United States Patent

[11] **3,561,617**

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[33] **South Africa**
[31] **66/6234**

[54] **MEANS FOR THE TRANSPORTATION OF GOODS**
3 Claims, 12 Drawing Figs.

[52] **U.S. Cl.** **214/15,** 214/14; 294/67; 214/16.4
[51] **Int. Cl.** **B63b 27/16**
[50] **Field of Search** 214/14, 16.4, 15; 294/67, 67.4A

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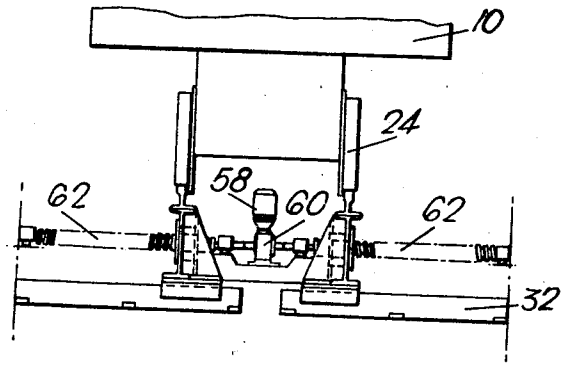
ABSTRACT: The invention provides for a means for transporting goods in which the goods are loaded in containers supported upon and detachable from wheeled chassis. The means further provides for cargo holding means having at least two levels, one level being for permitting the wheeled chassis to enter the cargo holding means, and another level being for stowing the containers after being detached from the wheeled chassis. A plurality of hoisting devices are operable between the levels to hoist the containers from one level to another. The hoisting devices include clamps for engaging the corners of containers. The cargo holding means may be provided on land or on a ship.



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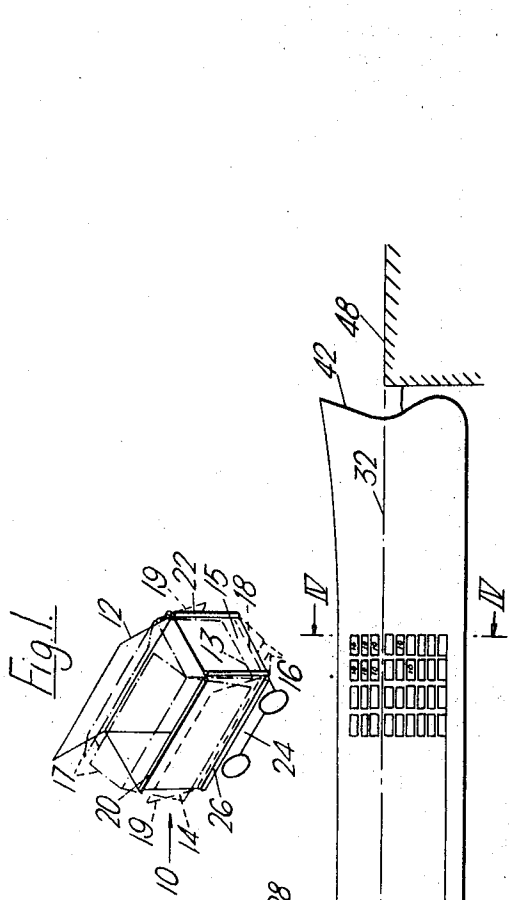

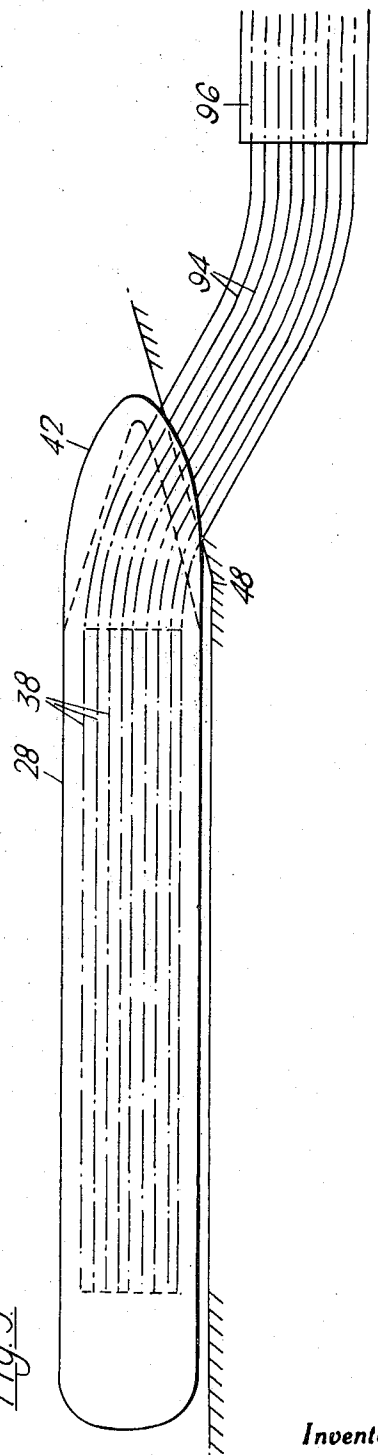

Fig. 2

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Fig. 5

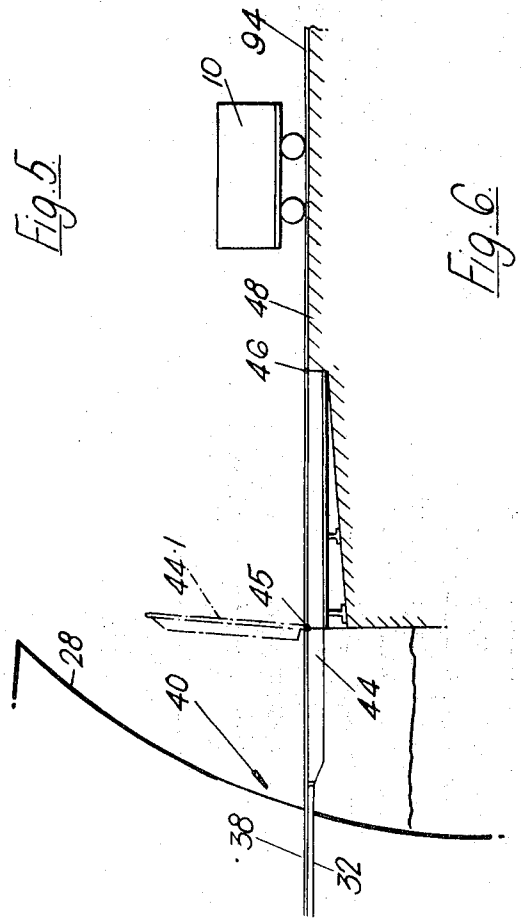

Fig. 6

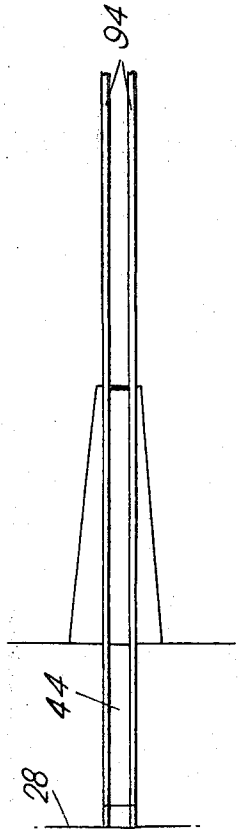

Fig. 4

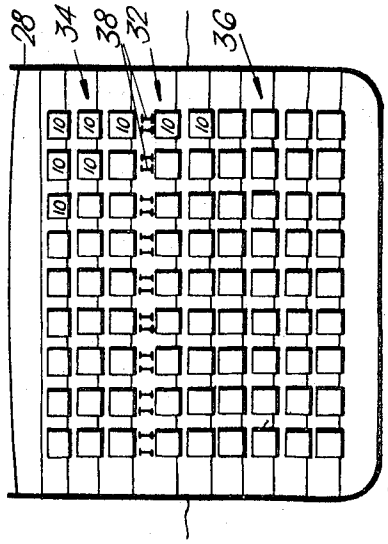

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Fig. 7

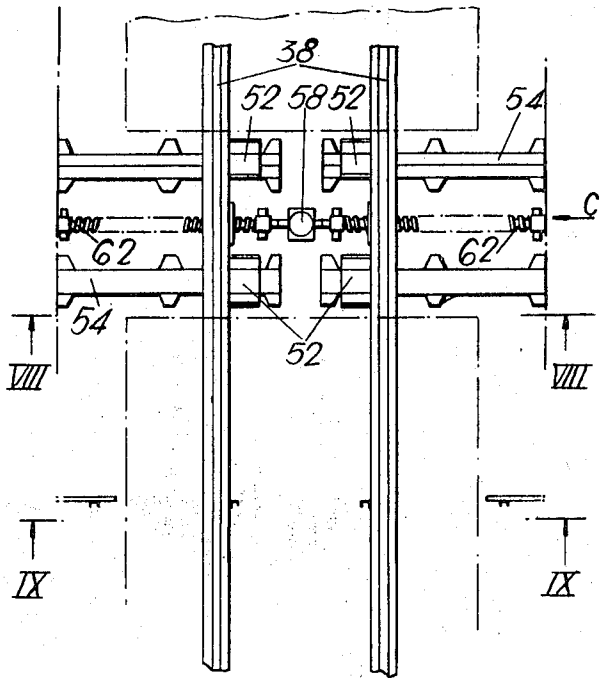
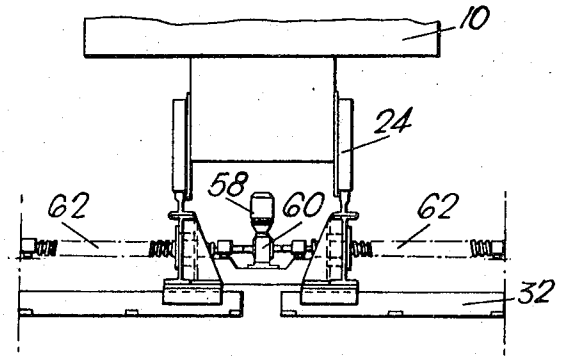


Fig. 8



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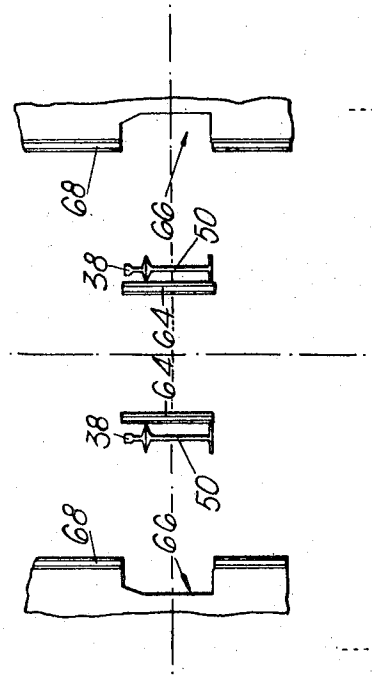

Fig. 9.

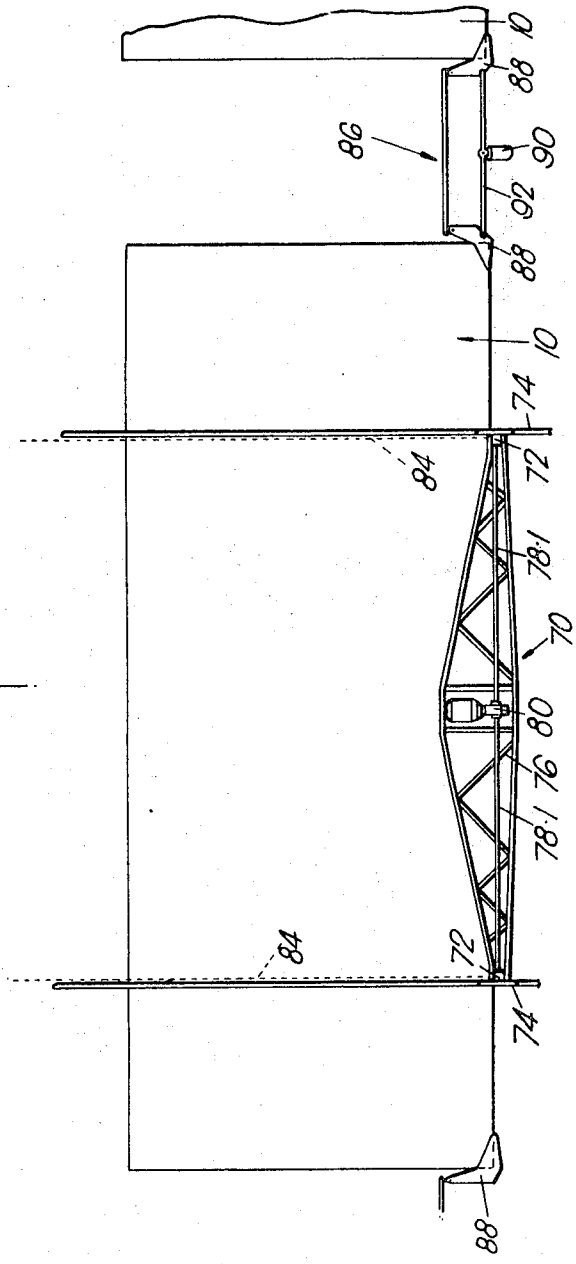

Fig. 11.

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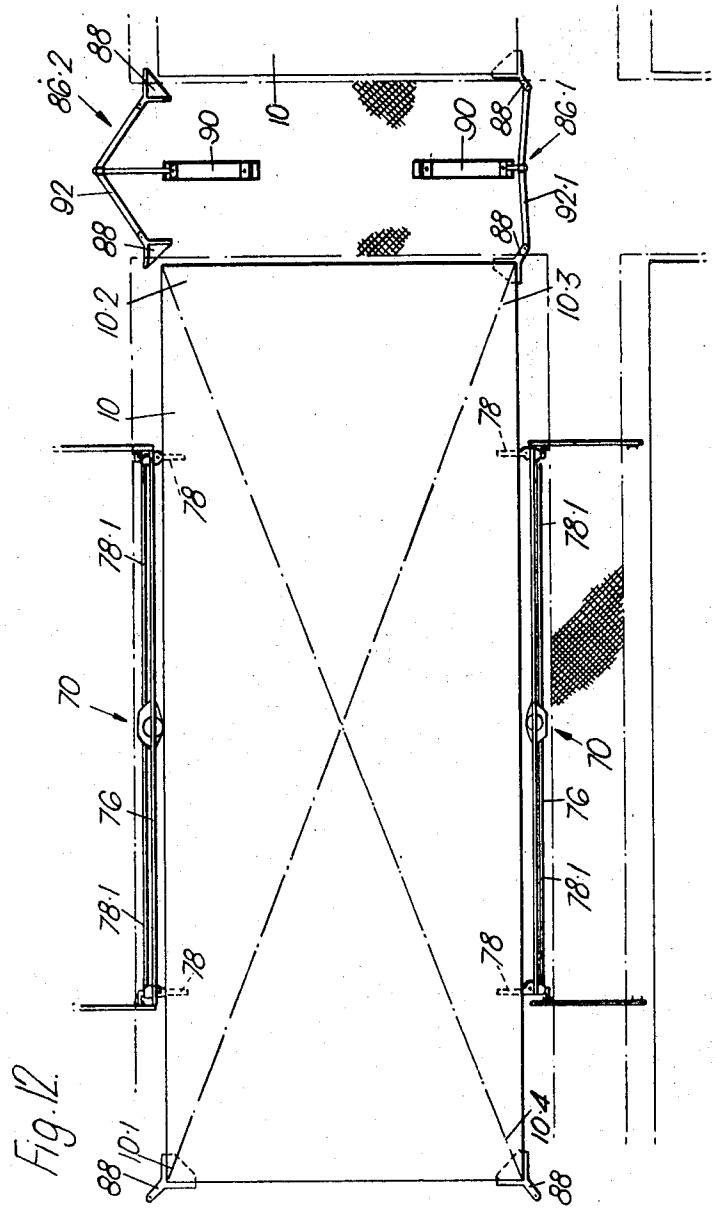

Fig. 12.

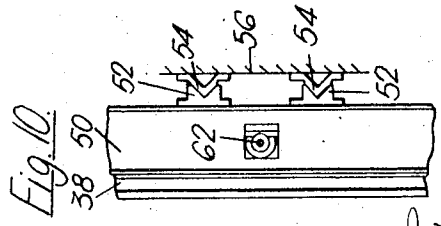

Fig. 10.

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MEANS FOR THE TRANSPORTATION OF GOODS

This invention relates to a method of and means for the transportation of goods. More particularly the invention relates to a method of and means for transportation of goods such as discrete articles, fluent materials and fluids.

According to the invention, there is provided a method of transporting goods which includes the steps of providing a container, loading the goods into the container, providing a wheeled chassis and mounting the container of the wheeled chassis, moving the wheeled chassis from the loading point to an unloading point, removing the container from the wheeled chassis and unloading the goods from the container.

The wheeled chassis may be moved from the loading point to the unloading point by being hauled by a hauling vehicle. Alternatively, the wheeled chassis may be a self-propelled vehicle which may propel itself from the loading point to the unloading point. As yet a further alternative method of moving the wheeled chassis it may be moved onto a movable platform which may then transport the chassis from the loading point to the unloading point. The movable platform may be a vehicle such as a ship or an aircraft or another wheeled vehicle.

The wheeled chassis may be hauled or propelled across an untracked surface such as a road, or it may be moved along a guided path which may comprise rails.

Further according to the invention there is provided means for transporting goods which comprises a container, a movable wheeled chassis adapted to support the container, and releasable securing means for attaching and detaching the container to and from the wheeled chassis.

Further according to the invention, there is provided means for transporting goods which includes a platform adapted to support a wheeled chassis having a detachable container mounted thereon for holding goods.

The platform may have at least two decks at different levels, one deck being an entry deck adapted to permit the wheeled chassis with container to enter the platform, and at least one other deck being a stowing deck adapted to permit the container to be moved thereto from the entry deck for stowing.

There may be provided a hoisting device adapted to lift the container from the wheeled chassis, and to move it from one deck to another.

The hoisting device may include at least one lifting bracket, guide means secured to the platform for guiding the bracket for movement in a substantially vertical direction, displacement means for displacing the bracket in a substantially vertical direction, and support means secured to the bracket for supporting the container on or from the bracket.

The means may further include a stowing device for stowing a container in a fixed position in/or on the stowing deck. The stowing device may include a plurality of displaceable clamps mounted on the platform and adapted to be displaceable between one position in which they engage with the container to support it, and another position in which they are free of the container.

The platform may be movable and may be in the form of a ship. Alternatively, the platform may be immovable, e.g. a quay. When the platform is a ship, it may be provided with a port in the vicinity of its bow through which a wheeled chassis with a container thereon may be transported into the ship onto the entry deck.

When the platform is a quay, there may be provided on the quay a length of railway track which is pivotally connected to a fixed railway track of on the quay to allow the length of railway track to pivot in a horizontal and in a vertical direction to allow the railway track to be aligned with a railway track on a floating platform such as a ship.

Further according to the invention, there is provided means for transporting goods which includes a graving dock suitable for accommodating a ship having a plurality of stowing decks adapted to stow containers capable of holding goods, the graving dock having a pumping apparatus for adjusting the water level in the dock.

There may conveniently be provided rails on the platform along which the wheeled chassis may be guided during its movement between a loading point and an unloading point.

The invention will now be described more particularly with reference to the accompanying drawings in which particular embodiments of the invention are shown by way of examples.

In the drawings:

FIG. 1 shows a schematic view of a container and wheeled chassis in accordance with the invention;

FIG. 2 shows a longitudinal section on a ship for stowing and transporting containers as shown in FIG. 1;

FIG. 3 shows a plan view of the ship shown in FIG. 2 together with a quay for handling such a ship;

FIG. 4 shows a section on an enlarged scale on line IV–IV of FIG. 2;

FIG. 5 shows a side view of a connecting railway track for connecting railway tracks on the quay with railway tracks in the ship shown in FIG. 3;

FIG. 6 shows a plan view of the connecting railway track shown in FIG. 5;

FIG. 7 shows a plan view of a rail retracting device for use on the ship shown in FIG. 3;

FIG. 8 shows a section on line VIII–VIII of FIG. 7;

FIG. 9 shows a section on line IX–IX of FIG. 7;

FIG. 10 shows an elevation in the direction of arrow C of the device shown in FIG. 7;

FIG. 11 shows a side view of a hoisting plant and a stowing plant for hoisting and stowing containers as shown in FIG. 1; and

FIG. 12 shows a plan view of the plant shown in FIG. 11.

The different elements of the invention will now be described.

THE CONTAINER

FIG. 1 shows a typical container **10**. It is a boxlike structure built of metal or other durable material with flat bottom, sides, ends and top. It is of varying standard sizes all having the same width and height, the length being in varying multiples of the standard unit. For convenience for the purpose of this application a "container" may be regarded as an oblong box 20 feet long, 8 feet wide and 8 feet high, and smaller units may be 4 feet or 8 feet long and will be termed "container sections."

The containers are container sections have hinged roofs **12** to allow them to be loaded or unloaded from above. They also have split hinged sides **14** to allow these operation to be done from ground or platform level. Finally they may have split hinged bottoms **16**, mechanically controlled, to allow unloading of bulk freight such as coal or ore by gravity.

The chain dot lines show that the top half **13** of the container and container sections may be slightly wider than the bottom half **15** and both are fitted with guide rails to allow the top to collapse telescopically over the bottom half and thus reduce the height of the box, when required or convenient to almost half. The top half **13** may have hinged covers **17** and sides **19**.

One of the two panels forming the container's bottom **16** has a round opening (not shown) cut through it which is normally kept closed with a manhole cover screwed or clamped into place which, when removed, will allow liquids to be discharged under control from the container. When the container is used for transporting liquids a suitably sized sleeve of plastic or other suitable material is fitted into the container to form a liquidproof inner container. It is filled from above through a nozzle-type opening, and it is emptied from below, also through a nozzle in the sleeve that is passed through the manhole.

The structure of the container and container section is a strong, one piece box frame **18** built into its outer bottom edges and countersunk in them, having at each corner an eyelet, also countersunk, to take the hook of a crane so that the container or container section can be hoisted by its base with the aid of a spreader to keep it upright and also to prevent

it swinging round while being transported in suspense. The container sections have a standard diameter tube **20** incorporated into the upper and lower edges of their sides so that when the requisite sections are placed next to each other to make up a complete standard size container, a strong metal rod can be passed through the tube and made fast with a screw nut at either end to bind the units together firmly and thus make of them one complete container.

At either side of their two ends each container or container section also has countersunk into it a similar vertical tube **22** so that when they are stacked one on top of the other a strong rod may be passed through the tube to help bind the containers into a firm stack. The rod is pierced through at intervals to allow a collar to be slipped onto it and to be fixed with a pinion into the appropriate position to help take the weight of the container above it and thus save the container resting its weight on its companion below.

The underside of each container and container section is fitted with built-in all-direction rollers of ball bearing type to allow it to be moved over flat surfaces such as platforms and warehouse floors with minimum effort.

THE WHEELED CHASSIS

Referring further to FIG. **1**, there is shown a wheeled chassis **24**. It is a simple fixed twin-axle, four wheeled platform de igned to run on normal train rails, in size slightly larger and slightly narrower than the standard containers **10** it is to transport, and in height having the top of its strong platform level with the top of a normal railway platform, so that containers may be easily moved across between one and the other. The chassis' platform **26** is fitted with transverse fixed guide rails at either end so that the containers moved onto it or lowered onto it will automatically be positioned correctly as regards their fore-and-aft position. Similarly on either side of the wagon, amidships, there is a short length of guide rail fitted on a bracket extending from the platform in the correct position to ensure that the two will grip the container firmly and hold it in the exact center of the chassis. These side guide rails are on axles mechanically controlled so that one may be lowered to allow the container to pass over it when being maneuvered into position, and it can then be raised again to hold the container in a fixed position.

At either end the chassis has the normal type of railway couplings so that they may be connected together to form a train. The chassis also has the normal type of vacuum brakes so that they can assist in braking when required, when in train form, activated by the locomotive in charge of the train. They also have their own individual sets of mechanical brakes.

A variation of the wagon is a self-propelled one, fitted with an electric motor geared to one of the axles and powered by a transistor and able to maintain a speed of about 15 miles an hour with a load of about 30 tons. It has an elevated driver's seat and alternative control position at either end.

THE SHIP

Referring now to FIGS. **2**, **3**, and **4**, there is shown a ship **28** for carrying containers **10**. The ship is in general outward appearance much like a conventional bulk carrier, with engines superstructure **30** right aft, but it is heavily streamlined both above and below water. The proportions of the hull at loaded waterline are approximately 10 feet of length to 1 foot of beam, but from here upwards the hull flares quite sharply outward as in most aircraft carriers, until at quay level, which is about 15 feet above loaded waterline, the sides are continued vertically upward and the proportions of the ship at this level and upwards are approximately 10 feet of length to 1⅛ feet of beam.

At the position where the flare ends and the sides begin to continue vertically upwards (see FIG. **5**) there is within the hull what will be termed the Train Deck or the Entry Deck **32**.

At the Train Deck level **32** the forward end of the ship tapers in a straight line to the stem, whereas at the waterline level below it has the usual inward curve and at the top deck level above the usual outward curve.

Above and below the Train Deck **32** there are decks or holds **34** and **36** for stowing containers **10**.

The hull of the ship from the keel up to the Train Deck is double-skinned, the double bottom being subdivided by watertight bulkheads into fuel, fresh water and ballast tanks in the normal way, while the double sides are filled with foam rubber or other material with similar properties of minimum weight for maximum bulk and cohesion and maximum buoyancy. The purpose is to make the vessel unsinkable even if its main cargo space is fully loaded and flooded, and thus to dispense with all or as many as possible of the usual transverse and even if possible longitudinal watertight bulkheads that the classification societies normally demand, and so provide the largest possible hold or holds for stowing containers.

The sides of the container hold or holds is the inner skin of the ship extending from the double bottom vertically to the top deck. The space between this bulkhead and the outer skin of the ship, having the Train Deck **32** as its floor, is subdivided into cargo holds for stowing uncontainerized cargo and for ballast tanks. The side "bulge" holds are equipped and have the necessary piping connections and pumping plant to allow them when used for the transport of liquids in bulk to pass their liquid to empty containers, properly equipped to receive it in the main cargo hold. This operation can also be done in reverse.

The container holds **34** and **36** are filled with mechanical apparatus for lifting and stowing containers, to be described later with reference to FIGS. **11** and **12**. At the Train Deck level **32** there is provided entry into this stacking and stowing apparatus for trains of containers, which enter the ship along railway tracks **38**, linked with the shore through ports **40** (see FIG. **5**) in the bow **42** and over rail bridges **44** fastened through universal joints **46** at one end to the ship **28** and at the other end to the quay **48**. The ports **40** are covered by strong doors which fit snugly and flush with the ship'a outer skin into the openings when the ship is at sea. They are hinged along the tip edge and have an eyelet projecting from near the bottom edge so that they can be hoisted up with the aid of winches on the upper deck into a position clear of the ports to allow the container trains and locomotives to pass through.

CONTAINER SHIP LOADING GEAR

The equipment forming part of the ship mechanism is divided into the following components:

a. Train Rails including retracting mechanism,
b. Hoisting Plant,
c. Stowing Plant,
d. Operating and control apparatus.

TRAIN RAILS AND RETRACTING MECHANISM

The FIGS. **7** to **10** illustrate this mechanism which is positioned in the ship at the Train Deck **32** which is approximately at the level of the quay **48**. There is a complete set of double rails **38** for each vertical lime of containers and the length of each set of rails is made to suit the full length of the container holds **34** and **36** (see FIG. **4**).

The rails consist of standard flat bottom rails, secured to steel joists **50** forming a compound girder of suitable strength to take the weight of a fully loaded container **10** and truck over a span of approximately 24 feet.

At intervals of approximately 24 feet along each rail girder, V-shaped sliding shoes **52** are fitted and these are mounted on slides **54** fastened to the ship structure **56**. The object of the slides **54** is to allow each length of rail to be moved broadside throughout its entire length over a distance of approximately 3 feet to allow a container **10** to be lowered down or to be hoisted up through the rails **38**.

Also at intervals of approximately 24 feet the rails are reinforced and fitted with square threaded bronze nuts forming part of the retracting mechanism.

The retracting mechanism is power operated and consists of a series of electric motors **58** and worm reduction gears **60** coupled to right and left-hand square threaded screws **62**. These are positioned between the double lines of rails **38** and each set of rails has one additional unit. All the units in each set of rails are linked electrically so that the two lengths of rail move sideways simultaneously from the standard rail guage position to the retracted position.

The retracting mechanism is started from the Control Room and is stopped automatically. The mechanism is suitable for reversing to bring the rails back into the operating position. Automatic stop limits are provided to set the rails at a standard railway guage.

At the beginning of each set of rails, safety stops come into position as soon as the rails begin to retract so that no truck can inadvertently be moved off the stationary rails in the forward part of the ship.

There are also fitted to the rail girders **50** a series of channel sections **64** which will move into position to fill the gaps **66** in the vertical guides **68** of the hoisting plant (shown in FIGS. **11** and **12**) to allow movement of the rails into retracted position.

HOISTING PLANT

FIGS. **11** and **12** show a hoisting plant **70** made up of a series of units of which there is one for each container **10** at a train deck level **32**. Each unit consists of four lifting brackets **72** having sealed ball bearing rollers operating in vertical channel guides **74**, secured to the ship structure. The two lifting brackets on each long side of the container are linked together by a latticed structural frame **76**. Each lifting bracket **72** has a pivotal arm **78** which can be rotated for insertion beneath the container or alternatively clear of the hoisting position. The rotation of the lifting arm is made by means of a worm wheel quadrant and worm. The worms are fitted on shafts **78.1** mounted on the structural frame **76** and the other ends of the shafts are connected to a worm reduction gear **80**. positioned at the center of each structural frame. The worm reduction gear **80** is operated by electric motor **82**.

Each hoisting unit **70**, therefore, consists of two structural frames **76** and the motor **82** on each will rotate two lifting arms **78** into the engagement position or the free position. The actual hoisting will be done by means of four roller chains **84** attached to the lifting brackets **78** and running vertically upwards over chain sprockets (not shown). The chain sprockets are positioned just below the main deck of the ship and are fitted to shafts connected through suitable reduction gear to a hoist motor. There are four hoist motors per unit.

All the hoisting units **70** in a complete train line are electrically interlocked and synchronized so that:

i. All lifting arms **78** rotate together and

ii. all hoist motors engage simultaneously.

The general operation is to engage and lift an entire train load of containers from the wheeled chassis into the deck position for stowing. The hoisting units are automatically stopped at a predetermined deck position by means of limit switches and electric controls.

Similarly, when the containers are secured by the stowage plant (shown in FIGS. **11** and **12**), the lifting arms **78** are disengaged and raised or lowered for another operation.

The operations are reversed for unloading the ship.

Electric supply to the motors mounted on the moving structural frames are by means of cable reels and cab tire electric cable.

STOWING PLANT

FIGS. **11** and **12** show a stowing plant **86**.

Each container **10** is supported and held in position by pneumatically operated arms or clamps **88**. The first set of arms to be used during loading, support the containers **10** at each of the four bottom corners. **10.1**, **10.2**, **10.3** and **10.4**. The arms **88** are pivoted from the ship structure and are operated by double acting pneumatic rams and cylinder **90**. Each cylinder **90** will operate two arms **88** by means of a toggle lever operation **92** so that once in the position **86.1** they cannot be dislodged to the position **86.2** except by further pneumatic operation.

The operation of the pneumatic cylinders **90** is by means of an electric solenoid valves. As in the hoisting plant **70**, the operation of the arms **18** is electrically linked in the train loads.

After an entire ship is loaded but before sailing, the containers **10** are secured against any lateral movement by means of further pneumatically operated clamps (not shown) on both sides and ends of containers bracing the container against its neighbor throughout the entire ship.

OPERATING AND CONTROL APPARATUS

The work of directing the entire loading or unloading operations may be done from a control room equipped with a control panel divided into sections of train loads. On this panel each moving part, whether on the Rail Retraction, Hoisting, or Stowing Plants, is connected to a signal so that failure of any part to move into its correct position will be noted and used to prevent the following operation being carried out. The entire system is electronically controlled to use the minimum of other labor or manual controls. The control room is however linked telephonically with various strategic points and a closed television circuit may also be used.

GENERAL DESCRIPTION OF LOADING AND UNLOADING

The procedure followed in loading the ship is for trains of containers to be pushed by a locomotive each along its own line **38** through the port **40** in the bow **42**, but with a similar exercise going on simultaneously on every line, into the ship **28**, as far as it can go. Upon it coming to a stop in a prearranged position, the hoisting plant **70** hoists all the containers **10** simultaneously off their chassis **24** and proceeds to stow them within itself, by means of the stowing plant **86**, while the train of empty chassis withdraws to fetch another load of containers. By moving the rails **38** apart in the manner described above with reference to FIGS. **7** to **10**, the containers **10** can be lowered between the rails for stowing. The procedure is the same for unloading, but in reverse.

ALTERNATIVE OR ADDITIONAL ARRANGEMENTS

In addition to carrying containers within its hull the ship may be equipped to carry containers on deck. They can be brought to the deck via the interior of the hull and ejected on to the deck through hatchways, or by hoisting over the side. They may be stacked one upon another on deck with the aid of cranes, and the units in each stack can be bound firmly together with the aid of rods as already described. The lower ends of the rods drop into deep sockets in the deck and are pinioned there, to anchor each stack firmly to the deck.

The ship's cranes are specially adapted for the purpose. They are of the goliath type in principle, spreadeagling the ship transversely with the shoes of their twin sets of double legs riding in channels laid along the deck on either side of the ship for the full length f of the container stowage section, so that the cranes can be moved quickly along the length of the ship above the container stacks and hatches and their crabs can pick up containers in rapid succession and swing them ashore, and vice versa.

Fitted atop each of the four corners of the crane's main structure is a short-jib but quite heavy-lift swivel crane used for hoisting uncontainerized cargo and swinging it between the quay and the holds for uncontainerized cargo.

On the poop right aft, above the engine room, is a strongly reinforced flat platform that may be used for accommodating extra heavy items of freight and/or for a landing platform for a helicopter, with which the ships will normally be equipped. Serving this platform and also the engine room below and therefore fixed firmly to the ship's main structure in their close

vicinity is a heavy-lift crane of sufficient lifting capacity and reach to be able to hoist the heaviest piece of machinery forming part of the engine room equipment, out of the ship and onto the shore, and vice versa.

The ship is equipped with a very large ballast tank capacity and also a powerful pumping plant, so that its draught and trim may be altered very substantially very quickly. For instance when it is transferring cargo between ship and shore by means of its rail system it should preferably always be at full load draught so that the train deck will be level with the top of the quay, and this should preferably be so even when it is not carrying container cargo. Hence it should preferably be able to carry the same weight of ballast water as it can carry containerized cargo. And it should preferably be able to pump it out at at least the same rate, by weight as it is able to take in containerized cargo. Also it should preferably be able to adjust ballast very rapidly to compensate for the weight as container trains move in or out at the forward end, to maintain trim to avoid distorting the comparatively delicate connections with the quay.

THE QUAY

FIGS. 2, 3 and 5 show a quay 48 fitted with railways tracks 94 and a storage building 96 termed a shore stack. The quay is angled to take the shape of the forward side 42 of the ship 28, at Train Deck level 32, so that the bow section through which the container trains run may also be close up to the quay edge for its whole length while at the same time the rest of that side of the ship may also be close up to the quay to allow not only for secure mooring of the vessel but for handling cargo with crane aid over the side and for servicing of the ship (fuelling, watering, victualling, etc.) through the side.

The angled portion of the quay 48 next to the bow 42 is fitted with a bridge 44 which is hinged at 45 and can be swung away into a position 44.1. The bridge 44 can pivot at 46 in a vertical and horizontal direction to allow the railway 94 on the quay 48 to be aligned with the railway 38 in the ship 28. From the bridge 44 the railway tracks 94 run into storage building 96 having hoisting plant and stowing plant similar to those indicated by numerals 70 and 88 in FIGS. 11 and 12. The Shore Stack 96 differs from that in the ship mainly in that its Train Deck is at ground level at the bottom of the stack and not roughly halfway up it, and as containers do not have to be lowered below the Train Deck there is no need to have retractable rails, and the railway tracks are fixed. The Shore Stack (Imports) receives the container trains from the ship, unloads them and hoists and temporarily stows the containers while the empty train is pushed back into the ship without waste of time to fetch another load. This shutting back and forth continues at maximum speed until all cargo consigned to or through that port has been transferred to the stack. The container trains then start unloading the duplicate Shore Stack (Exports), adjoining, and transferring those containers due for shipment in that vessel, into it in like manner. As soon as the last load is aboard the locomotives withdraw with their empty trains and the ship departs.

Meanwhile individual self-propelled chassis each with a driver will have been collecting containers from the Imports Stack and delivering them according to their destination boards to the respective platforms in a container Sorting Yard nearby. The containers are pushed manually from the chassis onto the platforms and in due course from these onto railway trucks of the local system for dispatch up-country or onto road trailers for local delivery.

Containers arriving for shipment are handled similarly, in reverse, and taken into the Export Stack if they are to be shipped into the next departing vessel, or into the Transit Stack that adjoins the other two, if they are to await later shipment. All three stacks are directly linked through a points system with the railway bridges providing connection with the interior of the container transport ship and with the railway tracks serving the quay to which the side of the ship is moored. There may be two, three or four parallel railway tracks on the quay as near as possible to the ship so that a big container transport ship equipped with sufficient goliath-type cranes of adequate reach may assign one to each set of rails and thus load or unload up to four trains simultaneously, over its side. At the same time loading or unloading the interior of the ship can be proceeding through the bow ports.

THE HARBOR

Where there is no suitable existing quay available for regular use by the container transport ships, or insufficient depth of water for the bigger ships that will be required, or too much congestion on the land side to allow for efficient operation and expansion, or shipping congestion, tidal or other water movement that delays the operations of the container transport ships, special harbors for them may be constructed as required at positions authorized by the local authorities. These will normally be in comparatively open sea and in exceptionally deep water and therefore they will have to be of special design both for construction and for operation.

From the operation aspect they may generally comprise a long, very wide pier running out from the shore into deep water. At the end of the pier is a graving the entrance and immediate approach to which is protected by a breakwater. The graving dock will normally be used by the container transport ships as a wet dock or lock whose gates will be shut behind them when they are in it to give them still water of controllable level and thus ideal conditions for loading or discharging, the graving dock's own pumping plant assisting where beneficial to trim the ship by raising or lowering the water level in the enclosed basin.

The lock at its seaward end has a double set of strong waterproof gates of which the outer one is constructed to withstand water pressure from the outside when the level of the water outside the walls is higher then the inside enclosed area, and the inner one to withstand pressure from inside when the level of the water inside the enclosed area is higher than the outside walls. Each gate is split into two equal positions hinged to the side of the lock entrance and so constructed that the pressure of the water from one sidewall force their outer edges together and press the seal they make hard against the entrance wall of the lock and thus help in making it waterproof.

The landward end of the graving dock is shaped at one side to incorporate the angle quay described earlier, and on the the pier between the graving dock and the shore there is duplicated the layout and ancillaries already described as apertaining to the special quay.

The side of the pier that is protected from the prevailing weather may be equipped as a deepwater quay for berthing ships in the normal course of trade. At the head of the graving dock, there will be a ship-repair shop.

The lock gates will normally be open only when ships are passing in or out. The water in the graving dock may be impregnated with suitable chemicals for clearing marine growth off the underwater hulls of the ships floating in it.

The core of the pier and breakwater and of the graving dock walls and quay are hollow, waterproofed, and subdivided into numerous compartments of varying sizes all connected through inlet and outlet pipes of large diameter, served by powerful pumps, with the graving dock, the quay wall and the shore, so that they may serve as storage tanks for liquids including oil and refined fuels. Between each tank and on top of it, there may be water-filled cofferdams to contain, and as far as possible eliminate fire dangers.

Besides providing semipermanent storage for these tanks will serve the purpose of receptacles for the liquid cargoes of giant and smaller tankers that wish to be dry-docked but must first discharge their cargoes. They can reload after dry-docking.

METHOD OF BUILDING THE HARBOR

Where it is necessary, more practical or otherwise advantageous, the special harbors may as far as possible be built out of discarded ships. This will have the advantages, generally, that the harbors can be built in much deeper water than would otherwise be possible, in more open and disturbed water, quicker, at less cost, and the use of selected vessels such as small and medium-sized tankers currently in employment will help to open the way for their replacement by modern, much larger vessels which are potential customers for the deep-water ports and graving docks.

The sea bed is prepared by levelling as far as possible and then laying down a mat of "dolosse" or similar interlocking block forms to make a level bed with a standard size U-shaped groove down its center to act as a guide and grip for the false keel of the ship to be lowered onto it.

The ships are converted into, in effect, giant interlocking bricks by cutting away all top-hamper and projections including counter or cruiser sterns and stems and bow-flares and by welding over and along the length of the keel a standard-sized U-shaped false keel just narrow and shallow enough to fit snugly into the groove in the sea floor mattress. A similar standard-sized U-shaped groove is out into the ship's upper deck along its full length amidships. Similarly, a standard groove is cut vertically down the centerline of one end of the ship and a key to fit the groove is built on also vertically down the centerline at the other end. The ships are scuttled under control on top the prepared beds, end-to-end and, where necessary, one on top of the other, to form giant brick-style walls of the required length and height. After sinking the ships are pumped full of underwater concrete and they are firmly bound together with steel girders and beams set in the concrete and/or other welded to their plating, gaps in the structure or other weaknesses being dealt with by building up boxes of welded steel sheet around them and filling these with liquid concrete. The walls are bonded to the sea floor by sinking strong steel girder uprights into the sea bed, concreting them in position, and welding them to the hulls of the ships forming the wall. Where necessary, the walls are made two or three ships thick and they are solidly built up to ensure watertightness and ability to withstand the maximum pressure and shock to which they are likely to be subject. When this has been done in the wet state and complete basins have been formed, the sea floor within is thickly concreted to make it waterproof and firm and the water is then pumped out of the basin and construction work on the core of the piers, the inside surfacing of the graving docks and the construction of their gates and so on is carried out in the dry state.

I claim:

1. Means for transporting goods comprising:
cargo holding means adapted to support wheeled chassis each having a detachable container mounted thereon for holding goods;
said cargo holding means having at least two levels, one level being an entry level adapted to permit said wheeled chassis each with said container to enter said one level, and at least one other level being a stowing level adapted to permit said containers to be moved thereto from said entry level for stowing; and
said cargo holding means also including, a guide means on at least said entry level to guide said wheeled chassis on said level:
a plurality of hoisting devices adapted to lift said containers from said wheeled chassis and simultaneously move said containers on said entry level to said stowing level,
stowing means for stowing said containers on said stowing level,
said stowing means including four clamps to support each container, one clamp for each of four corners, and
said clamps being operable in pairs by a fluid operated ram and cylinder via a toggle action linkage to engage adjacent containers.

2. Means for transporting goods comprising:
cargo holding means adapted to support wheeled chassis each having a detachable container mounted thereon for holding goods; stowing stowing;
said cargo holding means having at least tow two levels, one level being an entry level adapted to permit said wheeled chassis each with said container to enter said one level, and at least one other level being a stowing level adapted to permit said containers to be moved thereto from said entry level for stowing;
said cargo holding means also including;
guide means comprising a railway track on at least said entry level to guide said wheeled chassis on said level, the rails of the track being displaceable away from and toward one another between one position in which the track supports a wheeled chassis and another position in which a container may pass unobstructed between the tracks in a vertical direction; and
a plurality of hoisting devices adapted to lift said containers from said wheeled chassis and simultaneously move said container on said entry level to another level.

3. Means according to claim 2, in which the rails of the track are supported upon shoes which are slidable upon support bars, and in which the rails and the shoes are slid over the support bars by means of a drive mechanism including a worm gear.