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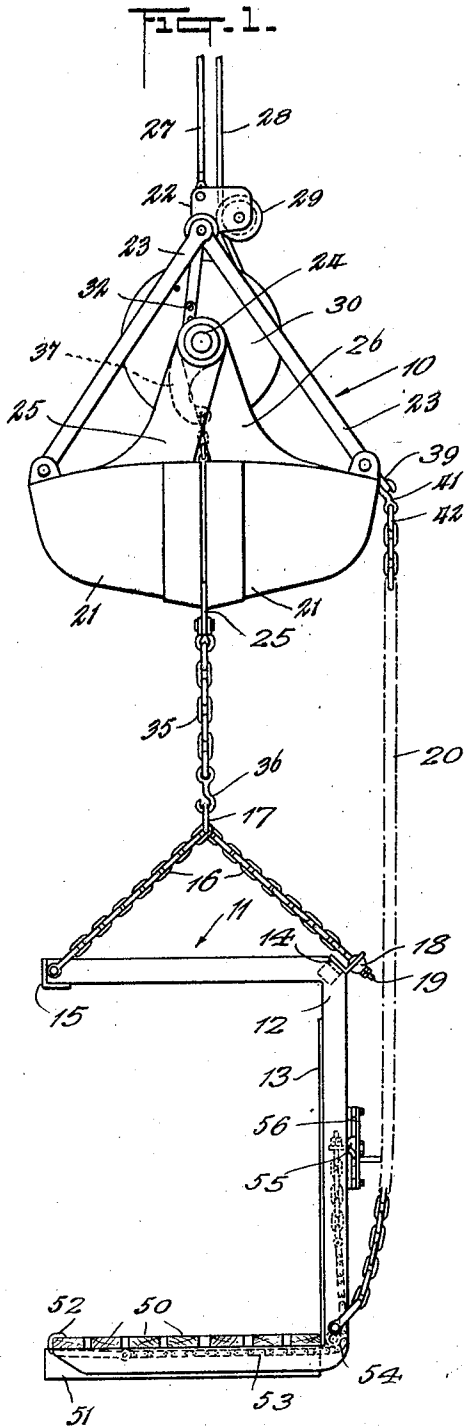
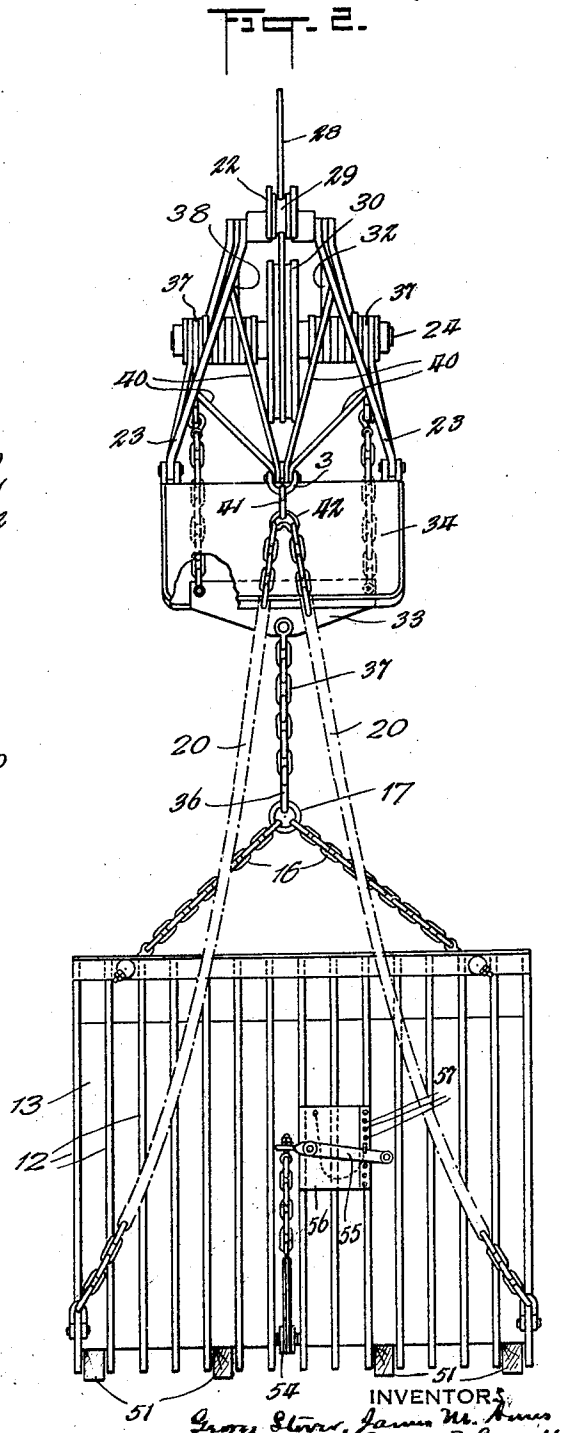
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MATERIAL TRANSFERRING APPARATUS

Filed Dec. 13, 1930

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 3.

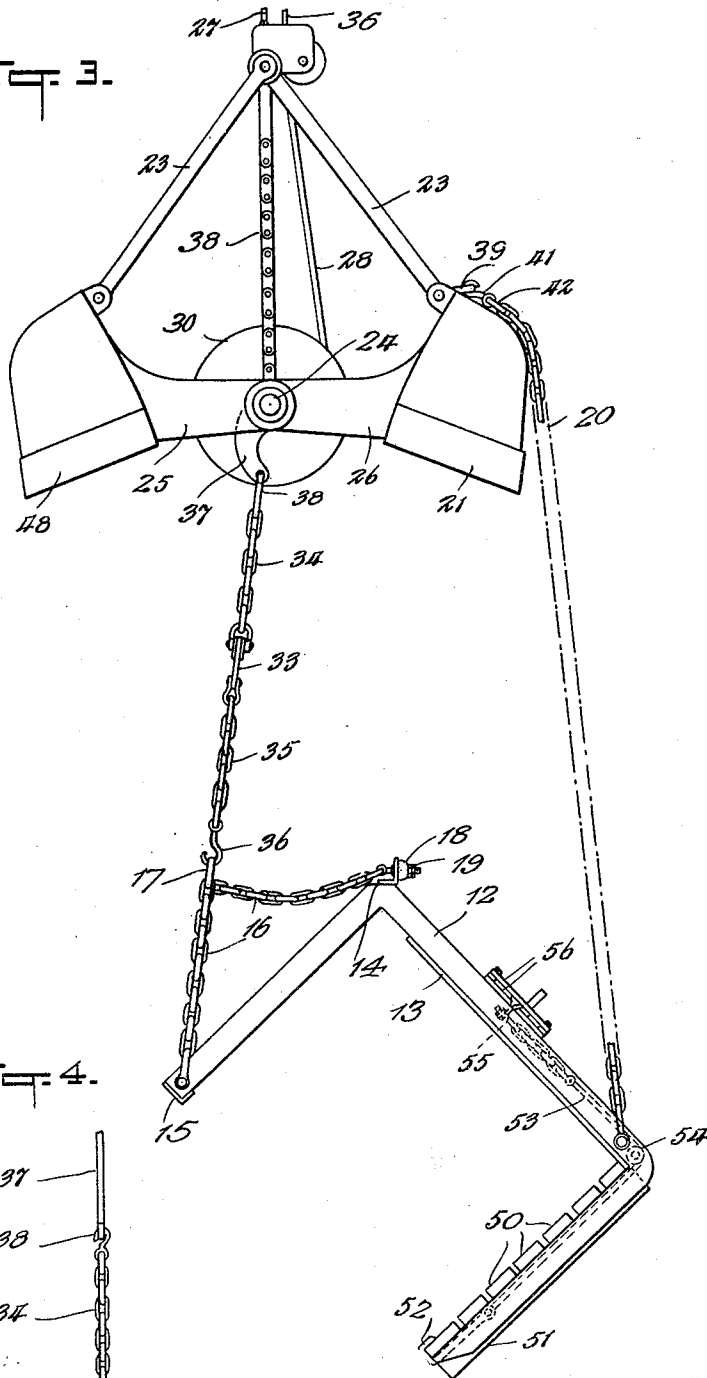
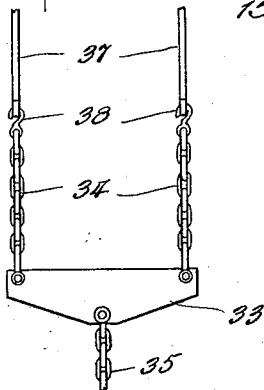


Fig. 4.



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MATERIAL TRANSFERRING APPARATUS

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This invention relates to material transferring apparatus. Loose materials are conveniently handled by a grab-bucket, such as the familiar clam-shell or orange-peel bucket. Material of regular forms such as bricks, planks, etc. cannot be handled by such devices, and, especially in the case of bricks, it is usual to transfer such material by means of so-called lifting-forks. These forks consist of a U-shaped frame, the arms of which are normally horizontal. The lower arm is adapted to be slipped under a stack of bricks or the like while the other arm is connected to the hoisting mechanism. The point of suspension is located so that when the arms are substantially horizontal it is over the center of gravity of the load, including the frame. The load may be discharged by lowering the frame and its load onto a support having a recess or recesses therein to receive the lower arm of the frame while retaining the load. When the weight of the load has been transferred to the support, the frame is then slid horizontally from beneath the load. Another method is to tilt the frame to dump material carried thereby. This dumping is conveniently accomplished by a dumping chain or cable attached to the lower part of the frame. The present invention has more particular application to the last mentioned method of discharging the load carried by the lifting-fork.

The principal object of the present invention is to enable the same hoisting equipment to be used for operating both a grab-bucket and a lifting-fork without requiring disconnecting and removal of the grab-bucket. To this end we provide the grab-bucket with suitable connecting means for suspending and connecting a lifting-fork in such manner that the grab-bucket shall serve as part of the mechanism for raising and lowering and dumping the lifting-fork.

The usual clam-shell bucket comprises two scoop-plates, or jaw members, an upper bracket member to which the hoisting cable is connected and which carries a guide pulley for the dumping cable and from which the jaws are hung by pivotally connected links, and a horizontal operating shaft to which

side arms extending from the jaws are pivotally connected so that as the shaft moves downward away from the bracket member the jaws swing outward away from each other.

In connecting a lifting-fork to such a bucket in accordance with the present invention, the lifting chain, or cable, of the lifting-fork is connected to the vertically movable operating shaft of the bucket and the fork dumping cable is connected to one of the jaws, or scoop plates, of the bucket, so that when the bucket opens the relative vertical movement between the operating shaft and the jaw to which the fork dumping cable is connected will cause the required relative movement between the lifting and dumping cables of the fork to tilt and thereby dump the fork.

Other objects of the invention are to reduce wear on the parts, facilitate the connection and disconnection of the lifting-fork, enable the load on the latter to be balanced readily, and retain on the forks the pallet on which the bricks are stacked so that the pallet will not be dumped with the bricks.

An embodiment of the invention in the form now considered best is shown in the accompanying drawings, in which:—

Fig. 1 is a side elevation of the grab-bucket and lifting-fork, with the latter in material elevating position;

Fig. 2 is a rear elevation of the same with a part broken away;

Fig. 3 is a view similar to Fig. 1, except that the parts are shown in fork dumping position;

Fig. 4 is a detail elevational view showing a part of the fork hoisting connections.

The drawings show a grab-bucket 10 of conventional form and design and a lifting-fork 11. The latter is formed of a number of U-shaped members 12 connected together in spaced relationship by a vertical plate 13, extending the full width of the fork and the greater part of its height. From beneath the lower margin of this plate, the lower arms of the members 12 extend like the prongs of a fork for insertion beneath the load to be lifted. The upper arms of the

members 12 are connected by angle bars 14 and 15, which serve not merely to strengthen the fork but also to provide points of attachment for four supporting chains 16. These four chains are connected together by a ring 17, by which the fork as a whole may be suspended. For leveling adjustment of the fork, the chains of the front or rear pair, or both, are provided with means for adjusting their effective length. As shown, such means are provided for the chains of the front pair, and comprise balls 18 seated in roles in the angle bar 14 and through which pass threaded rods 19 to which the chains are connected and on which are adjusting nuts bearing against the balls. The balls, being free to turn in their seats, enable the rods 19 to align themselves automatically with the direction of pull thereon.

So long as the fork is suspended wholly by the ring 17, the lower arms of the members 12, forming the bottom of the fork, are maintained in nearly horizontal or load supporting position. To dump the contents of the fork, the latter has to be tilted. This is accomplished by means of dumping chains or cables 20 connected to the lower rear part of the lifting-fork. By holding the ring 17 steady and pulling upward on the chains 20, or by holding the chains 20 steady and lowering the ring 17, or by a combination of these two methods, the lifting fork may be tilted into the dumping position shown in Fig. 3.

The grab-bucket shown is of the well known clam-shell type, comprising two scoops, or jaws, 21 hung from a bracket member 22 by links 23 and from an operating shaft 24 beneath the bracket 22 by two pairs of side arms 25 and 26 extending from the two jaws and pivoted on the shaft 24, the arrangement being such that when the operating shaft moves downward away from the bracket 22 the jaws 21 are swung apart from the position shown in Fig. 1 to the position shown in Fig. 3. The bracket member 22 is hung on the hoisting cable 27, and a dumping cable 28 which controls the opening and closing of the bucket extends down past a guide pulley 29 and is secured to a large diameter pulley 30 rotatably mounted on the shaft 24. On each side of the pulley 30 is a small diameter drum or hub 31 formed or secured to turn with the pulley 30. To each of the drums 31 is attached the lower end of a chain or other cable 32 the upper end of which is secured to the bracket member 22. If the dumping cable is drawn upward when the bucket is open, the pulley 30 and drums 31 are rotated and by the winding of the chains 32 on the drums the pulley and drums and the shaft 24 and parts connected with it are caused to move upward toward the member 22, thereby swinging the bucket jaws back to the closed position shown in Figs. 1 and 2. So long as the dumping cable is held against

movement relatively to the hoisting cable the bucket jaws are held closed, but when the dumping cable is released or permitted to move downward relatively to the hoisting cable, the pulley and drums are free to turn, and by the weight of the bucket jaws and the load in the bucket the shaft 24 moves downward away from the member 22 and the jaws swing outward, such downward movement of the shaft being limited by the length of the chains 32.

When the lifting-fork is suspended from the grab-bucket in accordance with the present invention, the relative movements between the lifting and dumping cables of the fork for tilting the fork into dumping position and for returning it to carrying position are, as stated, effected by operation of the bucket, the lifting cable of the fork being connected to the operating shaft of the bucket, and the fork dumping cable being connected to one of the bucket jaws. The connecting means should be such that the lifting-fork may be readily connected to and disconnected from the grab-bucket, and the parts of the connecting means which remain on the bucket when a lifting fork is not connected thereto should not interfere with the use of the grab-bucket as such. The connecting devices shown in the drawings meet these requirements and have other advantages.

If the lifting fork were suspended from the operating shaft of the bucket by a chain or chains extending downward between the bucket jaws, destructive wear would result on both the chains and the jaw edges when the jaws closed on the chains. To avoid such wear, a plate 33 is suspended from the operating shaft by chains 34 connected one to each end of the plate, and the lifting fork is suspended from this plate by a chain 35 connected to a lower mid point of the plate and having a hook 36 at the lower end for detachable connection with the ring 17 of the fork chains 16. The plate is suspended at such distance below the operating shaft that when the bucket is closed the jaw edges will contact with the plate below the points of connection therewith of the chains 34 and above the point of connection of the chain 35. The edges of the jaws thus contact with a long flat smooth surface, so that the wear at any point on either the jaw edges or the plate is but slight.

For detachably connecting the plate chains 34 to the shaft 24 so that the wear plate could be readily removed from the grab-bucket, having the bucket in condition for its customary use, two links 37 are hung on the shaft 24 one near each end of the shaft conveniently between the ends of the jaw arms 25 and 26. As the arms 25 and 26 are inclined outwardly from the shaft, the links, in order that they may extend vertically downward under the pull of the chains 34, are curved edgewise to

permit them to cross the plane of the inner arms 26, so that while the upper ends of the links are outside the upper ends of the arms the lower ends of the links will when the bucket is closed be inside these arms. The chains 34 are detachably connected to the links 37 by hooks 38. When the grab-bucket is to be used as a grab-bucket the hooks 38 are disconnected from the links 37 and the wear plate 33 is removed. The links 37 do not interfere with the use of the grab-bucket. For merely connecting and disconnecting different lifting forks, however, it is more convenient to make and unmake the lifting connection at the hook 36.

For connecting the fork dumping cable, one of the bucket jaws is provided with a shackle 39 at the upper outer edge of the jaw hung on the bolt which holds the lower ends of the center braces 40 of the jaw supporting links 23. A hook 41 on a ring 42 connecting the ends of the dumping cables 20 serves for conveniently connecting and disconnecting the cables to the bucket jaw.

It will be understood that the invention also includes the combination with a grab-bucket of a dumping bucket or the like as well as lifting-fork, all of which devices may be designated generally as lifting and dumping devices. Further, the invention is applicable to grab-buckets having three or more jaws. For buckets having more than two jaws, the wear plate instead of being all in one plane if formed of three or more sections or parts spaced apart from each other at suitable angles to receive impact of the jaw edges.

The lifting-fork may be used for lifting and transporting a wide variety of objects such as bricks, blocks, planks, etc. It is especially designed, however, for handling bricks.

It has been found convenient to stack bricks on a wooden platform known as a pallet to facilitate the insertion of the lower arm members of the lifting-fork beneath the stack of bricks. As shown, this pallet consists of a number of boards 50 laid across and secured to cross-pieces 51 of greater height than the lower arm members of the fork and of less width than the spaces between the latter, so that when the pallet is resting on the ground the lower arm of the fork may be slid under the boards 50. It is desirable to retain the pallet on the fork when the bricks stacked thereon are dumped, so that the pallet may be returned to the brick stacking floor. For this purpose, we provide a releasable retaining member for engaging the pallet to hold it against sliding forward on the fork arm. In the construction shown this releasable member is a hook 52 which is adapted to be slipped over the edge of the pallet after the lifting-fork has been raised off the ground and then secured in place by a chain 53 passing around a pulley 54 and attached to one

end of a lever 55 pivotally mounted on a plate 56 on the rear of the lifting-fork. The long arm of this lever is moved downwardly to pull the chain 53 taut and then secured in position by a pin inserted thereabove in one or other of a series of holes 57 in the plates 56.

The use of the pallet is not essential, as the bricks may be stacked on a floor having slots to receive the lower arms of the fork, or the bricks may be laid lengthwise across a series of supports to leave room beneath the stack of bricks for the fork arms or the bricks may be stacked directly on the fork arms.

When it is desired to use the grab-bucket the hooks 38 are disconnected from the links 37 and the hook 41 is disconnected from the shackle 39. At other times, it is more convenient to leave the plate 33 attached to the grab-bucket and connect and disconnect the lifting-fork or different lifting-forks by the hooks 36 and 41.

What is claimed is:

1. The combination with a grab-bucket and means for raising and lowering and for opening and closing the bucket, of a lifting and dumping device suspended from the bucket by a lifting connection, and a dumping connection between the lifting and dumping device and the bucket, said lifting and dumping connections being each to different parts of the bucket which during the opening and closing operations of the bucket have a relative vertical movement, whereby by one of said operations of the bucket the lifting and dumping device is dumped.

2. The combination with a grab-bucket and means for raising and lowering and for opening and closing the bucket, of a lifting and dumping device and a lifting cable and a dumping cable connected thereto, and means for detachably connecting said lifting cable and said dumping cable to different parts of the bucket which during the opening and closing operations of the bucket have a relative vertical movement, whereby by one of said operations of the bucket the lifting and dumping device is dumped.

3. The combination with a grab-bucket having jaws mounted to swing outward to dump the load and having a member which moves downward as the jaws move outward, of a lifting and dumping device detachably suspended from the grab-bucket by a lifting cable connected to said member of the grab-bucket, and a dumping cable extending from the lifting and dumping device to a member of the grab-bucket with respect to which the first said member moves downwardly.

4. The combination with a grab-bucket having jaws mounted to swing outward to dump the load and having an inner member which moves downward relatively to the jaws as the jaws move outward, of a lifting-fork

suspended from the grab-bucket by a lifting cable detachably connected to said inner member, and a dumping cable extending from the lifting-fork to one of the jaws of the grab-bucket.

5 5. The combination with a clam-shell grab-bucket having an operating shaft which moves downward relatively to the bucket jaws as the jaws open, of a lifting-fork sus-
10 pended from said operating shaft of the bucket, and a dumping connection extending from the lifting-fork to one of the jaws of the bucket.

6. The combination with a grab-bucket
15 having jaws mounted to swing outward to dump the load and having a member which moves downward as the jaws open, of a lifting and dumping device, and means for suspending said device from the grab-bucket
20 comprising a plate member detachably suspended from said member at such distance therefrom that when the jaws of the bucket are closed the plate member extends between the adjacent edges of the jaws, and a dump-
25 ing cable extending from the lifting and dumping device and connected to one of the bucket jaws.

7. The combination with a clam-shell grab-bucket having an operating shaft which
30 moves downward relatively to the bucket jaws as the jaws open, of a lifting fork, means for suspending the lifting fork from the bucket comprising a plate detachably sus-
35 pended from said operating shaft at a distance therefrom such that when the jaws of the bucket are closed the plate is positioned between the jaw edges and a lifting member detachably connected to said plate, and a
40 dumping cable extending from the lifting fork and detachably connected to one of the jaws of the bucket.

8. The combination with a grab-bucket having jaws mounted to swing outwardly to dump the load, of a load supporting member
45 detachably suspended from a part of the bucket in position to engage the edges of the bucket jaws when the jaws are closed, said member being formed to provide extended jaw engaging surfaces.

50 9. The combination with a clam-shell grab-bucket of a load-supporting plate detachably suspended from a part of the bucket in position to engage the edges of the jaws of the bucket when the jaws are closed.

55 10. The combination with a clam-shell grab-bucket having an operating shaft which moves downward relatively to the bucket jaws as the jaws open, of means for suspend-
60 ing a load from the bucket comprising a pair of links hung on said shaft and a load supporting plate detachably connected to said links and hung therefrom at such distance below the shaft that when the bucket jaws are closed the plate is positioned between the
65 jaw edges.

11. The combination with a lifting-fork, of a pallet formed to seat on the load-carrying arm of the fork, and means for releasably holding the pallet on the fork arm when the fork is tilted to dump the load on the pallet comprising a hook for engaging the forward
70 edge of the pallet and releasable holding means at the back of the fork and a connection from the hook to said means whereby the fork is held against the edge of the pallet.

In testimony whereof we have hereunto set our hands.

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