor seat to the interior of the bucket. When the bucket is loaded, jack 77 is extended to close the gate and jacks 85 are contracted to raise the bucket to the carrying position of Fig. 1. For the dumping operation jack 77 is contracted to open the gate and jacks 90 are extended to move the bucket into the position of Fig. 5.

Referring to Fig. 14, it will be seen that we have provided a novel link suspension of the bucket so that the bucket moves substantially in a straight line from digging position (shown in full lines) to carrying position (shown in dot-dash lines). Links 39 and 90—96 are pivotally connected to the bucket side wall 56 at the vertically spaced points 67 and 63. The side wall of the bucket and the reinforcing member 64 forms a third link between 67 and 63. Thus, when the jacks 85 raise and lower the bucket, a substantially straight line movement is imparted to the bucket because the linkage just described is Watt's straight-line linkage. While it is true that the link 90—96 is extensible, yet when the hydraulic system supplying jack 90 remains unoperated (as is usual in operating the scraper) the oil or other liquid in the hydraulic system is substantially incompressible and the link 90—96 is temporarily substantially fixed in length.

No fluid supply lines are shown for jacks 77, 85 and 90 or control valves therefor as these are all well known in the art. It will be understood that the control valves are preferably placed conveniently for the tractor operator and to this end they may be mounted on the channels 18 or on the beam 17 with operating handles of sufficient length. The jacks are independently controlled so that each of the operations above described may be independently carried out. Pressure may be held on all jacks to allow each element to be forced into the desired position and to be held there. We prefer a differential pressure arrangement on the gate jack allowing a by-pass at a lower pressure than the other jacks, particularly the hoisting jack, so that when the bucket is raised and it strikes the gate, the gate jack 77 will allow the gate to be pushed upwards by the bucket without damage. This also prevents twisting of the front gate when it is being forced shut if a log or other obstruction is under one corner. A suitable control system of this sort is disclosed and claimed in the copending application of Raymond Q. Armington and George E. Armington, Serial No. 333,526 filed May 6, 1940.

It will be noted that the flared lips on the sides of the bucket have a slight clearance with respect to the inner face of the sector portions 70 of the movable gate. This permits an easier closing of the gate and the lips scrape the portions 70 clear of material as the gate closes.

Due to the general proportions of the tractor scraper assembly and to the type and position of hitch mounting, weight is transferred to the driving wheels of the tractor proportional to the pulling resistance of the scraper producing maximum traction when loading the bucket.

In fully loaded carrying position the proportions are such that the weight is approximately the same on the tractor drive wheels as it is on the scraper trailer wheels so as to give maximum traction and maximum tire life.

When the scraper is assembled with a tractor as shown in Figs. 1, 11 and 12, a novel result occurs when a bulldozer is pushing against bumper 14 to aid in loading the bucket. It will be noted that the universal hitch 21 (permitting relative movement between the tractor and scraper in all directions) is located ahead of the axle 100 of the tractor drive wheels 22. Steering of the tractor is by wheel 101 which guides wheels 102 in the usual manner. With the bulldozer pushing forward, the rigid frame of the scraper transmits this force to the tractor ahead of the axle 100 so that there is no tendency for the tractor to leave its steered course, that is, there is no jack-knifing or lateral buckling between the tractor and scraper. It will be noted also that the hitch 21 is above the axle 100 so that any push transmitted to the tractor from the bull dozer helps to hold the front end of the tractor down.

What we claim is:

1. In a wheeled scraper, a bucket having opposite side walls, an end wall and a bottom and being open at one end, a frame having two fixed rigid members, one extending along each of said bucket side walls near the top and outside thereof, each of said frame members having a portion sloping downwardly at the closed end of said bucket and there provided with wheel means, two drag links pivotally connected one respectively between each of said bucket side walls and a portion of said frame in front of the open end of said bucket, two jacks, each respectively connected generally vertically between one of said frame members and the drag link on the same side, and two dumping jacks, each respectively connected generally horizontally between the

sloping portion of one of said frame members and the adjacent side wall of the bucket, the connections of said last named jacks with the bucket being spaced vertically from the drag link connections with the bucket.

2. In a wheeled scraper having a frame and a bucket supported thereby, said bucket having opposite side walls, an end wall and a bottom and being open at one end for digging, a pair of drag links connected with said frame forwardly of said open bucket end, said drag links being connected respectively each with one of said bucket side walls, a gate extending across the open end of said bucket to close it against loss of material, said gate having one part forming a rigid beam rigidly connected between said drag links intermediate their ends and spaced from the open end of said bucket and another part of said gate being movably mounted to cause opening and closing of the said space between the fixed gate part and the open end of said bucket.

3. In a wheeled scraper, a frame, a digging bucket supported by said frame, said bucket having side walls and an end wall and a bottom and being open at one end, said frame having members extending one along each of said side walls and outside thereof, said frame members being of hollow sheet metal construction, and a jack for operating said bucket, said jack being housed in one of said hollow frame members and having a movable member extending outside of said frame member and effectively connected with the adjacent side wall of said bucket.

4. In a wheeled scraper having a frame and a bucket supported thereby, said bucket having opposite side walls, an end wall and a bottom and being open at one end for digging, wheel means supporting said scraper including driving wheel means near the open end of said bucket, an operator's station beyond the open digging end of said bucket positioned so that the operator may look into said bucket from beyond the open end, and a gate for closing the open end of said bucket against loss of material when loaded, said gate having a part spaced from the open end of said bucket and above the bottom thereof and said gate part being fixed relative to said bucket when the latter is in digging position, the top of said gate part being sufficiently low that the operator can observe the loading of material into said bucket, said gate having a movable part of a width to close said space between said first named part and said bucket bottom, means mounting said movable gate part for telescoping movement alongside said first named part when said gate is open, and both of said gate parts extending generally vertically when said movable gate part is opened for digging so that a greater depth is provided in said bucket near said digging end and adjacent said driving wheel means to place a greater load on said driving wheel means.

5. In a wheeled scraper having a frame and a bucket supported thereby, said bucket having opposite side walls, an end wall and a bottom and being open at one end for digging, a gate for closing said open bucket end to retain material therein, means for moving said gate to closed position including an arm movable at an angle to the general plane of said gate when closing said gate, a part held rigid by said frame during a gate closing operation, and a part on said arm engaging said rigid part during gate closing movement whereby to withstand the thrust of said arm and to prevent deflection of said gate.

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