

Aug. 10, 1943.

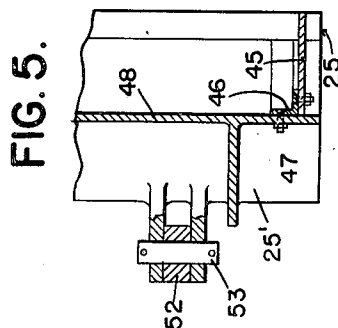
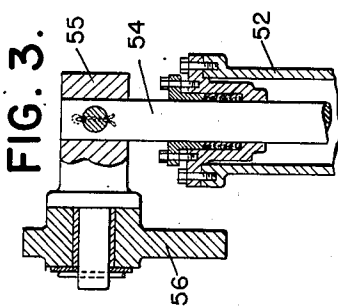
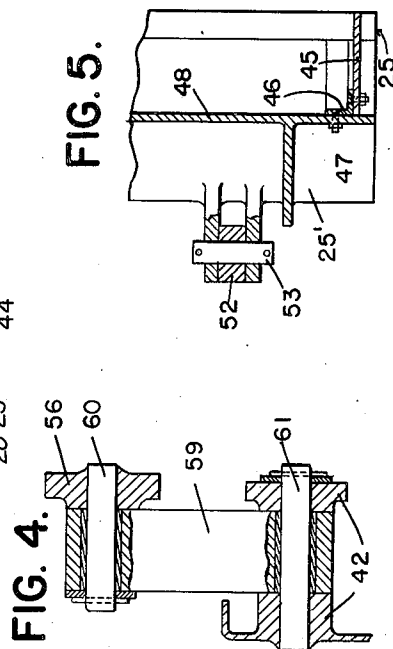
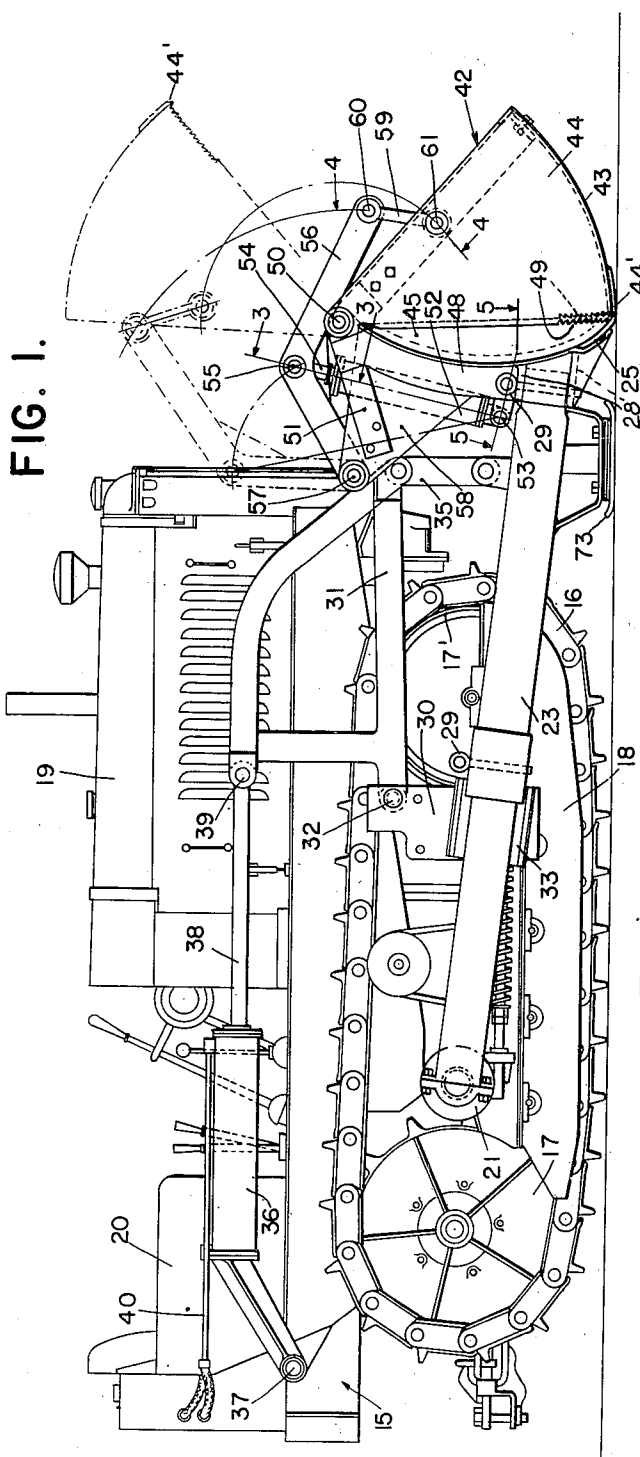
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2,326,338

MATERIAL HANDLING APPARATUS

Filed Dec. 30, 1940

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

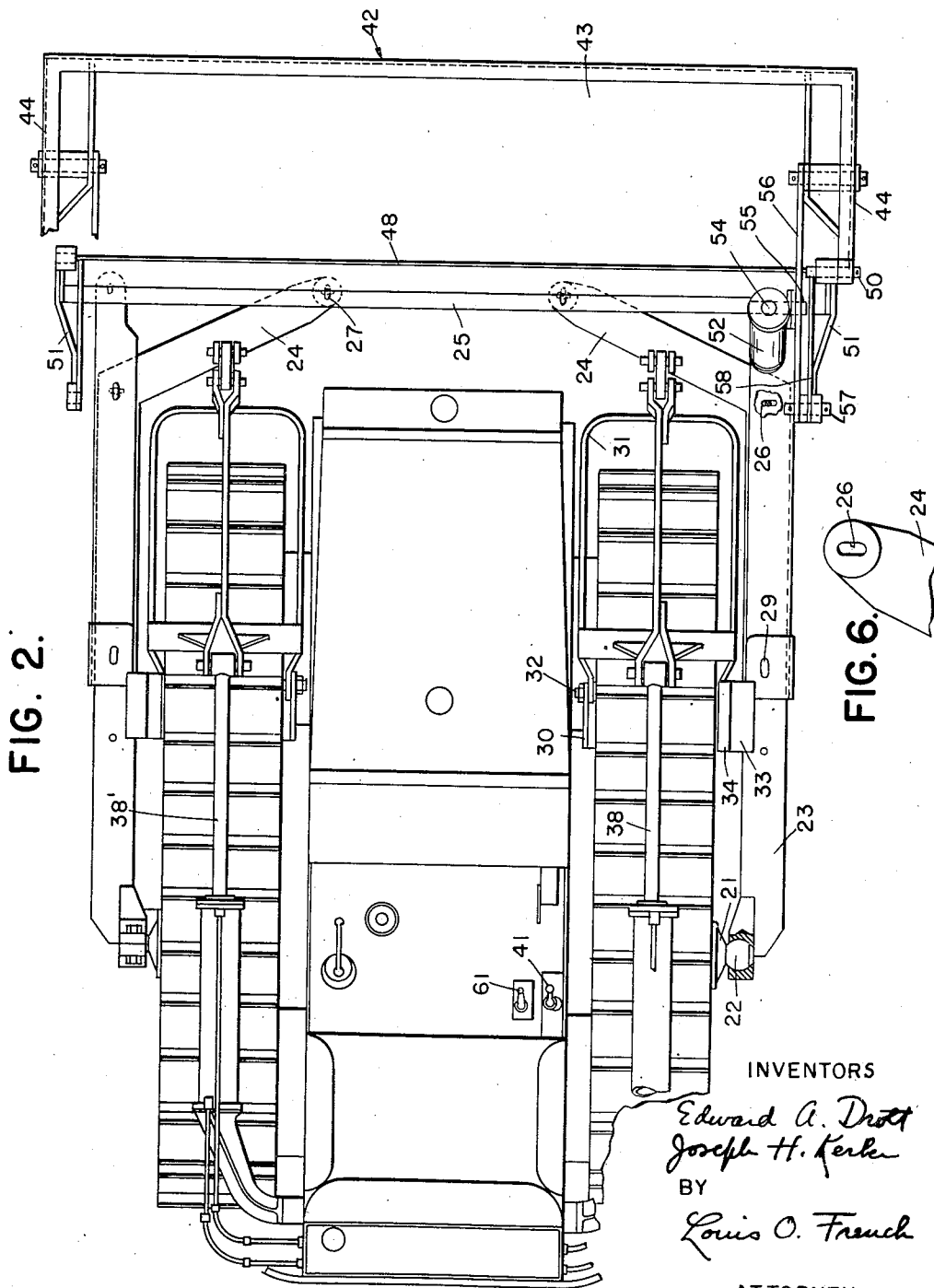


FIG. 2.

FIG. 6.

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FIG. 7.

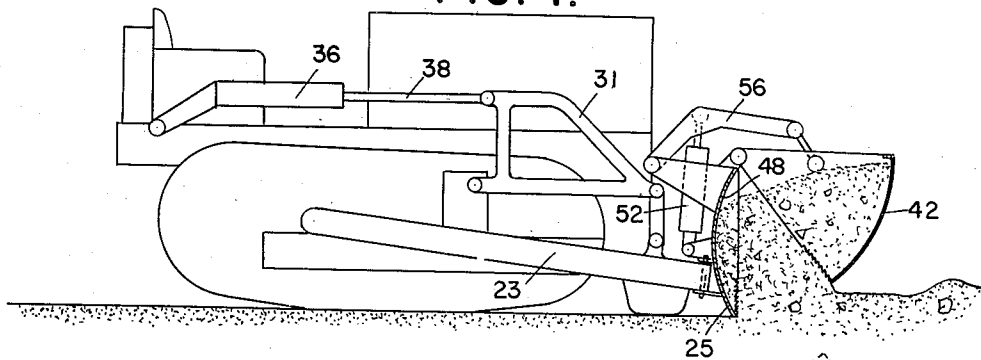


FIG. 8.

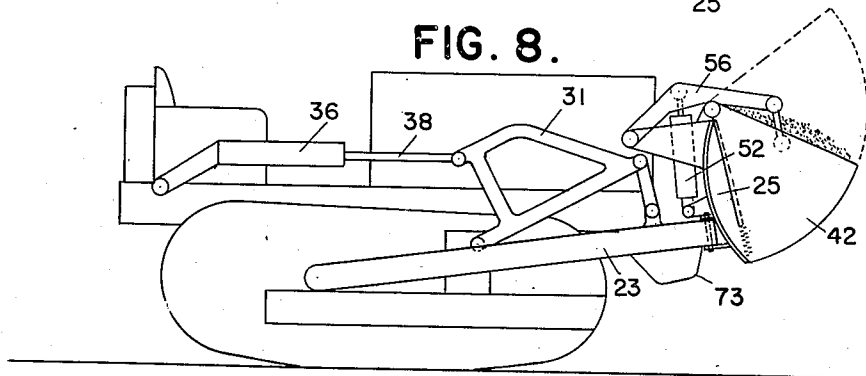
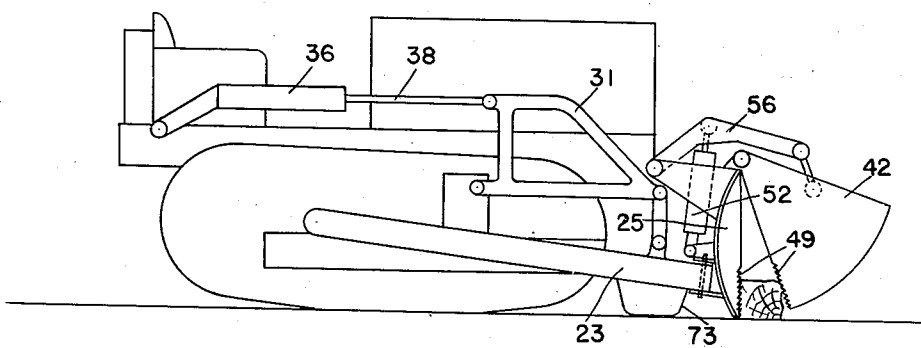


FIG. 9.



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FIG. 11.

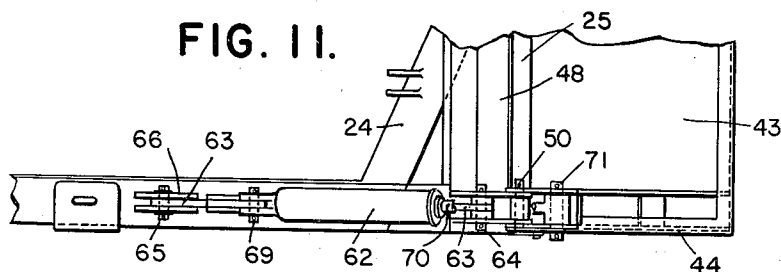


FIG. 10.

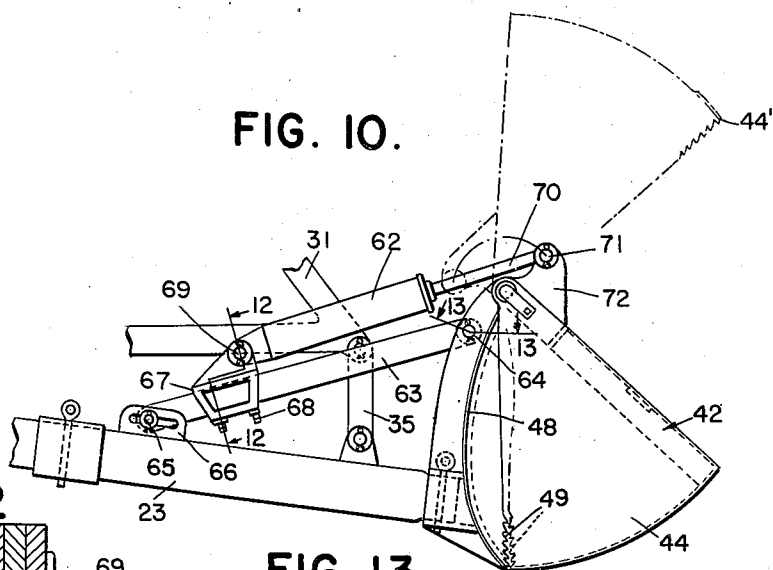


FIG. 12

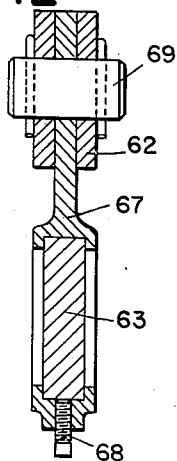


FIG. 13.

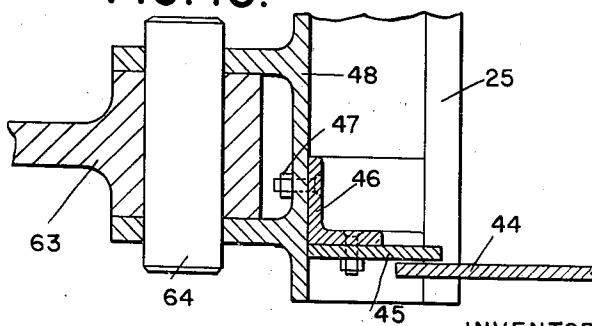
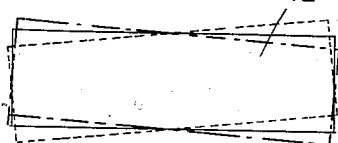


FIG. 14.



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2,326,338

MATERIAL HANDLING APPARATUS

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Application December 30, 1940, Serial No. 372,322

7 Claims. (Cl. 37-118)

The invention relates to material handling apparatus.

The general object of the invention is to provide a heavy duty material handling apparatus having a wide variety of uses in the excavating and moving of earth or other bulky material and in the carrying and handling of logs, stones, and other objects and materials. According to the present invention, we have combined with a structure which acts as a plow, preferably, though not necessarily, of the type used as a bulldozer, back filler, or snow plow, a movable gripper member which preferably has the form of an open ended scoop cooperating with the plow to form a bucket which through the vertical movement of the pusher is raised to transport its load and which may discharge its load in either a raised or lowered position.

The present apparatus may be used for the excavating of earth, snow, and other material by placing the bulldozer or snow-plowing blade in a digging position and moving the scoop member to a partially open position whereby on the forward movement of the apparatus the earth picked up by the blade will be turned into the scoop member until finally the bucket structure formed by the blade and scoop member will become full of earth, and then the scoop member may be moved to a closed position and the whole structure raised to transport the load to a place of deposit. When using the device for picking up refuse, the device may be moved to a position where it may be lowered onto a portion of the refuse with the scoop member in an open position and then by moving the device through part of the refuse and closing the scoop member the charge acquired by the apparatus during these operations can be moved to the desired location. In using this device for the handling of large stones with the scoop in a raised position, the apparatus is moved to bring the bulldozer portion adjacent the one side of the stone to be removed, and then the movable scoop member or gripper member is moved to a position to engage the opposite side of the stone whereupon the whole structure may be moved to an elevated position to transport the stone to a place of deposit. In using this device for the handling of timber either in lumber yards or in the woods during cutting and lumbering operations the device may be moved to a position to engage one side of the piece of timber or log while the gripper member is in an elevated position, and then the gripper member may be lowered to engage the other side of the

timber or log and then the whole plow structure raised so as to carry or move the timber or log to the desired location.

In connection with the gripping and carrying of various types of material by the structure embodying the invention, it is to be noted that the carrying arms for the plow structure are capable of independent raising or lowering movement, so that articles such as a piece of timber, while in a raised position, may be tilted vertically so as to bring one end or the other into a raised position which in some instances aids in loading the timber or logs onto a pile.

In addition to the above uses, the device may also be used for tamping down earth when the scoop member is in a lowered or closed position and is raised and lowered with the bulldozer so as to bring its lower face into contact with the earth and act to tamp the same.

The invention further consists in the several features hereinafter set forth and more particularly defined by claims at the conclusion hereof.

In the drawings:

Fig. 1 is a side elevation view of an apparatus embodying the invention;

Fig. 2 is a plan view thereof, parts being broken away and parts being shown in section;

Fig. 3 is a detailed sectional view taken on the line 3-3 of Fig. 1;

Fig. 4 is a detailed sectional view taken on the line 4-4 of Fig. 1;

Fig. 5 is a detailed sectional view taken on the line 5-5 of Fig. 1;

Fig. 6 is a detailed sectional view of the ends of one of the raising arms;

Fig. 7 is a generally diagrammatic view showing the apparatus in the position in which it acts as a remover of earth or other bulky material;

Fig. 8 is a view similar to Fig. 7 showing the apparatus in load carrying position;

Fig. 9 is a view similar to Fig. 7 showing the apparatus in the position for receiving a piece of timber or other bulky object;

Fig. 10 is a detailed side elevation view showing certain modifications in the scoop member operating mechanism;

Fig. 11 is a plan view of the structure shown in Fig. 10, parts being broken away;

Fig. 12 is a detailed sectional view taken on the line 12-12 of Fig. 10;

Fig. 13 is a detailed sectional view taken on the line 13-13 of Fig. 10;

Fig. 14 is a diagrammatic front end view showing the vertical tiltability of the structure embodying the invention.

In the drawings, the numeral 15 designates generally a tractor of known construction of the full crawler type having endless propelling treads 16 running over sprockets 17 and 17', here shown conventionally at the rear and front portions of the tractor and over the usual truck or tread rollers (not shown) mounted in the truck or tread frames 18. As is usual, the rear sprockets 17 are driven from the engine housed in the housing 19 through a suitable transmission (not shown) and under the control of the operator or driver of the tractor from his seat 20, these controls not being specifically shown. The tread frames 18 include frame members to which pivot-forming brackets 21 are secured, said brackets having ball shaped pivot ends 22 upon which the side frame members 23 of the plow supporting frame are pivotally mounted. This supporting frame further includes angular frame members 24 which may be adjustable lengthwise relative to the members 23, said members 23 and 24 adapted to be connected at their outer ends to a pusher blade or other implement member 25 by pin joints consisting of elongated or oval slots 26 in the frame members adapted to receive a coupling pin 27 which pin also passes through spaced ears 28 provided on a transversely extending frame part 25'. The slots 26 allow the pins 27 sufficient play so as to permit the raising or lowering of one end of the implement member 25 relative to the other. The frame members 23 and 24 are detachably secured to each other through removable pin connections 29. The slots for these pins may also be loose in a transverse direction to accommodate the individual tilting of the frame members. Angular brackets 30 generally similar to those shown and described in the prior issued Patent No. 2,190,452, dated February 13, 1940, are rigidly secured to the truck frame, and U-shaped lever members 31 straddle the front ends of the truck frames 18 and are pivotally connected to each set of brackets by pivot bolts 32. The side frame members 23 preferably carry plates 33 which cooperate with similar plates 34 on the brackets 30 to keep the sides of the supporting frame in proper alignment. Each member 31 is operatively connected by a link 35 with a part of the side frame, particularly the front end of the part 24. Each of the supporting frames are independently operable through a hydraulically operated means including a hydraulically operated cylinder 36 pivotally connected at its rear end upon a pivot 37 secured to the frame of the tractor and having a piston working in said cylinder with its rod 38 operatively connected to the lever 31 by a pivot pin 39. It will be noted that the lever 31 is composed of several pieces welded or otherwise suitably secured together to form a triangular frame fulcrumed at 32 and operatively connected at its ends to the rod and at its rear end to the power means here shown as the hydraulically operated cylinder 36. Each of the cylinders 36 is adapted to be supplied through pipe connections 40 with fluid from a suitable source of pressure supply and under the action of a suitable control valve 41 located in a position for operation by the operator from his seat 20 in the vehicle.

With the above construction, movement of the rod 38 toward the left swings the lever 31 upwardly, and this through the link 35 acts to swing the arm formed by one set of frame members 23, 24 upwardly and thus lift that end of the pusher blade to which said frame members are connected. The arm for the other end of the

pusher blade is similarly moved by a similar hydraulically operated rod 38' on the other side of the vehicle. Thus since each of the ends of the pusher blade or implement member 25 is independently adjustable, the vertical angularity of this member may be adjusted to suit the requirements of the work. It is to be noted that the cylinder 36 is a double acting cylinder, so that introduction of hydraulic fluid under pressure through one of the pipes 40 to the rear end of the cylinder acts to push the rod 38 forwardly and acts through the lever 31 and link 35 to put a positive downward pressure on the arm 23 and consequently the blade 25.

Upon the plow or bulldozer structure thus far described we mount a gripper member 42 which in the embodiment shown is in the form of an open ended scoop member having a curved bottom 43 coextensive in length with the length of the blade 25 and side plate portions 44 forming jaws adapted to cooperate with jaws removably secured to the plow structure and formed by side plates 45 bolted to angles 46 which are removably secured by bolts 47 to the face of the moldboard portion 48 of the pusher implement. The jaw forming plates 44 and 45 are also preferably provided with gripping teeth 49 to enable them to get a good grip on logs, timbers, and the like. The scoop and gripper member is pivotally connected at each of the upper ends of the side plate portions 44 by a pin 50 carried in a frame bracket 51 secured to or formed integral with the moldboard 48.

Power operated means are provided for moving the gripper or scoop member into its various operating positions. In Figs. 1 to 9, inclusive, this means comprises a double acting hydraulic actuator including a cylinder 52 pivotally connected at its lower end by a pin 53 to ears formed on the moldboard 48 and having the rod 54 of its actuating piston pivotally connected by a pin 55 to the intermediate part of a lever 56 which is fulcrumed on a pin 57 carried by a bracket 58 secured to the back of the moldboard 48 and operatively connected at its outer end by a link 59 and pins 60 and 61 to the side portions 44 of the scoop member. Opposite ends of the cylinder 52 are supplied with hydraulic fluid through flexible hose connections (not shown) connected with the same pump as that for the cylinders 36 and controlled by suitable valve mechanism under the control of the operator through the lever 61. With this construction the reciprocation of the rod 54 under the action of hydraulic fluid will act to oscillate the lever 56 and consequently swing the gripper and scoop 42 to an open or closed position as desired, or through control of the hydraulic fluid on both sides of the hydraulically operated piston the rod 54, lever 56, and member 42 may be held in any desired fixed position.

In Figs. 10 to 13, inclusive, the means for swinging the gripper and scoop member 42 to its various operating positions comprises a double acting hydraulic actuator at each side thereof and including a cylinder 62 which in this instance is adjustably mounted on a bracket means in the form of a link 63 pivotally connected at its upper end by a pin 64 to the moldboard 48 and its lower end by a pin 65 which for one side is mounted for a certain amount of movement in a longitudinally slotted bracket 66 secured to or forming part of the side arm 23. A bracket 67 is slidably mounted on the link 63 and secured in any desired adjusted position thereon by set

screws 68 and carries the supporting pivot pin 69 for the rear end of the cylinder 62. The rod 70 for the actuating piston that works in the cylinder 62 is pivotally connected at its outer end by a pin 71 to a bracket arm 72 secured to the side portion 44 of the scoop or gripper member 42.

With this last described construction the reciprocation of the rod 70 under the action of hydraulic fluid will act directly on the member 42 to swing it to any desired angular position and through the control of the pressure fluid in both sides of the hydraulically operated piston, the rod 70 and member 42 may be held in any desired fixed position. This form of gripper and scoop moving means is preferred as it allows the hydraulic fluid to act on the front face of the actuating piston while moving the rod 70 to a position in which the scoop member 42 is closed, thereby securing the full force of the hydraulic fluid so as to get a powerful gripping action between the jaws of the gripper member. It eliminates the necessity for the lever 56 of the first described form and permits the stroke of the rod 70 through the adjustment of the bracket 67 along the link 63 to be varied to suit different working requirements. The slotted bracket 66 compensates or provides for relative movement between the support 63 for the cylinder 62 and the tiltable frame or arm 23 with which it is connected so as to allow independent tilting movement of each arm 23, so that the scoop member 42 may be tilted vertically as shown in dotted lines in Fig. 14.

The bulldozer structure is also preferably provided adjacent its ends with shoes or runners 73 carried by the forward end portion of each frame member 23 and acting to limit the maximum depth to which the pusher blade 25 can be lowered. Since the controls for the cylinders 52 or 62 are separate from the cylinders 36, the gripper or scoop member 42 may be opened or closed in any position of the lifting frame or arms 23.

For using this apparatus as an excavator of earth, sand, gravel, and the like the bulldozer or pusher member 25 is lowered to a digging position as shown in Fig. 7, and the scoop member 42 is moved to a partially closed position either as shown in Fig. 7 or in some instances to a more fully closed position, so that a slot extending lengthwise of the member 25 is left between it and the member 42. With the parts thus positioned the forward movement of the propelling vehicle causes the member 25 to slice off a layer of the material being operated upon, and this layer moves up along the curved face of the moldboard 48 and is thereby turned over and cascades or rolls into the scoop member 42, thus gradually filling up the space between the members 25 and 42. When this space is filled, the scoop member 42 is moved to a fully closed position, and the bucketful of excavated material may then be transported to any desired place of discharge by swinging the arms 23 upwardly while keeping the scoop member 42 closed until the parts assume the position shown in Fig. 8. When the place of deposit is reached, the load may be discharged by moving the scoop member 42 to the open position shown in dotted lines. This same general method of procedure may be used in removing refuse bulk material from above the surface of the material by plowing into a body of such material with the scoop in open position and then closing the scoop while filling the space

between said scoop and plow with the material to be moved, or instead of plowing into the refuse material, the plow with the scoop in an open position may be raised above the material to be removed, and then as the plow and scoop are lowered through the material, the scoop member may be swung to closed position to enclose the load after which it may be discharged as previously described.

When using the apparatus for removing large stones or other bulky objects, the vehicle is moved so as to bring the plow element 25 against one face of the object with the scoop member in a raised position, and then the scoop is swung down to a position in which the stone or other bulky object is tightly gripped between or in the parts 25 and 42, and then the arms 23 may be raised and the vehicle then moved to bring the stone or other bulky object to a place of deposit. Under such conditions it will be noted that the function of the member 42 is largely that of a gripper member.

When using the apparatus for handling logs and timbers, the vehicle is driven to a position to bring the plow member 25 lengthwise of the log or timber while the gripper 42 is raised, and then the gripper member 42 is swung downwardly until the object being operated upon is tightly gripped between the teeth 49 of the jaws formed by the parts 45 and 44 of the members 25 and 42, respectively, as shown in Fig. 9, and then the members 25 and 42 in gripping or load carrying position may be raised by the upward swinging movement of the arms 23, so that the timber or log may be raised and carried by the vehicle to a place of deposit.

In connection with the handling of the various types of material as above described, it is also to be noted that since the arms 23 are adapted to be independently raised and lowered, the plow member 25 and its cooperative member 42 may be shifted to positions of various vertical inclinations, as shown in Fig. 14. This feature is of especial advantage where the device is used on logs or timbers, and it is desirable to raise one end of the log or timber higher than the other for stacking purposes or to clear obstructions.

It is also to be noted that the back end of the frame of the tractor 15 is suitably counterweighted so as to counteract the weight of the projecting parts including the members 25 and 42 and that the front edge of the bottom 44 is reinforced by a blade member 44' whose front edge forms a lengthwise extending cutting edge. The front edge of the plow blade 25 is also a cutting edge. It is further noted that while the apparatus is shown as mounted on a track-laying tractor, it may also be fitted to other vehicles such as motor trucks, trailers, etc., and that the device may be mounted for operation at the rear instead of the front of its carrier vehicle.

For using the device as a tamper, the bottom 44 of the scoop member will on being raised and then lowered against the material act to tamp the same, this tamping action being assisted by either a load in the bucket 42 or the downward pressure produced by the pressure fluid in the cylinder 36 acting on the front face of the ram or piston having the rod 38 connected to the lever 31.

We desire it to be understood that this invention is not to be limited to any particular form or arrangement of parts except in so far as such limitations are included in the appended claims.

What we claim as our invention is:

1. The combination with a vehicle, of a pair of pusher arms swingingly mounted on said vehicle and a pusher having a curved moldboard portion extending between said pusher arms and carried thereby, and a scoop member pivotally connected to the upper portion of said moldboard and provided with a bottom portion projecting in front of said moldboard during digging.

2. The combination with a vehicle, of a pair of independently swingable pusher arms mounted on said vehicle and a pusher having a moldboard portion extending between said pusher arms and carried thereby, a scoop member pivotally connected to the upper portion of said moldboard and provided with a bottom portion projecting in front of said moldboard during digging, and hydraulically operated means carried by said arms and for moving and holding said scoop member in open or closed position relative to said pusher.

3. In a material handling apparatus, the combination with a vehicle, of a pusher structure vertically adjustably mounted on said vehicle and having a blade extending transversely thereof, a gripper member pivotally mounted on said pusher structure and extending transversely of the vehicle, said blade and gripper member having cooperative jaw portions at the end portions of said pusher.

4. In a material handling apparatus, the combination of a pair of swinging arms adapted for connection to a vehicle, a blade secured to said arms, means for independently raising and lowering said arms to adjust the angle of said blade in a vertical plane, a scoop member pivotally mounted on the upper portion of said blade, hydraulically operated means for operating said scoop including a cylinder and a piston operating in said cylinder and connected to said scoop, and a support for said cylinder having a lost motion connection with one of said arms.

5. In a material handling apparatus, the combination of a pair of swinging arms adapted for connection to a vehicle, a blade secured to said arms, means for raising and lowering the blade carrying ends of said arms, a scoop member pivotally mounted on the upper portion of said blade, hydraulically operated means for operating said scoop including a cylinder and a piston operating in said cylinder and connected to said scoop, a support for said cylinder operatively connected to one of said arms and to which said cylinder is lengthwise adjustably connected.

6. In a material handling apparatus, the combination with a vehicle, of a bulldozer member adapted to work at one end of the vehicle by movement into the material to be excavated, arms pivotally connected to the vehicle and carrying said member in front of this end of the vehicle, means for independently raising and lowering said member to adjust the angle of said member in a vertical plane to regulate the depth of cut of said bulldozer member, and a scoop member movably mounted on said member and adapted to receive material plowed up by said bulldozer member and adjustable therewith in a vertical plane to a material carrying position.

7. In a material handling apparatus for vehicles, the combination with a bulldozer including a blade support and a blade adapted to project in front of one end of its supporting vehicle with its cutting edge projecting wholly in front of said support, said support being movably mounted on the vehicle, of a movable scoop member pivotally mounted on the bulldozer and projecting in front of said blade and adapted to be filled with material by the deflecting action of said blade, and means for raising and lowering said support to bodily raise said blade and said scoop member.

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