

Dec. 15, 1942.

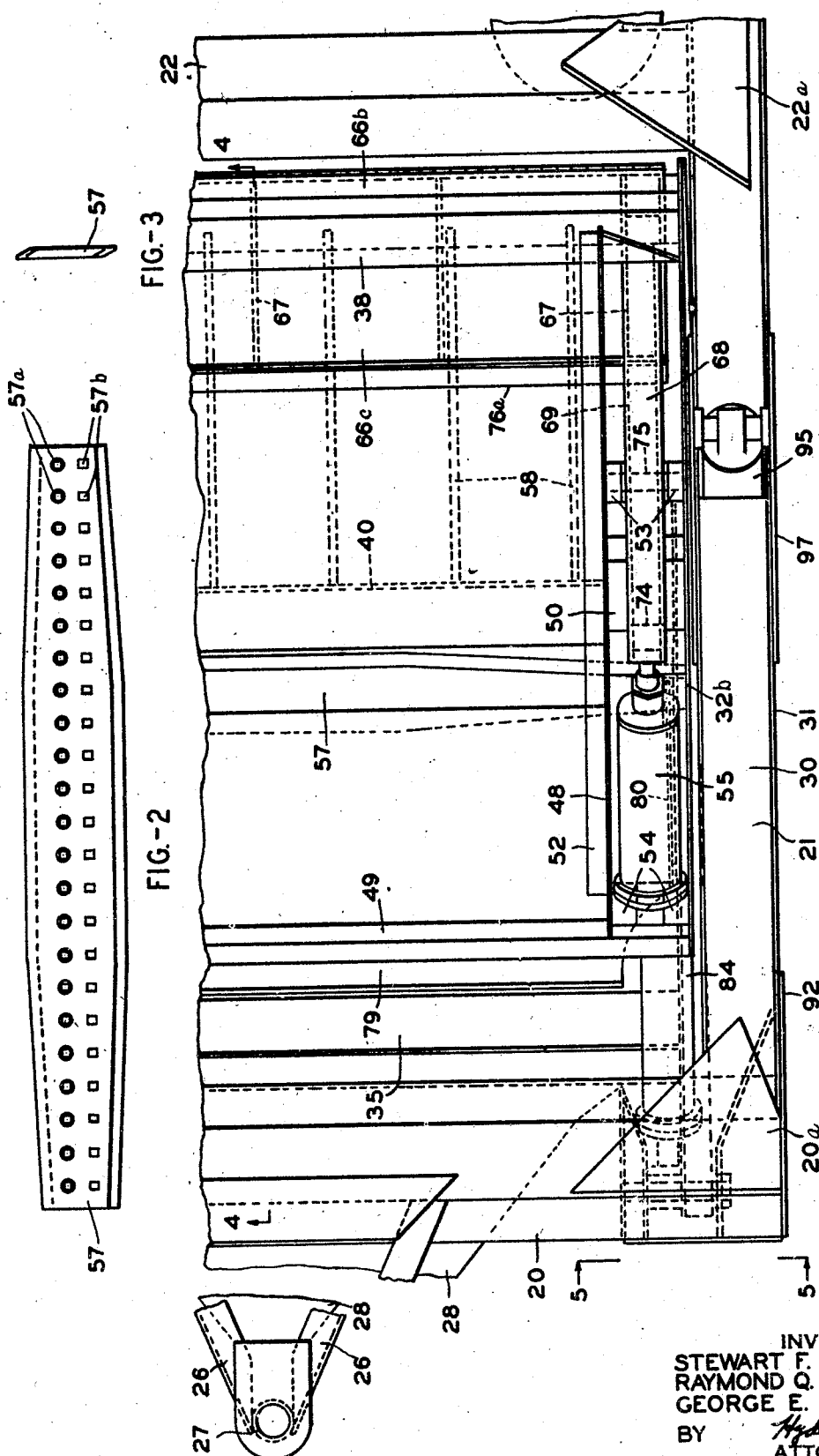
S. F. ARMINGTON ET AL

2,304,786

SCRAPER

Filed Nov. 13, 1939.

5 Sheets-Sheet 1



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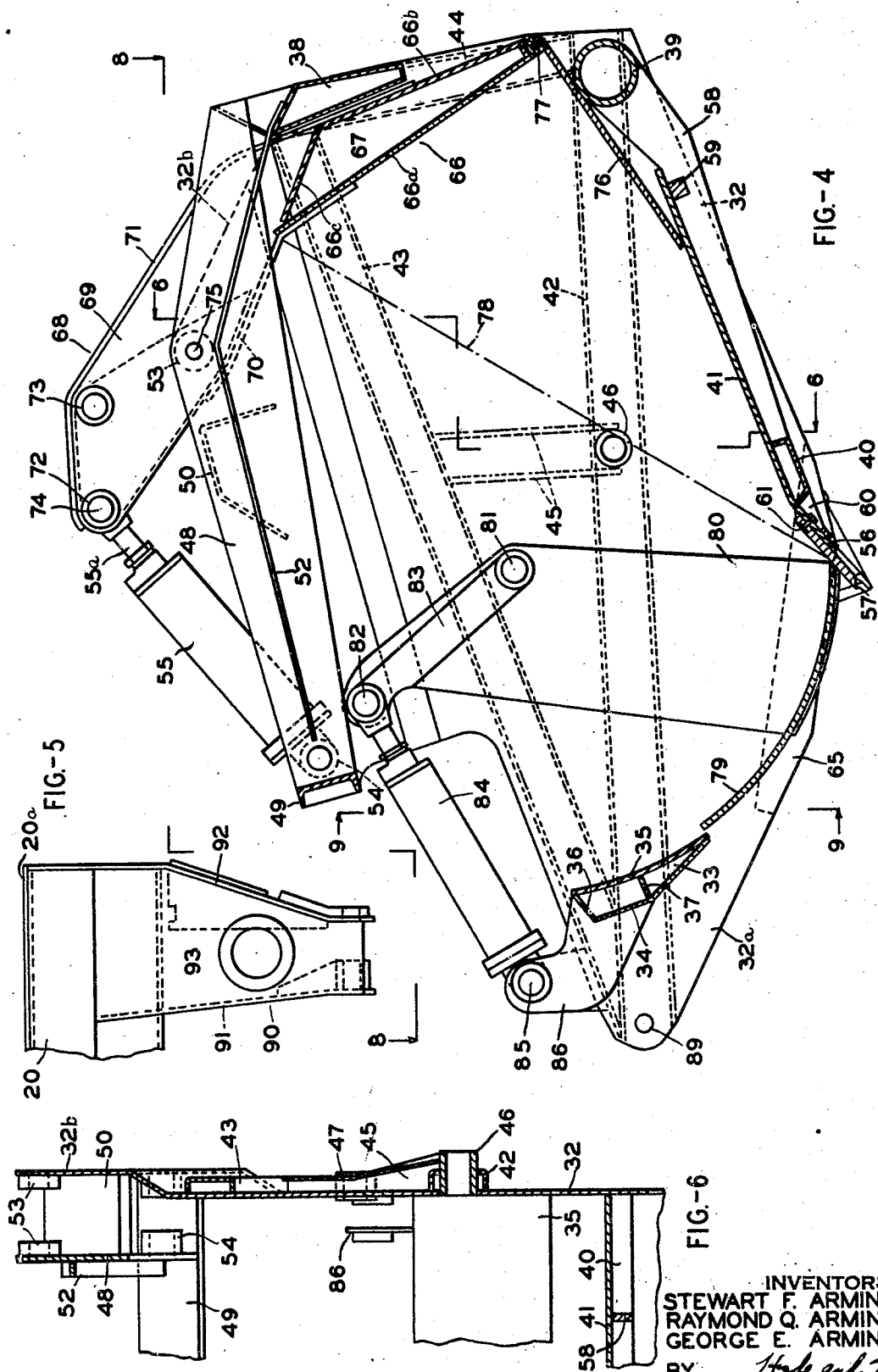
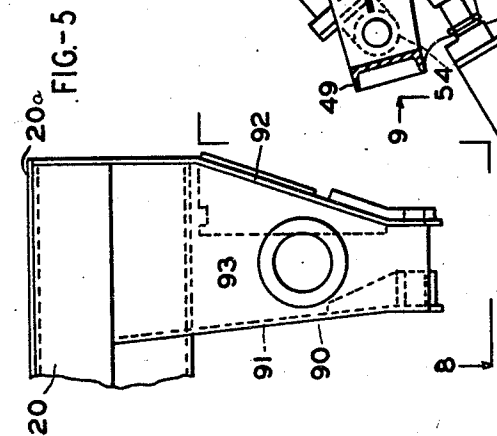
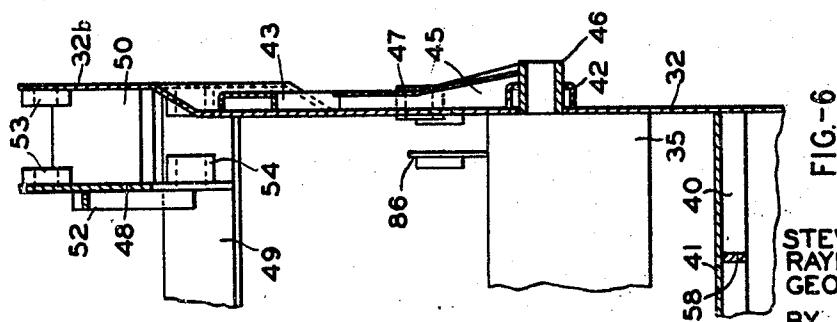
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5. Sheets-Sheet 2



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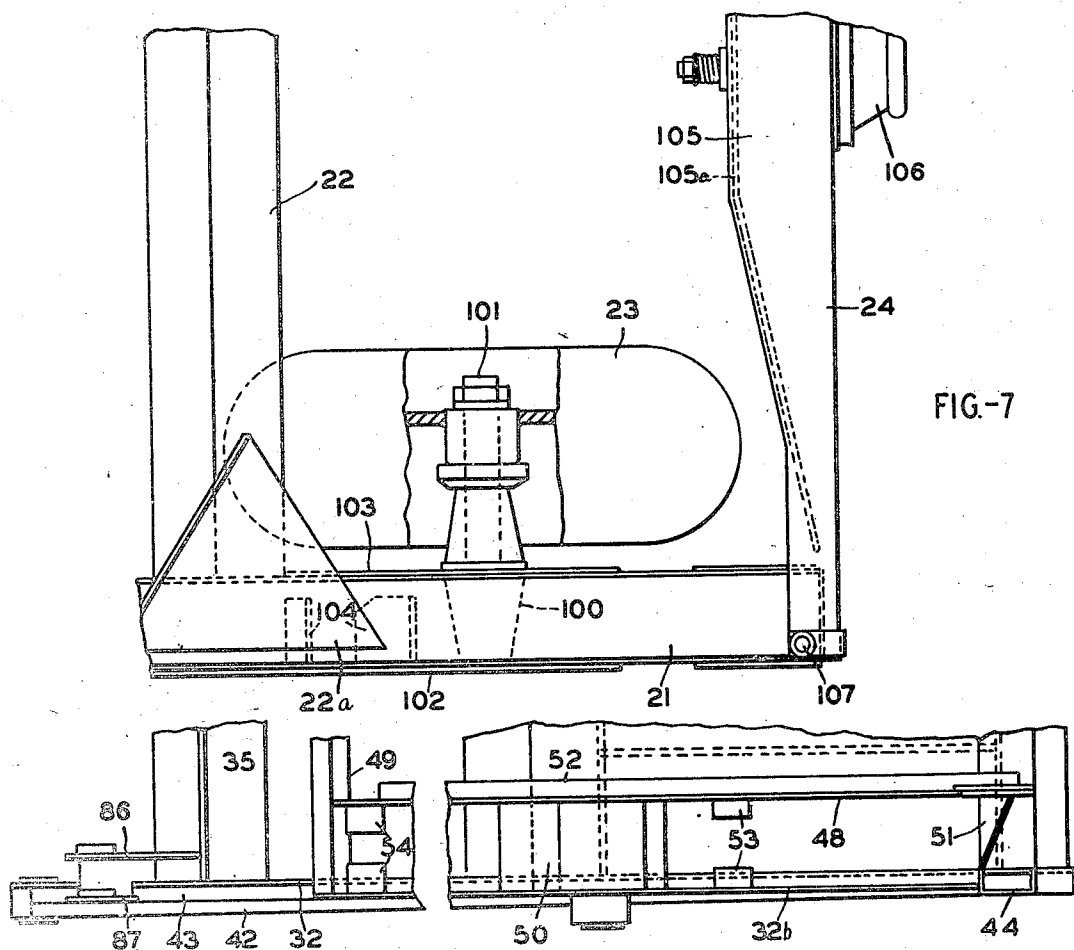


FIG.-8

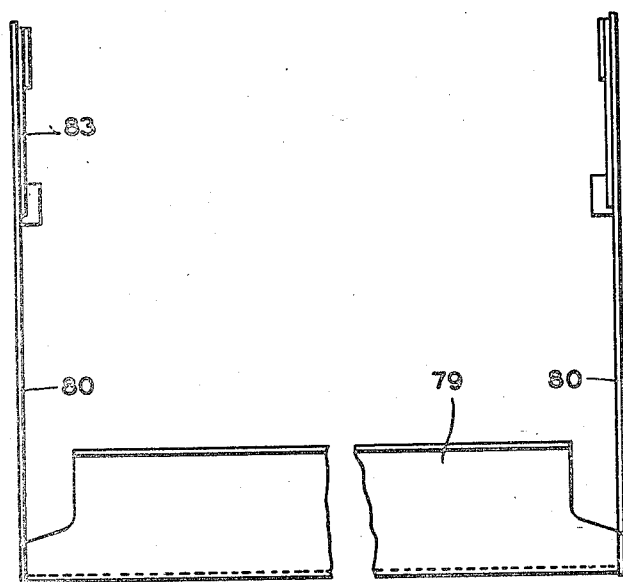


FIG-9

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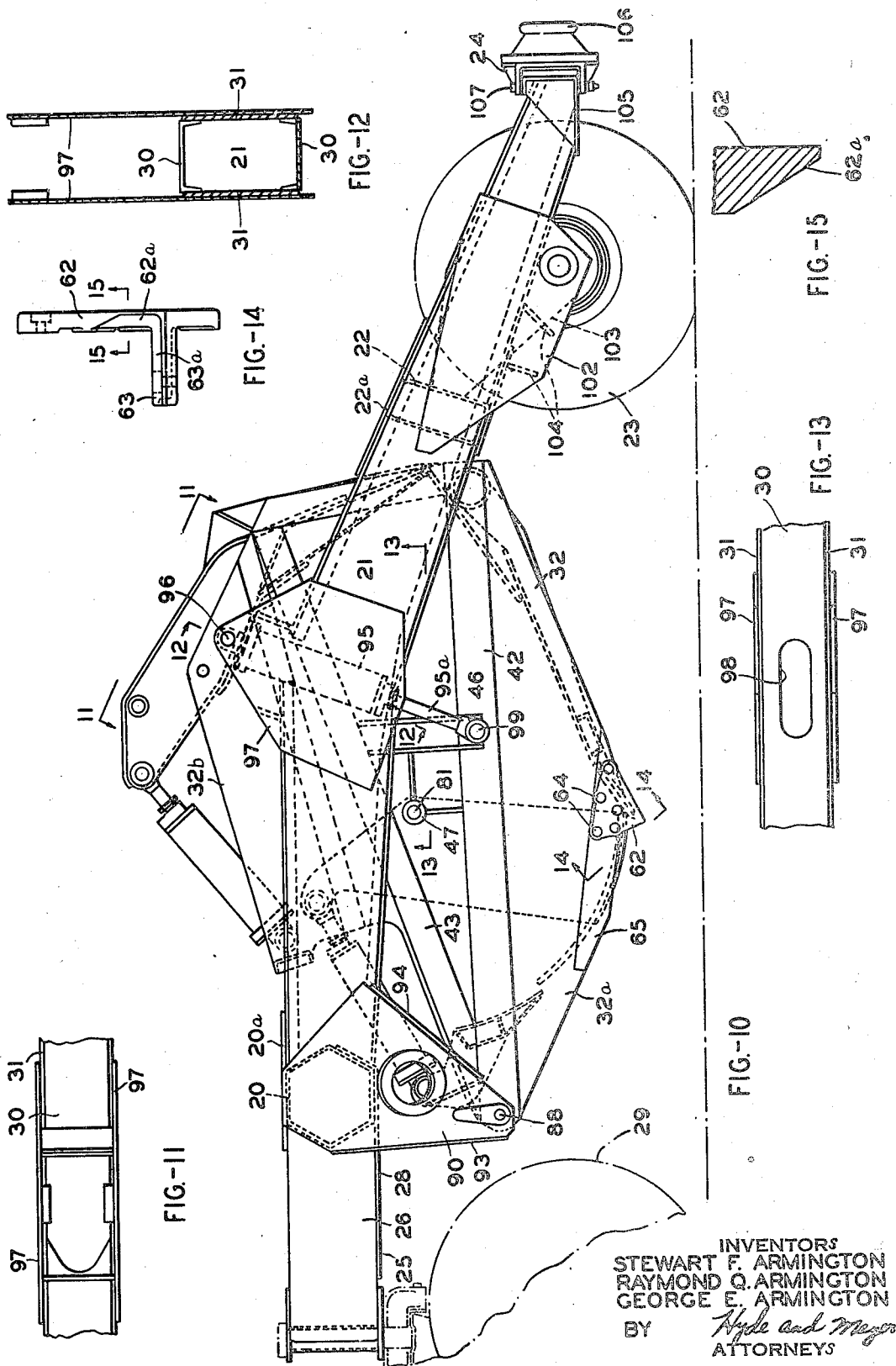
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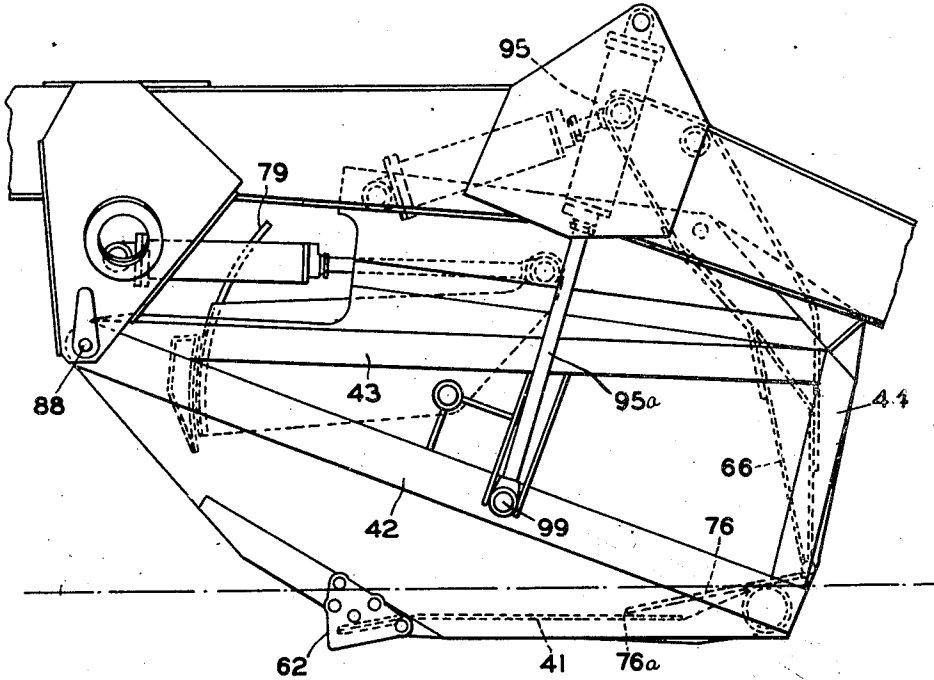


FIG.-16

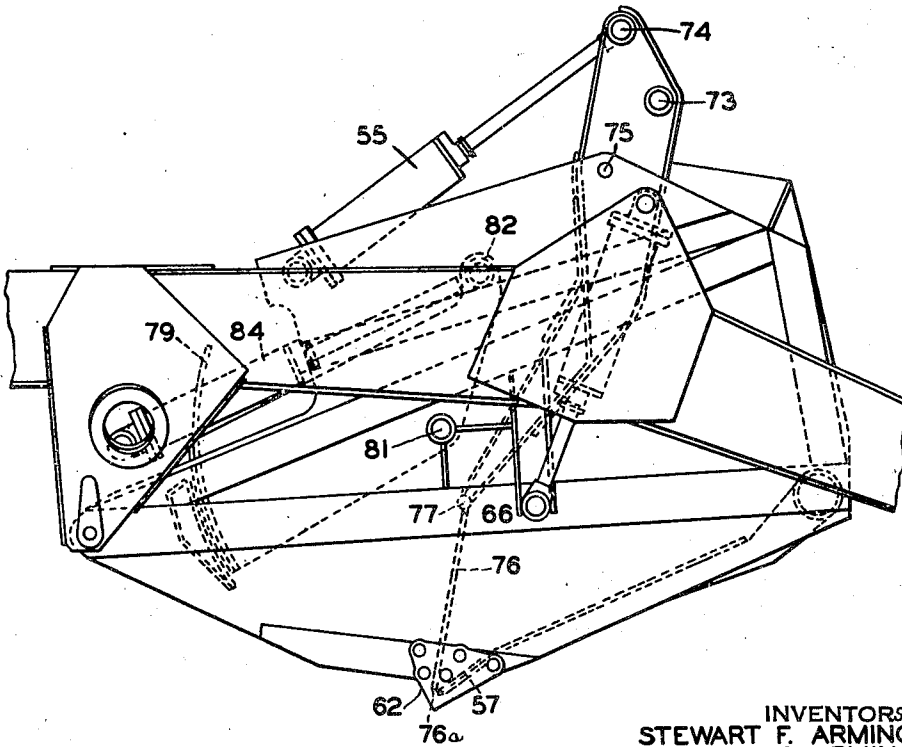


FIG.-17

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2,304,786

SCRAPER

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7 Claims. (Cl. 37—129)

This invention relates to improvements in dirt moving machinery, particularly of that type wherein a bowl open at its front end is supported on a wheeled frame and wherein means is provided for ejecting a load of material out of the open front end of the bowl.

Among the objects of the present invention is to provide a dirt carrying bowl or bucket of the type described in a strong, rigid frame so that the entire device is sturdy and able to handle heavy loads.

Another object of the present invention is to provide a bowl of very strong character reinforced in a novel manner and pivotally suspended from the main frame in an ingenious manner.

Another purpose of the present invention is to provide a novel and strong apron or gate construction for closing the normally open front end of the digging bowl or bucket.

Another object of the present invention is to provide novel digging means where the edges of the bowl enter the ground when the bowl is loading itself.

Another object of the present invention is to provide a novel and strong construction for the bottom of the bowl.

Another purpose of our invention is to provide a novel construction of the ejector gate and in particular an arrangement whereby a portion of the dirt ejecting means underlies and carries the dirt or other material out of the bowl as distinguished from the usual operation of pushing the dirt out.

Another object of the present invention is to provide novel hydraulically operated means for operating the bowl and the gates so as to provide a very strong construction and one in which the center of the bowl is left entirely clear for overhead loading if desired.

Other novel features will appear as the description proceeds and the essential features thereof will be summarized in the claims.

In the drawings, Figs. 1 and 7 are partial top plan views of a scraper embodying our invention, it being unnecessary to show the entire device as it is symmetrical about the center line; Figs. 2 and 3 are top plan and end elevational views respectively of the cutting blade for the bowl; Fig. 4 is a longitudinal sectional view taken along the line 4—4 of Fig. 1; Fig. 5 is a fragmental elevational view taken from the position 5—5 of Fig. 1 showing the frame parts only; Fig. 6 is a partial sectional view taken along the line 6—6 of Fig. 4 with the moving operating parts removed; Fig. 8 is a fragmental top plan view taken along the line 8—8 of Fig. 4 with the moving operating parts removed; Fig. 9

is a front elevational view of the movable front gate taken approximately on the line 9—9 of Fig. 4; Fig. 10 is a side elevation of the scraper; Figs. 11, 12, 13 and 14 are views taken along similarly numbered lines of Fig. 10; Fig. 15 is an enlarged fragmental sectional view taken on the line 15—15 of Fig. 14; while Figs. 16 and 17 are side elevational views corresponding to the mid portion of Fig. 10 and showing the bowl in digging and dumping positions respectively.

While the present invention might be embodied in a frame supported entirely by its own wheels and even self-propelled if desired, we have chosen to illustrate the same as embodied in a trailer-type scraper adapted to be pulled behind another vehicle which supports the forward end of the scraper frame. The main frame comprises a forward transverse member 20 which is here shown as hexagonal in section and may serve as a reservoir for the hydraulic fluid used to operate the jacks shown. This cross frame member is rigidly connected at its ends to parallel side frame members 21 which extend rearwardly and downwardly, being tied together at the rear of the bowl by a rear cross frame member 22 which is substantially rectangular in cross section. Gusset plates 20a reinforce the connection of member 20 with the side members 21, and gusset plates 22a reinforce the connection of the member 22 with the members 21. The rear end of the frame is carried on a pair of wheels 23 to the rear of which is a rear bumper 24 connected between the side frame members in a manner later described. At its front end the frame is provided with a draw bar generally indicated at 25 and comprising a pair of channels 26, the rear ends of which are rigidly secured to the cross frame member 20 and the forward ends of which converge to meet and are secured as by welding to a sleeve 27 which is adapted to support the vertical pin of a swivel or universal joint connection in a manner similar to the construction shown in our copending application Serial No. 290,392 filed August 16, 1939. 28 indicates a plate generally triangular in shape welded to the bottom flanges of the channels 26 and at its rear end passing beneath and folded up alongside of the transverse frame member 20 and welded thereto. In Fig. 10 at 29 we have indicated a rear wheel of a traction vehicle adapted to pull the scraper, such for instance as a tractor commonly used in this art. As best shown in Fig. 12 the side frame members 21 are hollow beams comprising top and bottom channel members 30 and side plates 31 rigidly welded thereto. A general consideration of the main

frame as thus far described will indicate that it is very strong, being composed of large hollow beams all rigidly connected together and defining between the side frame members 21 and the front and rear cross frame members 20 and 22 an opening in which the digging bowl or bucket may be suspended. This is a great advantage over those frames of the type which are hinged or buckled in the middle or at one end and provides a scraper adapted for very heavy duty.

The digging bowl or bucket comprises parallel side plate members 32 extending forward at 32a beyond the point necessary to support the load of material in the bowl for the purpose of providing a strong construction and a novel means for pivotally connecting the bowl to the main frame. The bowl side plates are rigidly connected together at a number of points. It will be noted that the bowl is open at both the front and rear and (referring particularly to Fig. 4) four hollow beam cross members are shown which rigidly connect the side plate members 32. At the front end of the bowl the tie member 33 forms a fixed gate or apron portion adapted to coact with a movable gate portion which telescopes therewith when the front of the bowl is open. This tie member 33 comprises a front plate 34 and a rear curved plate 35 which converge together and are secured at their bottom edges. A top plate 36 completes the beam which may be reinforced by an internal web 37 if desired. A second tie member 38 is shown at the upper rear portion of the bucket. This member is quadrilateral in form as shown in Fig. 4 and is rigidly connected at its ends to the side plates 32. A third tie member 39 tubular and cylindrical in form is provided at the lower rear portion of the bowl and rigidly connected at its ends to the side plates 32. A fourth cross tie member 40 is provided at the lower front portion of the bowl and comprises an upturned channel member which has the edges of its flanges welded to the bottom plate 41 of the bowl just to the rear of the front digging edge thereof. The channel 40 and the plate 41 are both welded to the side plates 32 of the bucket. Thus the bucket is tied together in a very strong manner by these four transversely extending members.

The side walls of the bucket are reinforced in a novel manner and the reinforcing members are associated in a novel manner with the means for supporting and manipulating the bowl. A long channel member 42 extends substantially parallel to the ground from front to rear of each side plate 32 on the outside thereof and is welded throughout its length to the side plate. A second channel shaped member 43 extends along each side plate 32 near the upper edge thereof, the channels 42 and 43 being separated at the rear of the bowl by substantially the height thereof and converging at a common point at the front end of the bowl. A third channel member 44 extends substantially vertically along the rear edge of each side plate 32 and is welded thereto and welded also to the rear ends of the channels 42 and 43. In the mid portion of the bucket, plates 45 extending normally to plates 32 are welded thereto and to the channels 42 and 43 and provide another tie member between the channels and a reinforcing member for the bucket side plates. To the bucket side plates and the channels 42 are secured suitable bosses 46 for the attachment of the hydraulic jacks which raise and lower the bowl. The side walls also carry bosses 47 by means of which the movable front gate is

suspended from the bucket side walls. We have thus provided a truss-like reinforcement for the side walls of the bowl with which are associated the supporting and lifting structures for the bowl.

The bowl side plates 32 extend upwardly at 32b to a height beyond that necessary to support the normal load of material in the bowl. The purpose of these portions 32b is to aid in providing a mounting means for the ejector gate and its hydraulic actuating mechanism. Referring to Figs. 4 and 8, a plate member 48 is provided inside of and parallel to each plate portion 32b and permanently fixed in that position. The means for so fixing the plate 48 comprises a channel 49 at the front end extending clear across the bucket and in a sense forming another cross tie member for the bucket in addition to the four previously described. At the mid portion of the bucket a channel shaped member 50 is welded between the plates 48 and 32b to tie them together at that point. At its rear end the plate 48 is supported by the triangular plate member 51. A stiffener member 52 extends the full length of each plate 48 on the inside thereof and approximately midway between the top and bottom thereof. Bosses 53 on plates 48 and 32b are provided for the pivotal support of the arms of the ejector gate. Bosses 54 are provided on plates 48 and 32b for connecting the hydraulic jack 55 which operates the ejector gate.

The bottom of the bowl is of unusual construction. It will be noted that the forward edge of the bottom plate 41 is bent downwardly at 56 and provided with a row of holes to accommodate the bolts which fasten a hardened steel cutting blade 57 in cutting position. Referring to Figs. 2 and 3 it will be seen that this cutting blade is reversible and adapted to be secured either by a row of bolts 57a as shown or by turning the plate over the bolt holes 57b may be used, thus doubling the life of the cutting blade. The blade is tapered slightly toward each end to increase its cutting qualities. Just back of this cutting edge the transverse member 40 stiffens and supports the cutting edge. Extending rearwardly from the member 40 are a series of parallel steel bars 58 secured to the member 40 and to the bottom plate 41 and at their rear ends welded to the cross member 39. A strengthening and tie member 59 extends across the entire bottom and is recessed into the bars 58 as best seen in Fig. 4. It will be noted that the bottom plate 41 terminates just to the rear of the cross member 59 leaving the spaces between the bars 58 open between the rear edge of plate 41 and the cross member 39. Thus dirt cannot accumulate at this point but falls out between the bars. Between the member 40 and the plate portion 56 are a plurality of triangular inserts 60 welded in position which serve to protect the bolts 61 which secure the cutting blade 57 to the bottom plate portion 56. The ribbed construction of the bottom here described is very strong and facilitates the sliding of the bottom of the bowl over the ground during the cutting action as the scraper bowl is filled with loose material.

Where the cutting blade 57 joins the side walls 32 means is provided to resist wear and to assist the cutting action as the bowl digs into the ground to fill itself. Referring to Figs. 10, 14 and 15, at each end of the cutting blade 57 is provided a casting 62 of a material adapted to resist abrasion. This casting has a flange por-

tion 63 adapted to be secured to the bottom-plate portion 56 while the main vertical portion of the casting is secured to the bowl side plate 32 as for instance by the rivets 64. Referring to Figs. 14 and 15, the flange portion 63 is beveled at 63a to give a cutting edge and the main casting portion 62 is beveled as at 62a to give a side cutting edge. The casting 62 obviously may be renewed when necessary. If desired, the side plates 32 may be further reinforced by riveting a plate 65 along the forward lower edge of each plate 32 where it engages the ground during a digging action.

The ejector gate indicated generally at 66 extends entirely across the bowl between the side plates 32 and is oscillatable from its rear position shown in Figs. 4 and 16 to a forward position shown in Fig. 17 to eject dirt out of the open front end of the bowl. The ejector gate proper is a hollow member substantially triangular in section comprising a front plate 66a, a rear plate 66b and a top plate 66c all welded together and reinforced by a plurality of substantially triangular plates 67 spaced along the length of the gate and extending normally to the plates 66a, b and c and welded rigidly thereto. At each end of the ejector gate and close to the side walls 32 is provided an arm 68 by which the ejector gate is operated. Each arm comprises a pair of parallel side plates 69 spaced approximately four inches apart and extending to the plate 66c to which they are welded. The parallel plates 69 are tied together with a plate 70 on one side thereof and by means of a plate 71 on the other side thereof. The plates 70 and 71 extend downwardly onto the plates 66a and 66b respectively to which they are welded to give a strong construction. Suitable openings are provided through the ejector arms at 72 and 73 through either one of which may pass the pin 74 which pivotally connects the piston rod 55a of the hydraulic jack 55. A pin 75 passing through bosses 53 pivotally connects each ejector arm to the bowl. It will be noted that the openings 72 and 73 are located at different distances from the pivot pin 75 so that the hydraulic jack 55 may be connected to the ejector arm with different leverages depending upon the digging conditions. For instance with the connection made at the point 72, if the material being dug is heavy this will give greater power and less rapidity of action, whereas if the digging is lighter the connection is made at 73 which provides less power and greater rapidity of action. Referring to Fig. 17 it will be noted that points 73 and 74 are equidistant from the point where jack 55 is pivotally mounted on the bowl, when the ejector gate is in its forwardmost position. Thus proper ejection takes place whichever leverage is used. Referring to Figs. 1 and 8 it will be noted that the point 54 where the jack 55 is connected to the bowl, and the point 74 where the piston rod of the jack is connected to the ejector arm, and the point 75 where the ejector arm is pivotally connected to the bowl, are aligned so that no twisting forces are involved when the ejector gate is operated. It will be noted also that this operating mechanism for the ejector gate lies wholly at each side of the bowl so as to leave it open and unobstructed at the top.

An improvement is provided in the ejector gate whereby loose material in the bowl may be ejected with a minimum of friction. To this end a flapper gate 76 is hingedly connected at 77 to the bottom of the ejector gate. It will be noted that

the member 76 is not a mere scraper flap but is a plate of considerable extent so as to underlie a large part of the material within the bowl. Referring to Fig. 4 there is shown at 78 a line extending from the forward lip of the bowl out of which material is discharged when the front gate is open and this line 78 extends at substantially 60° to the horizontal which is a representative line indicating the angle of repose of material dug by scrapers of this type and which is difficult to unload. It will be evident here that the plate 76 underlies substantially half of the material which will be left in the bowl below the line 78 when the ejector gate starts forward to unload this residue material. The action therefore is that of carrying the material resting on plate 76 while pushing ahead of it the material lying in front of it. This gives a very easy unloading action. It will be noted that point 77 moves relatively abruptly forward and up because it moves about an arc whose center 75 lies within the confines of the bowl. The forward edge 76a constantly engages the bottom of the bowl to clean all dirt away. As the point 77 moves upward the dirt on plate 76 is lifted and rolled out the open front of the bowl and when the gate reaches its forwardmost position as shown in Fig. 17, the combined flapper and ejector gate breaks forwardly at the hinge point 77 as shown which causes the last increment of material to break away and to fall to the ground along the substantially vertical plate 76.

The movable front gate comprises a curved plate 79 extending the entire width of the bowl at the bottom thereof but cut away at the top side edges as shown in Fig. 9 so as to provide clearance for the parts. Plate 79 is secured to side arms 80 which lie just inside of the bowl side plates 32. The arms 80 are pivotally connected to the bowl side plates by means of pins 81 which enter the bosses 47 previously described. A jack for operating the gate is attached to each arm 80 by a pin 82. If desired a reinforcing plate 83 may be welded to each arm extending between the points 81 and 82 so as to transmit power without warping the gate. Two jacks 84 are provided one at each side of the bowl for operating the front gate. The cylinder of each jack is pivotally supported at a pin 85 which is held in the bracket structure comprising a pair of parallel side plates one of which 86 is welded to the plates 34 and 36 of the fixed apron and the other of which 87 is welded to the channel 43. It will be noted that the jacks 84 and the gate arms 80 are located at the sides of the bowl so as to maintain the space above the bowl entirely unobstructed.

The bowl is supported for pivotal movement relative to the main frame by two pins 88, each pin passing through an opening 89 in the bowl side plate 32 and in the channel member 42. Each pin 88 is supported in a bracket 90 best seen in Figs. 1, 5 and 10. Inner and outer side plates 91 and 92 respectively are secured to the hexagonal frame member 20 and are tied together by front and rear plates 93 and 94 respectively. Suitable stiffening plates and bosses are provided as shown.

The means provided for oscillating the bowl about the pins 88 comprises a pair of jacks 95. Each jack has a cylinder supported at its upper end pivotally on pins 96 which are carried by plates 97 which in turn are rigidly secured to the side plates 31 of the main frame member 21. The piston rod 95a of each jack extends downwardly through an opening 98 in the bottom

channel member 36 and is pivotally connected at its lower end by means of pin 99 directly to the bowl side plate 32 and the channel member 42. Thus the lifting force of the hydraulic jacks 95 is located directly in line with the bowl side walls and is connected with the truss-like reinforcement of the bowl side walls previously described.

The wheels 23 at the rear of the frame are in a protected position between the side frame members 21, the cross frame member 22 and the rear bumper 24. These wheels are supported in a novel manner. A steel casting axle bracket 100 is supported in each side frame member 21 and extends inwardly to receive a stub axle 101 which carries the wheel. The means for supporting the casting 100 comprises an outer plate 102 welded to the outer plate 31 of the side frame member 21 and extending forward to a point beyond the cross frame member 22. An inner plate 103 which is welded to the inner plate 31 of the side frame member extends upwardly to the cross frame member 22 and is welded thereto. These two plates 102 and 103 rigidly support the bracket 100 and hence the wheel 23. Between the plates 102 and 103 are secured cross members 104 which serve to support the wheel braking mechanism.

The bumper 24 at the rear of the frame comprises a member 105 generally channel shape in form and having its top and bottom flanges extending forwardly. A plate 105a extending normally to the flanges of the member 105 is welded between them near the rear edge thereof to strengthen the bumper. At its center the bumper carries a spring supported projection 100 adapted to take the blow from a bulldozer or other pushing vehicle. At each end the bumper has a pivot connection with the side frame members 21 by means of pins 107. Either pin may be removed and the bumper swung about the other pin as a hinge to gain access to the rear of the frame as for instance to remove or work on the wheels 23.

Suitable mechanism is provided for working the hydraulic jacks 55, 84 and 95 but the same is not shown here as it forms the subject matter of a separate application. Suffice it to say that to operate the scraper here shown it is only necessary to provide pressure fluid to work the pistons of the jacks backward and forward in a known manner.

The bowl and its connected mechanism are shown in carrying position in Figs. 4 and 10 and in digging position in Fig. 16 and in dumping position in Fig. 17. It will be understood by those skilled in this art that when the load has been carried to the desired point the jacks 84 are operated to move the points 82 in a clockwise direction as shown in the various views about the point 81 so as to telescope the front gate member 79 alongside the fixed gate or apron member 35 as shown in Fig. 17. Thereafter the jacks 55 are operated to move the point 74 in a clockwise direction about the point 75 so as to move the ejector arms and to carry the ejector gate 66 to the position shown in Fig. 17 where the loose material has been pushed by the ejector gate and partly carried by the flapper gate 76 forwardly with the point 77 moving forward and upward so that the flapper gate 76 gradually increases its angle of inclination relative to the bottom plate 41 until the flapper gate finally reaches the position of Fig. 17 where it hangs substantially perpendicular and in front of the cutting blade or digging edge of the bowl 57. Thus all material in the bowl is discharged, it

being noted that the front gate portion 79 is moved to such a steep angle that no material can be held there.

The next operation is to reverse the action of the jacks 55, returning the ejector gate to its rear position as shown in Fig. 16. The jacks 95 are then operated to force the piston rods 95a downward, thus moving the points 99 and indeed the entire bowl in a clockwise direction about the pivot pins 88. The cutting edges of the bowl are thus forced into the dirt with the bottom of the bowl substantially horizontal as shown in Fig. 16 and with the forward pull as applied through the main frame exerted through plates 32 and through the channel members 42 and 43 in a very direct manner to the bowl. When the bowl is sufficiently loaded the jacks 84 are operated in a direction to move the front gate 79 in a counterclockwise direction to close the front of the bowl and the jacks 95 are operated to lift the bowl so that the parts again return to the carrying position of Figs. 4 and 10.

It will thus be seen that we have provided a scraper of exceptional strength and simplicity having a small number of parts, all of which are rugged, with power applied directly to all of the operating parts by means located entirely along the side walls of the bowl so that the scraper is easy to construct and to maintain and to operate.

What we claim is:

1. In a scraper of the class described, a frame, a bowl supported thereby, said bowl having side walls and a bottom, said bowl having a fixed front wall portion spaced above said bottom leaving a front opening in said bowl, a gate pivotally mounted on said bowl for closing said opening, said gate being arranged to swing alongside said front wall portion telescopically, a jack for moving said gate, and a pivotal mounting for said jack including a portion of one of said bowl side walls and a bracket mounted on said wall portion.
2. In a scraper of the class described, a bowl having side walls and a bottom, an ejector gate in said bowl having a pivotal mounting permitting its oscillation from rear to front of said bowl to discharge material at the front thereof, means for pivotally mounting said gate including an upwardly extending portion of one of said side walls and a member adjacent and spaced from said side wall portion, a jack connected with said gate for moving it, and said jack having a pivotal mounting between said side wall portion and said member.
3. In a scraper of the class described, a bowl having side walls and a bottom, an ejector gate in said bowl having a pivotal mounting permitting its oscillation from rear to front of said bowl to discharge material at the front thereof, means for oscillating said gate including a jack having a pivotal mounting on said bowl, and two selectively usable pivotal connecting means for connecting said jack to said gate, said connecting means being spaced different distances from said gate pivotal mounting and said connecting means being spaced substantially equidistant from said jack pivotal mounting when said gate is at the front limit of its travel.
4. In a scraper of the class described, a scraper bowl having side walls and a bottom, said bowl being open at its forward end, an ejector gate extending between said side walls and to a point near said bottom at the rear of said bowl, means for moving said gate forwardly and upwardly to eject material from said bowl, and a flap hinged

to the bottom of said ejector gate and extending forwardly when the said gate is at the rear of said bowl, and the relation between said ejector gate, flap, and bottom being such that with said ejector gate in its forwardmost position, said flap hangs substantially vertical.

5. The combination of claim 4 wherein said parts are so arranged that said flap hangs in front of the forward edge of said bottom when said ejector gate is in its forwardmost position.

6. In a scraper of the class described, a frame, a bowl having sides and a bottom and being open at the front end, said bottom having a cutting edge at its front end, a plurality of parallel ribs extending from said cutting edge to the rear end of said bottom and secured to the lower face of said bottom, a beam extending from side to side of said bowl at the rear end of said ribs and there joining them together, reinforcing members extending forwardly along each side of said

bowl from said beam to a point forward of the cutting edge, and said side wall reinforcing members being pivotally mounted on said frame at their forward ends.

7. In a scraper of the class described, a rigid frame, wheeled means supporting said frame, a bowl having side walls and a bottom, said bottom having a cutting edge at its front end, reinforcing members for the side walls, two for each side wall of said bowl and secured to the associated side wall, the reinforcing members for each side wall being spaced apart vertically at the rear end of the bowl and converging to a common zone at the forward end of the bowl, and said reinforcing members being pivotally mounted at their forward ends on said frame.

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