Oct. 15, 1946. A. G. TELFORD 2,409,400

TRANSFER DEVICE

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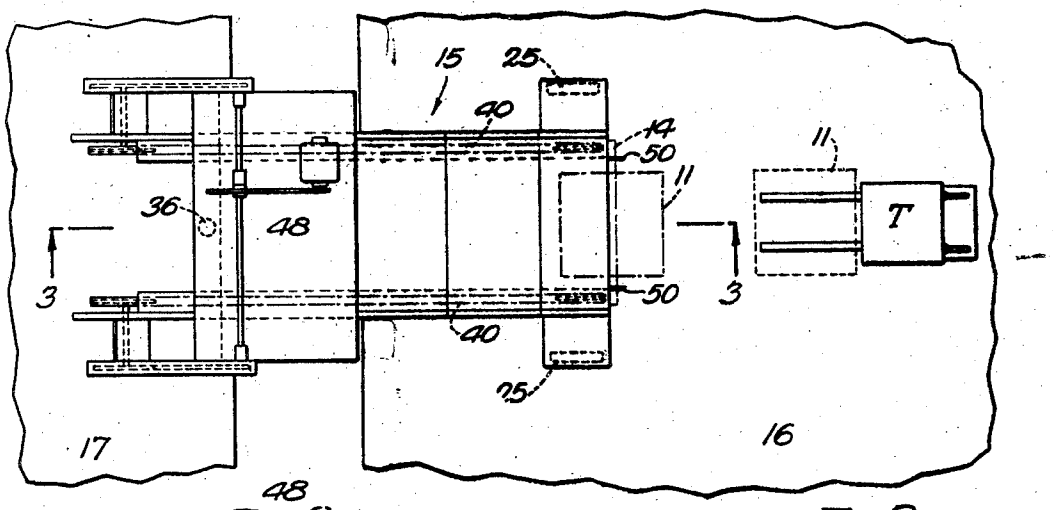


Fig. 2

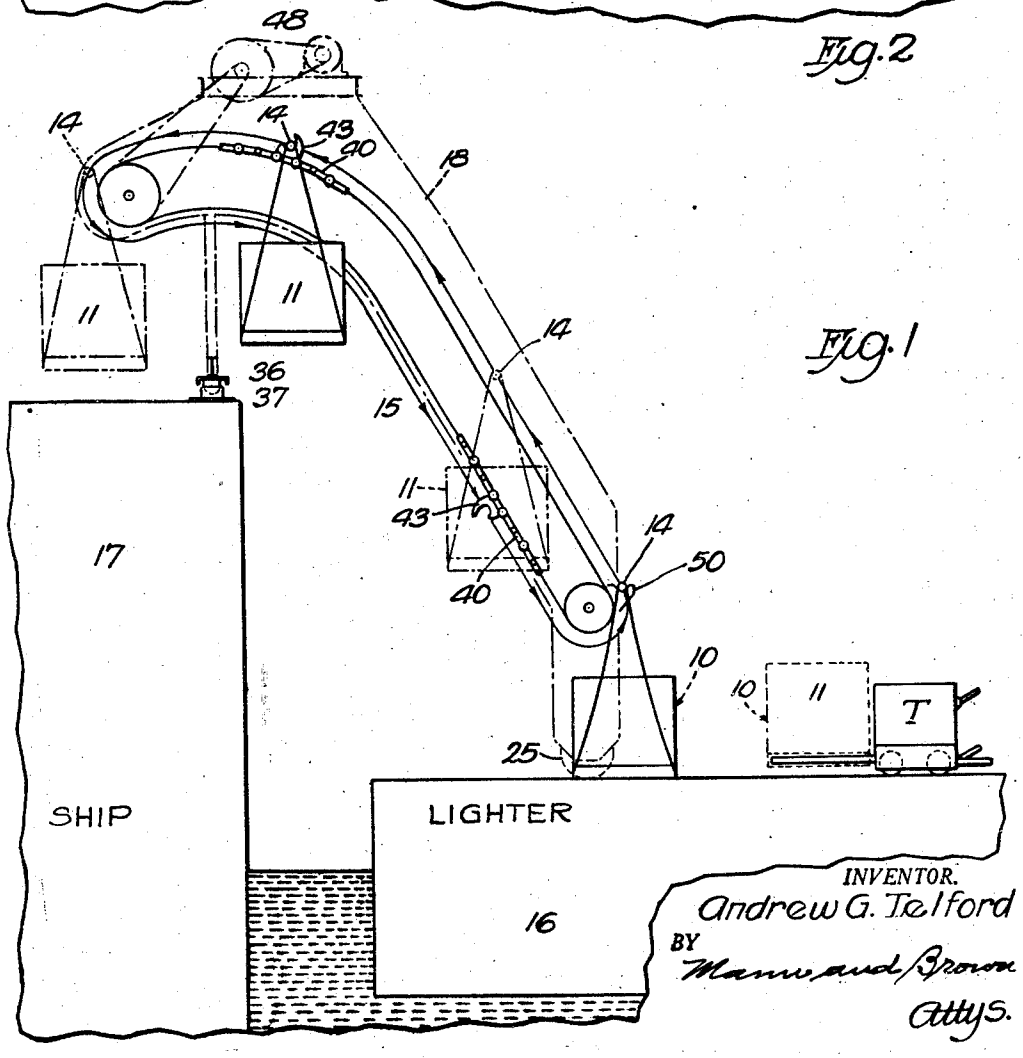


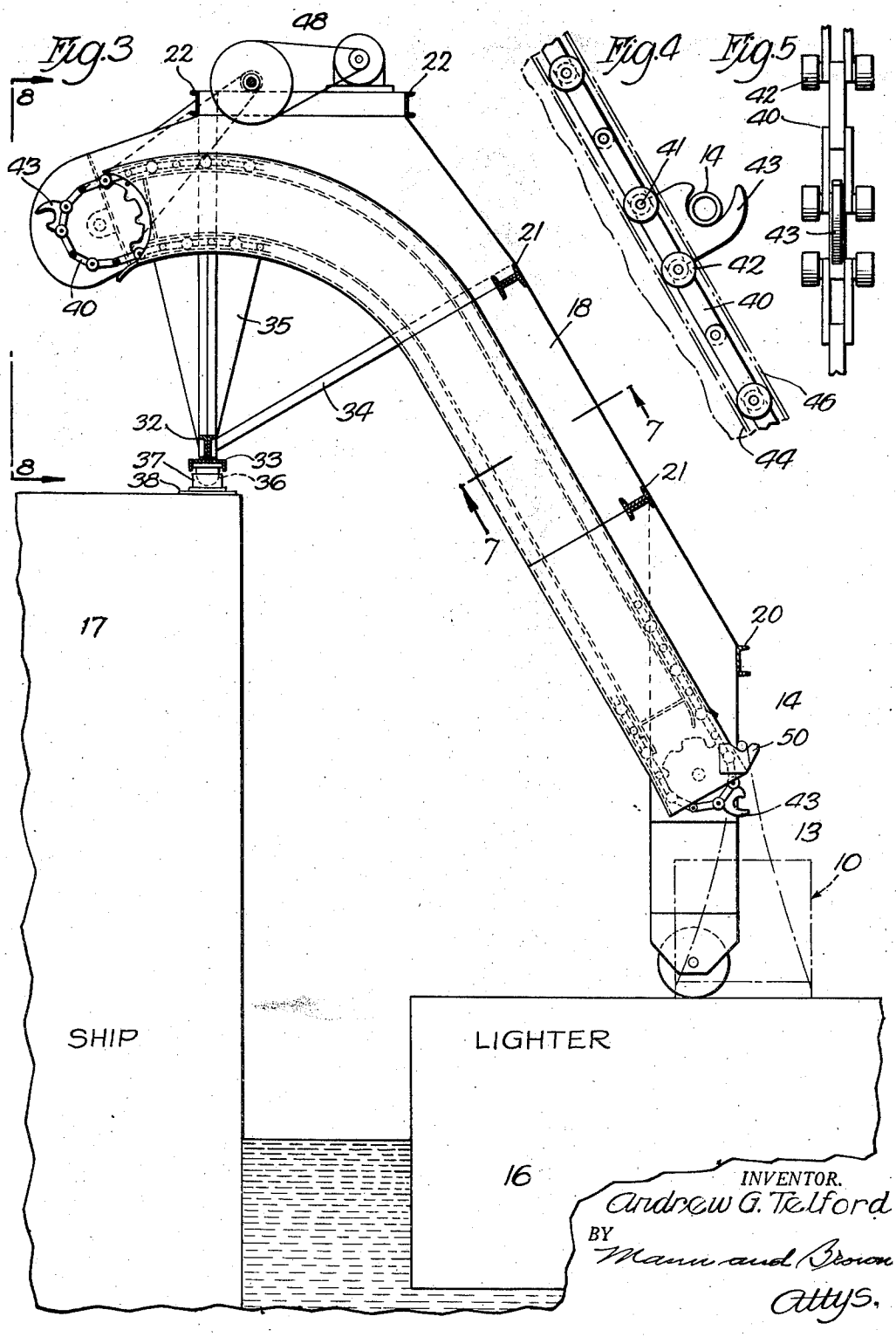
Fig. 1

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TRANSFER DEVICE

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Fig. 6

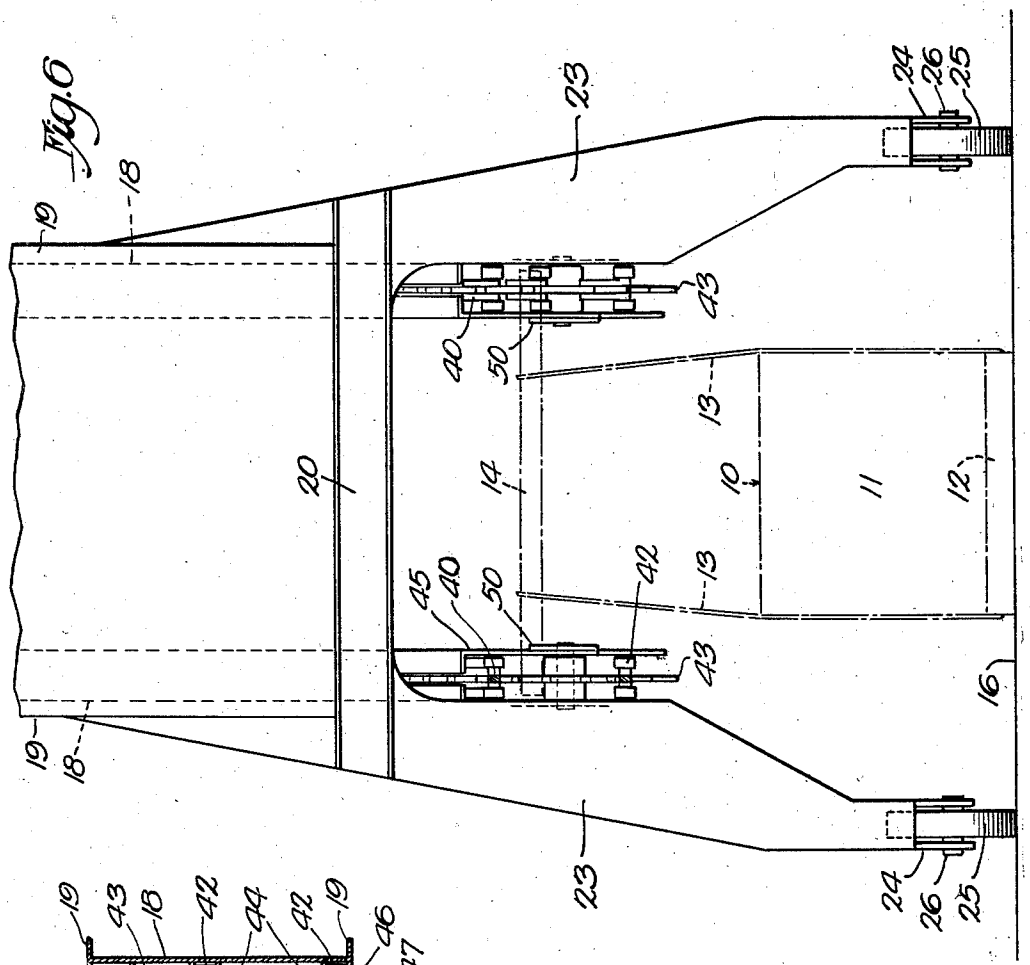
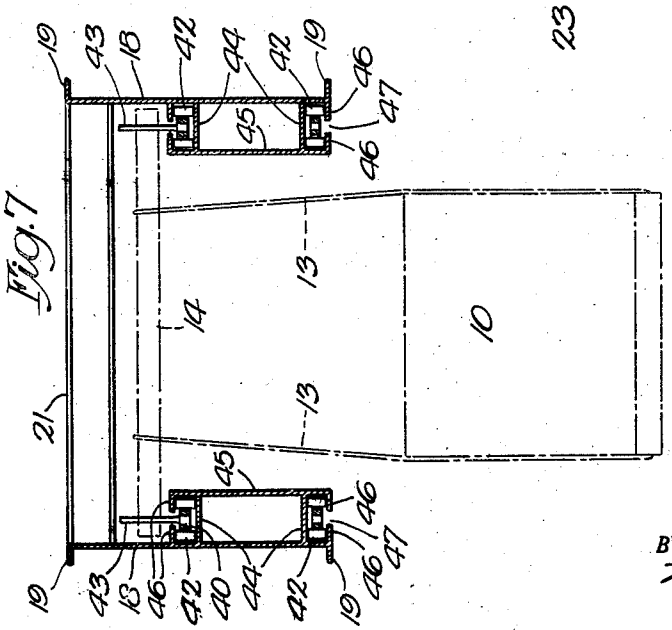


Fig. 7



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TRANSFER DEVICE

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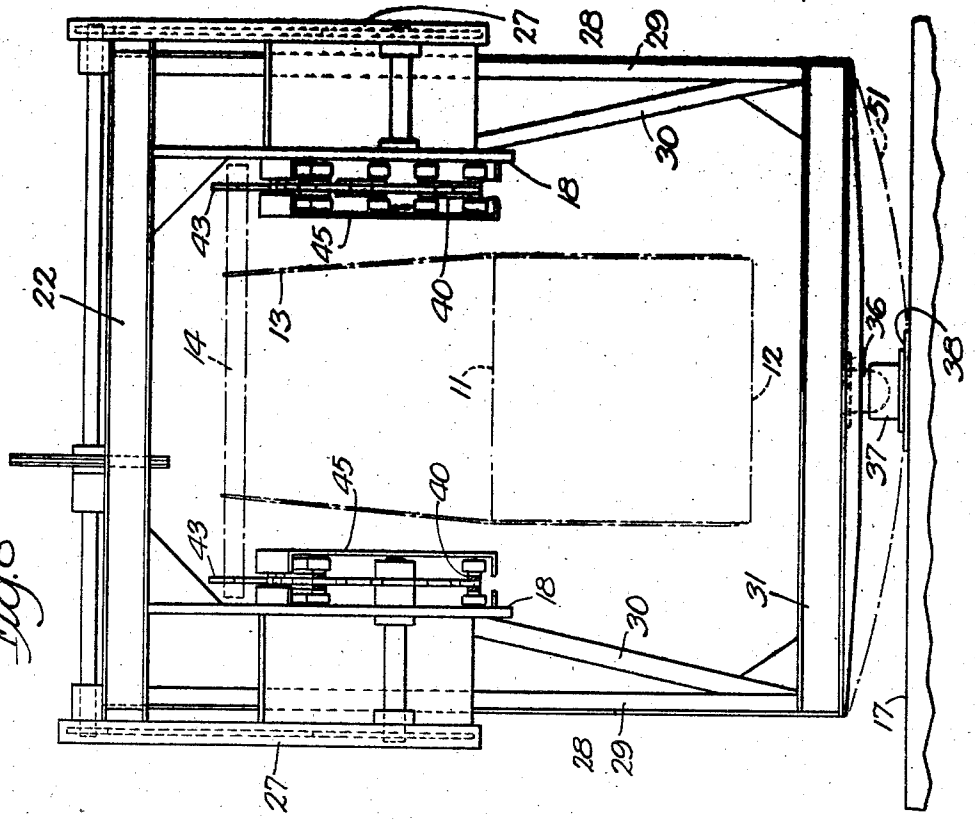


Fig. 8

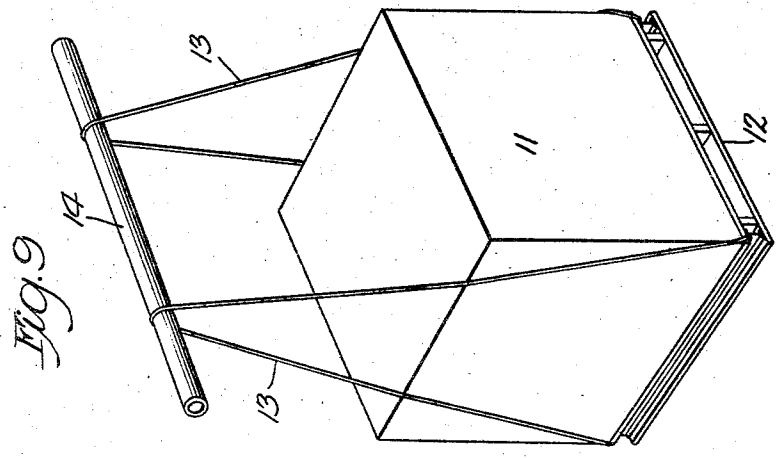


Fig. 9

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Fig. 10

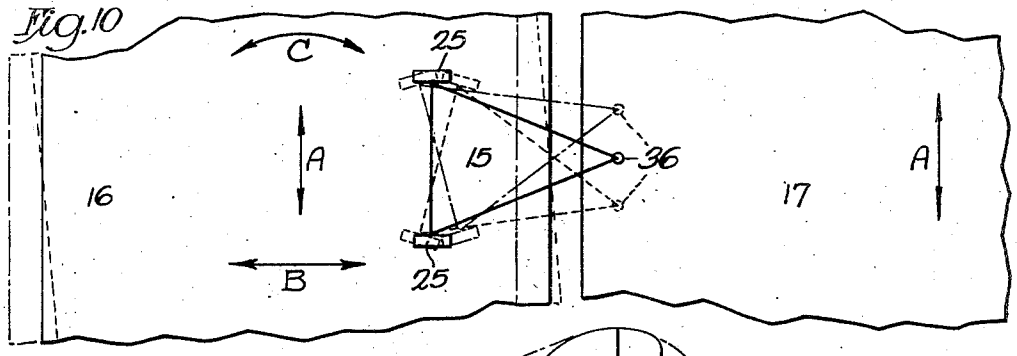


Fig. 11

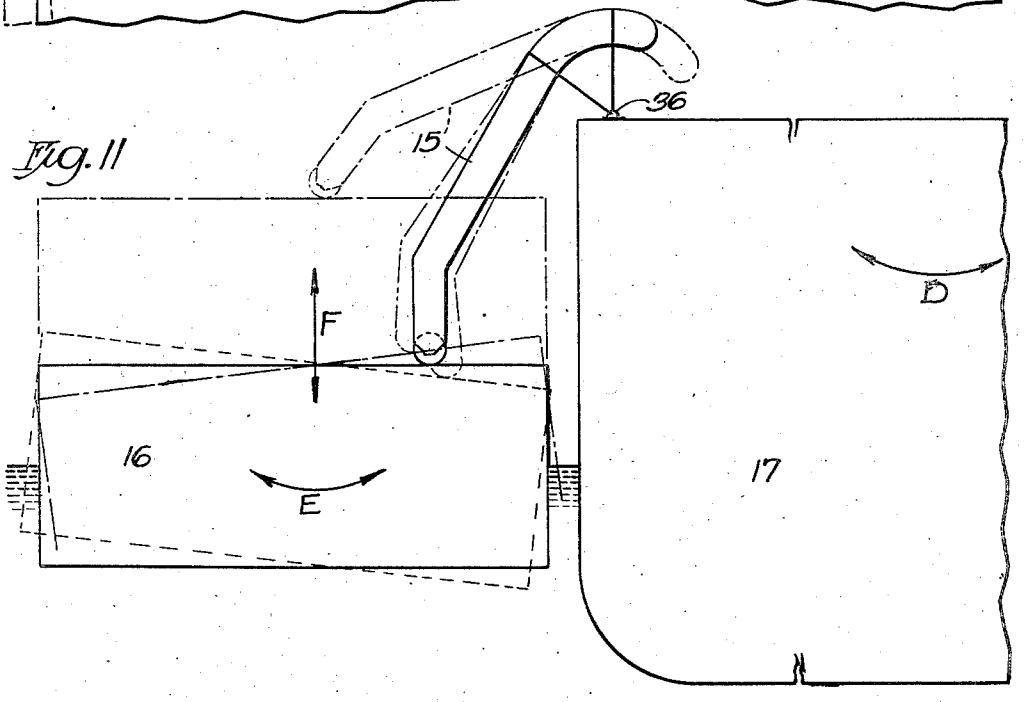
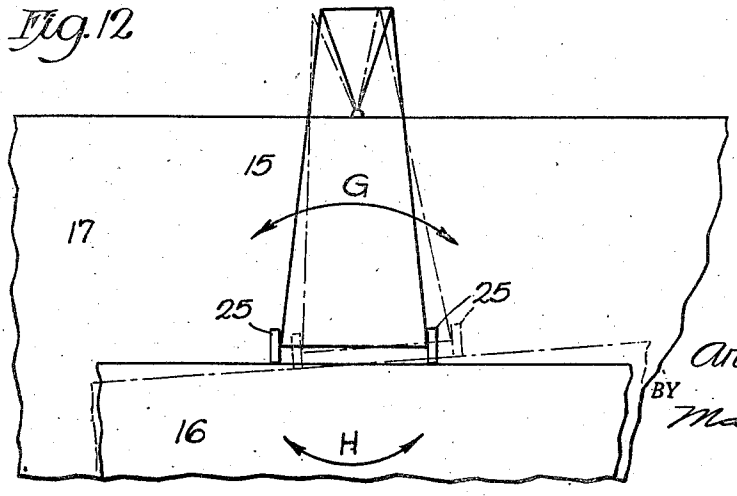


Fig. 12



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UNITED STATES PATENT OFFICE

2,409,400

TRANSFER DEVICE

Andrew G. Telford, Aurora, Ill.

Application February 16, 1945, Serial No. 578,211

5 Claims. (Cl. 198—123)

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This invention relates to loading and unloading ships, and has for its principal object to provide a transfer device that will span the space between a wharf or a pier and the deck of a lighter or a ship, or between the deck of a lighter and a ship, and safely transfer cargo regardless of the relative movements between the vessels or between the wharf or pier and a vessel.

Generally speaking, this is accomplished by a conveyor frame with laterally spaced wheeled supports for one end (which may well be the lower end) and a single, centrally located bearing support for the other end that will allow more or less universal movement while making it fast to the selected spot on the deck of the ship or the like.

With the two supports resting on the deck of a lighter or the floor of a wharf or pier and the single universal bearing support on the deck of a ship, a great variety of relative movements is accommodated without disturbing the operation of the conveyor or impairing the safety of the cargo.

The particular embodiment shown in the accompanying drawings and described in detail in this specification was designed and built expressly for the United States Navy to handle standard palleted packages of cargo in accordance with the Navy's system of supply.

Fig. 1 is a side elevation of the transfer device, largely diagrammatic, illustrating it transferring palleted packages of cargo from a lighter to a ship;

Fig. 2 is a plan view of Fig. 1;

Fig. 3 is an enlarged side elevation corresponding to Fig. 1 and including some structural features purposely omitted from Fig. 1 in the interest of clearness;

Figs. 4 and 5 are, respectively, side elevation and plan views of a length of chain used in the particular conveyor embodied in this special device;

Fig. 6 is a front elevation of the lower portion of the transfer device with a palleted package indicated in the position it assumes as the conveyor takes it from the deck of a lighter or the floor of a wharf or pier;

Fig. 7 is a transverse section taken on the line 7—7 of Fig. 3;

Fig. 8 is a front view of the upper end of the device taken from the position indicated by line 8—8 in Fig. 3;

Fig. 9 is a perspective view, largely diagrammatic, illustrating the Navy's standard palleted cargo package;

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Figs. 10, 11, and 12 are diagrams illustrating a few of the multitude of relative positions that may be taken by a lighter and a ship and the corresponding accommodating positions that may be taken by the transfer device while in use in transferring cargo between the lighter and the ship, or vice versa.

But these specific illustrations and the corresponding specific description are intended for the purpose of disclosure only and should not be interpreted as placing unnecessary limitations on the claims.

General description

The Navy's standard palleted cargo package, illustrated diagrammatically in Fig. 9 and generally indicated by 10, includes a cubical container 11, four feet on the side, resting upon and attached to a lift truck pallet 12 equipped with rope slings 13 having at the top thereof a four-inch bar 14. The capacity of this package is limited to a maximum weight of 4,000 pounds, but may be almost anything between that maximum and a relatively small, empty minimum, according to what it contains.

Other special packages for a large caliber shell have similar arrangements for cooperation with the lift trucks and include suitable slings and a bar 14.

Fig. 1 shows a familiar form of lift truck T taking a palleted package 10 to the transfer device, generally indicated by 15, which is shown with four palleted packages in various positions they assume while being transferred from the deck of the lighter 16 to the deck of the ship 17.

The frame

The frame of the transfer device is of somewhat peculiar shape, best represented in Figs. 1 and 3, appropriate to the particular scheme of palleted package handling and to afford the desired clearances within the transfer and between the packages and the vessels and equipment thereon.

This particular frame includes spaced side plates 18 having outturned flanges 19 at the top and bottom formed by welding strips on sheets and resulting in generally channel shaped structural members. In order to accommodate the cargo packages hanging from the slings, these plates are connected together crosswise by a series of structural channels 20, 21, and 22, welded to the side plates 18, and where appropriate also to the flanges 19.

This arrangement provides a wide open bottom passageway for the accommodation of the endless

chain conveyors and the palleted cargo packages suspended from them, as generally indicated in Fig. 1.

The spaced wheeled supports at the bottom of the frame are provided by legs 23 fabricated from sheets welded together and to the side plates 18 at the outer sides thereof in an arrangement best shown in Fig. 6, and they terminate at the bottom in forks 24 to receive the supporting wheels 25 on axles 26. In this Fig. 6, it will also appear that the channel 20 extends beyond the flanges 19 of the side plates to the remote edges of the plates forming the outer portions of the legs 23. The whole is welded together into one compact frame. From Figs. 1 and 3, it will appear that the legs 23 are at an angle to the main body of the transfer frame, and in the position shown in those figures are substantially upright, whereas the body of the frame is generally inclined from the lighter to the ship and curved over the deck of the ship.

In Figs. 3 and particularly 8, it appears that the channels 22 extend beyond the side plates 18 and their flanges 19 and are built into side frameworks 27, from which and the adjacent side plates depend legs, generally indicated by 28 and formed of side posts 29 of structural section and braces 30 coming together at their lower ends and welded to a cross piece 31 shown in Fig. 3 as composed of three channels, two indicated at 32, back to back, and the third at 33 forming a base for the other two. In this figure are also shown braces 34 from the side frames to the channels 33 and strengthening gussets 35 for the legs welded to the connected members.

In the middle of the channel 33, the ball member 36 of a universal joint is made fast between the flanges of the channel and also permanently attached to a cooperating socket member 37 having a base 38 to rest upon, and, where appropriate, be secured to, the deck of the ship. The ball and socket are permanently attached for convenience in handling the entire transfer device as a unit without danger of loss of parts.

This particular frame structure is only one of a great variety that engineers will readily design and fabricators build from a great variety of materials. This structure was designed on account of the use of steel plates and structural members that could be quickly and securely welded together for quick production under existing conditions. Space framework of structural elements, welded tubing, and a variety of other things will be preferred by some under more convenient manufacturing conditions. They will offer less wind resistance and make the overall weight less. Aluminum and the other lighter metals offer a great deal of advantage when peacetime production permits their use.

The conveyors

The conveyors are of the familiar chain type 40 (Figs. 4 and 5) with selected link pins 41 extended to form axles for carrying wheels 42 and some links replaced by or formed to carry the cargo bearing hooks 43.

The path of the conveyors through the transfer device is well illustrated in Figs. 1 and 3, and for convenience the top run has been selected for carrying the load.

Tracks for the chains are formed by steel plates 44 (Fig. 7) welded to the side plates 18 and to other plates 45 spaced from the side plates 18. Above and below, or, perhaps more correctly, surrounding the tracks 44 are flanges 46 made by plates welded in position and spaced apart at 47 to provide passageways for the hooks 43. A head-end drive, generally indicated by 48 in Figs. 1, 2, and 3, has been illustrated as mounted on the top framework generally built around the channels 22, and that arrangement has certain advantages. However, there will be instances in which the drive, or portions of it, should be nearer the lower end in order to get the center of gravity of the whole nearer to the supporting wheels 25. But these things are taken as a matter of selection and design for engineers.

The endless chain conveyors, including the cargo bearing hooks 43, were selected as appropriate for use with the Navy's standard palleted cargo packages, but when other things are to be handled the choice of conveyors will be different and a great variety of familiar conveyor structures will be at command. For handling bananas, for instance, the characteristic banana conveyors would be used. For bulk material, a variety of other conveyors could be used. Continuous platform conveyors would be best suited for some things. The choice of the conveyor and the characteristics of the commodity to be handled will change the frame to correspond and vary the passageways to suit, and sometimes entirely eliminate any such passageway as shown here.

The endless chain conveyors chosen for this embodiment may be provided with a reversible drive and safety checks to prevent disaster in the event packages containing high explosives should get out of control.

Operation

In the normal operation, lift trucks T will bring the standard packages into a position between the legs 23 and deposit them. Two men in suitable cages, protected from falling by guards and rails, will lift the bar 14 of each package and rest it in hook-shaped brackets 50 (Fig. 3), where it lies in the path of hooks 43 advancing with the chains. In this position, the sling is slightly slack. The hooks pick up the bar 14 and with it the package, and the movement is indicated by the successive positions shown in Fig. 1, in the last of which the package is about to be deposited on the deck of the ship 17 as the hooks pass to the return run of the conveyors. Lift trucks on the ship or other equipment will take each package away as it is deposited. The operation goes on rapidly and with such efficiency that the loading of a ship is frequently reduced from weeks to hours.

For production purposes, this standard form of construction and size will be most economical, but in order to provide some variation a straight section between the channels 21 in Fig. 3 may be made exchangeable for a longer section. The form of conveyor used lends itself to this variation as well as the frame construction.

In some applications a rocker may be used to replace the ball and socket joint as indicated by the dotted line 51 in Fig. 8.

Accommodating relative movements

In Fig. 10, portions of the lighter 16 and ship 18 are shown with a diagram 52 of the three-point support transfer device in a variety of positions. "A" assumes a movement of the ship lengthwise relative to the lighter sufficient to take the single point support 36 from the solid line position to either of the positions shown in heavy and light dotted lines. The correspond-

ing movement of the two wheels **25** on the lighter is indicated, respectively, in light and heavy dotted lines, as is also the framework of the transfer. Movement "B" is a lateral separation of the ship and lighter, or a lateral approach of the ship and lighter. This is accommodated by the wheels **26** either rolling on the deck of the lighter or allowing the deck with the lighter to pass under them, as the case may be. Relative movement "C" assumes angular swinging of the ship and the lighter, each or both, which is accommodated by corresponding rolling of the wheels **26** with respect to the deck of the lighter.

Fig. 11 assumes a similar variety of crosswise rocking movements of the ship and the barge represented by the letters D and E, and the change of relative elevation due to unloading of the lighter is indicated by F.

Fig. 12 attempts in the variations G and H to indicate the relative movement caused by lengthwise rocking of the ship and the lighter, which causes a peculiar turning movement of the transfer device on an axis through the single bearing with the supporting wheels **25** taking a circular motion.

These attempted illustrations are only a few of the multitude of relative movements that must be accommodated by the transfer device while continually passing 4,000 pound loads between ship and lighter at a rapid rate in all sorts of weather. The attempted showing of movements is faulty, as compared with photographs taken by the inventor, but within the limitations of line drawings they suggest some of the conditions with which the present device successfully copes.

Other embodiments of the general principles and organization to cope with other conditions will be readily made by engineers, and further illustration is omitted in the interest of simplicity and on account of prevailing conditions. A transfer device including some of the fundamentals and for operating between ships under way is the subject of my copending application, Serial No. 580,173, filed February 28, 1945.

Details for making these transfer devices reversible are not shown because they are things that engineers can and will supply as occasion arises.

I claim:

1. In a transfer device of the class described, a frame comprising laterally spaced side members connected together adjacent to their upper lengthwise edge portions only and forming a lengthwise passageway having an open bottom between the lower lengthwise edge portions of said members, a wheeled support for each of said members at one end portion of the frame, laterally spaced legs adjacent to the opposite ends of the members, a universal bearing for supporting said legs, a flexible endless conveyor element movable along each member, and hooks formed on said elements adapted to engage the opposite ends of a bar supporting a load in the passageway.

2. In a transfer device of the class described, a frame comprising laterally spaced side members connected together adjacent to their upper lengthwise edge portions only and forming a lengthwise passageway having an open bottom between the lower lengthwise edge portions of said members, a leg supporting each member adjacent to one end of the frame, a wheeled support for each leg, a leg supporting each member adjacent to the other end of the frame, a universal bearing for supporting the last named legs, a flexible endless conveyor element movable along each member, and hooks formed on said elements adapted to engage the opposite ends of a bar supporting a load in the passageway.

3. In a transfer device of the class described, a frame comprising laterally spaced side members connected together adjacent to their upper lengthwise edge portions only and forming a lengthwise passageway having an open bottom between the lower lengthwise edge portions of said members, tracks formed adjacent to the opposing inside surfaces of said members, a wheeled support for each of said side members at one end portion of the frame, laterally spaced legs adjacent to the opposite ends of the members, a universal bearing for supporting said legs, a flexible endless conveyor element movable on each track, and hooks formed on said elements adapted to engage the opposite ends of a bar supporting a load in the passageway.

4. In a transfer device of the class described, a frame comprising laterally spaced side members connected together adjacent to their upper lengthwise edge portions only and forming a lengthwise passageway having an open bottom between the lower lengthwise edge portions of the members, tracks formed adjacent to the opposing inside surfaces of said members and having flanges above and below them, a wheeled support for each of said members at one end portion of the frame, laterally spaced legs adjacent to the opposite ends of the members, a universal bearing for supporting said legs, a flexible endless conveyor element movable on each track, and hooks formed on said elements, projecting beyond said flanges and adapted to engage the opposite ends of a bar supporting a load in the passageway.

5. In a transfer device of the class described, a frame comprising laterally spaced side members each having one end portion curved downwardly, means connecting the members together adjacent to their upper lengthwise edge portions only whereby the members form a lengthwise passageway having an open bottom between the lower lengthwise edge portions of the members, a wheeled support for each of the members at one end portion of the frame, laterally spaced legs adjacent to the opposite ends of the members, a universal bearing for supporting said legs, a flexible endless conveyor element movable along each member, and hooks formed on said elements adapted to engage the opposite ends of a bar supporting a load in the passageway.

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