This application relates to ships for carrying bulk cargo such as raw or semi-refined sugar, all types of grain, fertilizer, bauxite and other ores or ore concentrates, copper, sulphur, and other such generally dry cargo which is usually carried in bulk. More particularly, the invention relates to ships which have installed bulk-cargo materials handling equipment for loading or unloading the cargo and which impart to the ship what is commonly known as a self-loading or self-unloading feature thereof.

The materials handling equipment permanently installed aboard the ship usually consists of conveyors and elevators and the like which move the cargo material directly either into or out of relatively large cargo holds of the ship wherein it is stored. Depending upon the type and arrangement of the apparatus, the ship will be capable of either self-loading or self-unloading or both, and these operations will be either more or less efficient and economical. Moreover, the complexity and arrangement of the selected equipment will determine whether the ship need be designed specially or extensively modified for the installation, and will determine whether initial installation costs will be high or low. The location of the apparatus on board the ship may affect its accessibility and its susceptibility to damage or interference by the cargo materials being handled, all of which may adversely affect maintenance costs.

Accordingly, it is an object of the present invention to provide a ship for storing and transporting bulk cargo as has been described which is provided with bulk-cargo materials handling apparatus arranged in a simple and effective manner to impart efficiency and economy to both self-loading and self-unloading operations of which the ship is capable. The several pieces of equipment are intended to be of a generally conventional and durable type, thereby contributing to reduced costs of installation and maintenance. Another object in the arrangement of the apparatus is to provide accessibility for maintenance of all of the several components and to avoid location thereof in places where they may become clogged or otherwise interfered with or damaged by the cargo material.

Ships which have been designed heretofore for the intended purpose more often incorporate special features in the construction of the hull or interior portions in order to accommodate the materials handling equipment. These features normally involve a reduction in the otherwise available cargo carrying capacity of the ship, and a heightening of the center of gravity of the loaded vessel which tends towards instability of the ship while travelling in a seaway. It is therefore another object of the present invention to provide a self-loading and self-unloading type bulk-cargo carrying vessel wherein the space available for carrying cargo is more fully utilized and the center of gravity of the ship when loaded will be relatively low.

The invention includes drag scraper means for levelling the cargo material and for hauling the material from within the holds of the vessel. Where drag scrapers have been employed somewhat satisfactorily heretofore, more often it has been found necessary to alter the normal interior structure of the ship to provide separate space in the form of tunnels and the like in which the drag scrapers operate with relative freedom from interference by the cargo material which is stored in cargo holds located generally thereabove. The tunnel or similar scraper passage structure is situated at or near the bottom of the ship and the cargo material is gravity fed thereinto from the storage holds. Not only do such arrangements effect a heightening of the center of gravity of the loaded ship, but the gates through which the cargo material passes into the tunnel and thus to the scraper are often a source of trouble caused by jamming of the gate apparatus, or by “hanging up” of the cargo material in the gate passage. In turn, these arrangements limit the type of cargo which may be carried by the ship to those which will flow freely through such gates or hoppers. It is an object of the present invention to avoid such special ship construction and thereby these attendant difficulties. A further object is to provide a ship which is universal with regard to the type of generally dry bulk-cargo which may be carried. The ship having the apparatus hereinafter to be described is intended to be capable of carrying bulk cargo of practically any type which may be in powdered form or otherwise, within an extremely wide range of particle size.

In other drag scraper arrangements which have been hereetofore provided, the operation of the scraper has been inflexible with regard to the direction of its movement, with consequent inefficiency in the moving of the cargo within the hold. Usually the scraper can be moved only along a fixed path, confined by the line of hull of the cables attached thereto, and attempts to provide for scraper movement in lateral direction have been generally unsuccessful. Accordingly, it is a principal object of the invention to provide drag scraper apparatus within the cargo holds of a ship of the type described which is arranged and constructed to effect great latitude of control over the direction of movement of the scraper during self-loading and self-unloading operations.

So as to more effectively remove all of the cargo contents from the holds of bulk-cargo carrying vessels it has heretofore been thought necessary that the holds be constructed with sloping sides or bottoms to cause the cargo material to fall towards the drag scrapers therewithin. Such necessity has been brought about partly by the aforementioned limited direction of movement of the drag scrapers, and partly by the inherently tacky nature of many types of cargo which are normally carried in bulk. It is therefore another object of the invention to provide drag scraper apparatus which will operate within the cargo holds in a manner so as to avoid the necessity of constructing the holds with sloping sides or bottoms. Construction of normal flat-bottomed holds in bulk-cargo carrying ships, which construction is permitted by the present invention, is more economical. Moreover, cargo carrying space is enlarged, and the facility with which the cargo may be completely emptied and cleared from the holds is increased.

It is still another object of the invention to provide a ship having bulk-cargo materials handling equipment operable by relatively few operating personnel. Although more operators may be employed as desired, the object encompasses the goal of almost complete automation of the self-loading and self-unloading operations by means which will be described.

In general, the invention consists of a ship for carrying cargo in bulk and having materials handling apparatus arranged and constructed for economical and efficient handling of the bulk-cargo material. The ship, which may be a steamship or a barge, has a number of large, relatively flat-bottomed holds within which the cargo is stored. A cable-suspended, crescent-type drag scraper is mounted for operation within each hold to move the cargo material. The scraper has the usual
inhaul and backhaul cables attached for imparting haul-
ing movement, both of the cables being winch operated from outside the hold and usually from the main deck of
the ship.

The backhaul cable is reeved through a sheave on a
novel shifter trolley which is moveable along a trans-
versely extending I-beam, or monorail, attached to a
bulkhead at the end of the hold which is opposite to
that end from which the cargo material is discharged.
The shifter trolley may be moved and held in any loca-
tion along the monorail by cables attached to each side
which pass around a common winch, or by other con-
ventional shifting and holding arrangements. The back-
haul cable of the scraper also is reeved through an-
other sheave which is attached to a hauler trolley mount-
ed for movement along an overhead I-beam, or monorail,
which extends the length of the hold. Then the
trolley also may be shifted and held in any location along
the monorail by conventional shifting and holding appa-
ratus. It has been found that location of the hauler
trolley monorail along one side of the hold, preferably
the outboard side, permits greater flexibility of movement
of the scraper, and greater facility of control over
scraper movement from outside of the hold, preferably
from the main deck. The novel apparatus and arrange-
ment described provides controlled movement of the
scraper in both longitudinal and transverse, or lateral
direction. This flexibility of scraper movement, in turn
avoids the necessity for providing steep sloping sides or
bottoms in the holds, thereby permitting greater utiliza-
tion of available cargo space as well as facility for
completely emptying the hold of the cargo material.

An inclined ramp at the discharge end of each cargo
hold elevates the scraper which hauls the cargo material
as it moves to discharge through a grait at the top of
the ramp. The ramp extends from the bottom of the
hold to an elevation above in upper deck of the ship, usu-
ally the main deck. Directly beneath the grait, and at
attached permanently to the deck, is a surge hopper which
countinuously stores the surge of material from the
scraper, feeding it gradually and uniformly through a
bottom opening and on to a transversely arranged pan
feeder conveyor therebelow which is also attached to
the deck.

The several feeder conveyors discharge the material in
inboard direction on to a single, longitudinally extend-
ing belt conveyor mounted at the center of the deck.
The longitudinal conveyor, being the common discharg-
ing source for all of the feeder conveyors, carries all of
the material being removed from the holds to discharge
on to a transversely arranged, belt-type shuttle conveyor
located at one of its ends, usually towards the after
portion of the ship. The transverse shuttle conveyor
carries the material to discharge on a boom conveyor,
preferably of a belt-type, pivotally mounted at one of
its ends at the side of the deck to be swung outboard
of the ship. The boom conveyor delivers the material to
receptacles on the dock.

In a preferred arrangement, two such boom conveyors
are attached to the deck, one at each side with their
materials receiving ends in line with the end of
the longitudinal conveyor, making it possible to un-
load the ship towards either side. The shuttle conveyor
is mounted on rails for transitory rolling movement on
the deck so that it may be shifted towards either boom
conveyor depending upon which side of the ship the
cargos are to be unloaded.

Where the shuttle conveyor is of a belt-type, it will
receive the materials by gravity discharge off the end of
the longitudinal conveyor and carry it, in turn, to
gravity discharge upon one of the boom conveyors. The
shuttle conveyor is therefore adapted for adjustment to
an inboard position, with one end beneath the materials
discharge from the longitudinal conveyor and the other
end over the materials receiving end of one of the boom
conveyors. The direction of incline must, of course,
be reversible so that the same arrangement will be
effected whenever the shuttle conveyor is shifted across
the deck for operation with the boom conveyor on the
opposite side.

Each boom conveyor is pivotable in vertical direction,
as well as laterally, to effect an incline thereof as neces-
sary depending upon the height of the unloading dock,
or other such conditions exterior of the ship.

Both boom conveyors, the shuttle conveyor, and the
longitudinal conveyor are reversible with regard to the
direction in which material may be carried. By revers-
ing the incline of the shuttle conveyor to receive the dis-
charge from the boom conveyor and deposit it in the
longitudinal conveyor, bulk-cargo material may be load-
ed on to the boom conveyor from the dock for delivery
into the cargo holds of the vessel. Of course, means such
as scraper bars or belt tripper arrangements must be
provided on the longitudinal conveyor to cause the
material to discharge laterally therefrom into the holds.
The material drops through hatchways in the main deck
directly into each hold, there to spread by the the very
flexible movement of the drag scraper apparatus already
thereby described. Alternatively, bulk-cargo trimmer
apparatus, of conventional type, may be used to spread
the material evenly throughout the hold.

These so-called self-loading and self-unloading opera-
tions may be performed by relatively few operat-
ing personnel. It may be preferred to place one oper-
ator in control of each cargo hold, operating the scraper
therewith. However, it is seen that the ability to con-
trol very flexible drag scraper movements in all of the
holds from the main deck, which is provided by the
apparatus and arrangement, would permit centralized operation of all of the scrapers. If results are
not thought adequately observed from the upper
deck, a television camera may be provided within each
hold for remote viewing of the scraper action there-
within.

The invention and other objects and features thereof
will become more fully apparent from the following
detailed description and by reference to the several
figures of the drawings.

Figure 1 is a plan view of a portion of a bulk-
cargo ship built in accordance with, and having the appa-
ratus of the invention, the figure being shown partly
in section taken at lines 1--1 of FIGURE 2.

Figure 2 is a sectional profile view of a portion of
the same ship shown by FIGURE 1, the section taken
at lines 2--2 of FIGURES 1 and 3;

Figure 3 is a front view elevation of the same ship,
partially in section taken along lines 3--3 of FIGURE 1;

Figure 4 is an enlarged plan view of a pair of cargo
holds of the ship, in section taken just below the main
deck, to point out interior features thereof, and the
invention in more detail; and

Figure 5 is a sectional profile view taken along lines
5--5 of FIGURE 4.

Refering to the several figures of the drawings, in
which like elements are similarly numbered throughout,
it is to be understood that the rules of good draftsm-
anship have not been exactly followed throughout but
that the drawings are intended merely to serve the
purpose of this disclosure.

With particular reference being had to FIGURES 1--3,
a portion of a ship 10 for carrying bulk-cargo, such as
cinnamon, sugar, your grains, various ores, cement, and
the like, has an upper deck 11 which may be the main
deck, a longitudinal centerline bulkhead 12, transverse bulkheads 13, a flat inner bottom 14, and bulk-cargo holds 15. The
bow of the ship is generally indicated by the numeral 16,
and all of the usual superstructures of the parts of the
ship not involved by the present invention have been
eliminated. The ship 10 is generally a wall-sided vessel hav-
ing port and starboard sides 17 of the hull. The ship 10
is generally wall-sided vessel having port and starboard sides 17 of the hull.
will usually have a plurality of bulk-cargo holds 15 which are arranged in pairs along the length of the ship, one such hold of each pair being located on either side of the longitudinal bulkhead 12.

An inclined ramp 18 is constructed at one end of each hold 15, that end of the hold being referred to as the discharge end. The ramp extends in fore and aft direction from the bottom 14 of the hold to an elevation, or height, above the upper deck 11, which deck is that on which other materials handling apparatus is mounted or attached in the manner to be described. Each ramp 18 passes through, and rests on the appropriate end of a deck opening 19 in the deck 11. These openings 19 are sufficiently large to permit the passage therethrough of the drag scrapers 20 when travelling on the ramps 18 hauling cargo material being unloaded from the ship, as will be described, and the openings 19 will of course be provided with suitable covering means (not shown) to close the same when not in use for their intended purpose.

The drag scrapers 20 are crescent-shaped, and are completely open at their bottoms particularly for the purpose of discharging materials, as will be seen. The top portions of the scrapers may also be completely open. During unloading operations, the drag scrapers 20 haul bulk-cargo material up the ramps 18, discharging it by gravity through the openings 21 in the ramp at upper, or top end 22 thereof. The grill openings 21 are rather large so as not to limit to any appreciable extent the size of materials which may pass therethrough, the grills being intended only to prevent the scrapers themselves from falling through these ramp openings. Arrangements, such as guide rails for the scrapers, etc., which would not involve such grills might also be devised for the purpose. Suitable stops and guides on the ramps (not shown) will further control the scrapers thereon.

The materials discharge from the scrapers 20 through the grill openings 21 is received by surge hoppers 23 attached on the deck 11 immediately beneath each of the top ends 22 of the ramps 18. The hoppers 23 momentarily store the bulk-cargo material, which is received in surges from the drag scrapers 20, and discharges the material by gravity flow in a gradual, uniform manner through the generally unrestricted openings 24 in the hoppers 23. The openings 24 might be equipped with gates (not shown) to control the rate of flow of materials therethrough.

The materials discharge from the hoppers 23 through the openings 24, flows by gravity onto transverse feeder conveyors 25 situated therebelow which are attached to the deck 11. Each feeder conveyor 25 is preferably of the pan-type, being a series of rather shallow buckets arranged in apron fashion on chains passing around a pair of end pulleys. Other types of feeder conveyors might be substituted, of course. The conveyors 25 are arranged to carry materials transversely of the ship 10 in inboard direction towards the centerline 12.

The bulk-cargo material being unloaded from the ship falls, by gravity discharge, from the inboard ends of all of the feeder conveyors 25 to on a single, longitudinal conveyor 26 which is attached to deck 11 along the centerline 12. The longitudinal conveyor 26 is preferably a belt-type conveyor of usual construction, but other types might be employed. The orienting of the conveyor 26 and the feeder conveyors 25 is such that the discharging ends of the feeders will be located over the belt of the conveyor 26 so that the material will fall on to the latter. So that it may be unloaded, a loading of bulk-cargo into the hold 15, as will be described, the longitudinal conveyor 26 extends the length of all of the holds 15, as shown more clearly by FIGURE 1.

In the embodiment shown by the drawings, the longitudinal conveyor carries the material towards the after portion of the ship during unloading. The materials are normally discharged by gravity off the end of the conveyors 26 on to a transverse shuttle conveyor 27, which is also preferably of the belt type. The shuttle conveyor 27 carries the materials discharge from conveyor 26 to discharge on one of the boom conveyors 28. Thus, the shuttle conveyor 27 is of a length approximately equal to the half-width of the ship 10. The shutter frame apparatus has wheels for mounting the unit on transversely extending rails 29 attached to the deck 11. This provides convenient means for shifting the shuttle conveyor 27 in transulatory movement across the deck 11 to be oriented with the boom conveyor 28 at the opposite side of the deck. Thus, the shuttle conveyor 27 is capable of carrying the cargo material towards either side 17 of the ship for discharge.

For proper handling of the cargo material during unloading, where the conveyors 26, 27 and 28 are of the belt type, the shuttle conveyor 27 should be oriented with its materials receiving end below the discharging end of the conveyor 26 and with its materials discharging end above the receiving end of a boom conveyor 28. It is therefore preferred that the frame apparatus of the shuttle conveyor 27 be adapted by conventional means (not shown) for adjusting the conveyor 27 to an inclined position appropriate for the purpose. These frame apparatus must also be capable of causing the incline, in a similar manner, when the shuttle conveyor 27 is shifted, or moved in transitory manner across the deck for discharging material on to the opposite boom conveyor 28. Because the shuttle conveyor is employed in self-loading operations, as will be later described, its frame apparatus should include means for elevating the end, is height greater than that of the longitudinal conveyor 26.

Boom conveyors 28 are pivotally connected to deck 11 at their inboard ends (with reference to their positions for use during loading and unloading operations) as more clearly appears by reference to FIGURE 1. A frame, or other pivotal mounting apparatus hereinafter being omitted from the drawings for clarity. Thus, boom conveyors 28 may be pivoted, or swung outboard of the ship within the plane of their lateral movement.

The boom conveyors 28 receive and carry the materials discharge from shuttle conveyor 27 to discharge outboard of the ship on their respective sides. To impart greater flexibility to loading and unloading operations, and because of possible variety in dock elevations or the heights of receptacles on the dock to which or from which materials are to be carried, the boom conveyors 28 are adjustable by means (not shown) for pivotal movement in a vertical plane about their inboard ends 30. Thus, they may be pivoted up or down to more accurately discharge or receive materials at the dock.

The novel apparatus for mounting the drag scrapers 20 within cargo holds 15, and which imparts great flexibility of control over the movement of the scrapers, is best described with reference being made particularly to FIGURES 4 and 5 which show in sectional detail a typical pair of cargo holds of the vessel. The inner bottom 14 provides a flat bottom substantially throughout the hold. Only the interior peripheral edges of the hold are sloped, the slope plates 31 being provided intercostally of the necessary vertical framing 32. Thus the entire hold is said to be relatively flat-bottomed. Slope plates 31 prevent "hanging up" of the scraper 20 on the framing 32. An overhead monorail 33, generally an I-beam, is attached to the ceiling, or overhead structure in each hold 15 and extending in longitudinal direction substantially the entire length of the hold. The monorail 33 should be attached near the outboard side of each hold 15. A hauler trolley 34 is mounted for rolling movement along monorail 33 by means of wheels 35. The hauler trolley 34 has a cable sheave means 36 attached thereto, the sheave means preferably including a universal-type swivel connection 37.

Attached to the transverse bulkhead 13 at the interior end of the hold 15, which is opposite the ramp 18 at the discharge end of the hold, is a second monorail 38. The
monorail 38 extends in transverse direction across substantially the width of the hold 15, and, for reasons which will become apparent, is situated in vertical direction at an elevation which is below the midpoint of the ship's middle waterplane level of the hold 15. A shifter trolley 39, having a sheave means 40, is mounted for rolling movement along monorail 38 by wheels 41. The sheave means 40 preferably include the universal-type swivel connection 42.

The boom conveyor 28 in each hold has a backhaul cable 43 attached at its back, or closed end, and an inhaul cable 44 which is attached to its front, or open end by means of the yoke, or bridle arrangement 45. The backhaul cable 43 is reeved through the sheave 40 of the shifter trolley 39 and thence through the sheave 36 of the hauled trolley 34. Both cables 43, 44 lead out of the hold 15 through deck opening 19, having first passed beneath a chafing guard roller 46 at the ceiling of the hold, all as indicated by the drawings. A winch 47 at each hold on the deck 11, as shown in FIGURE 1, operates both the backhaul cable 43 and the inhaul cable 44 to impart hauling movement to the scraper 28. The connection of the cables to the winch for such operation is well-known and need not be further described nor illustrated in this disclosure.

Both the hauled trolley 34 and the shifter trolley 39 may be shifted along their respective monorails, to any location thereon, and held in such location. The manner of shifting and holding the trolleys along a monorail is also well-known and any preferred power operated arrangement for doing the same from remote location, such as by means of a winch and cables, is acceptable and need not be indicated here.

By shifting the shifter trolley 39 along its monorail 38, the drag scraper 28 may be moved in lateral direction in conjunction with a taut condition in the cables 43, 44 and the location of the hauled trolley 34 along its monorail. Thus, together with the hauling movement of the cables 43, 44 the capability of the apparatus to laterally shift the scraper within the hold imparts great flexibility to the range of movement of the scraper, and hence more efficient control over the moving of the cargo material. This latitude of movement also permits the cargo hold to be constructed having a relatively flat bottom, thereby avoiding sloping sides and bottom construction which would reduce the otherwise available cargo-carrying space therein and which would tend to elevate the center of gravity of the cargo-laden ship.

The cables 43 and 44 are controlled from the deck 11 and from within the hold, a feature not found in other arrangements, which permits location of the hauling winches at places other than within the cargo holds. The advantages in installation and maintenance are obvious. This feature will also permit all of the cables to be run to centrally located winches, thereby providing for more efficient use of deck space, or to a centrally located operating station, thereby avoiding the need for operating personnel at each of the cargo holds 15. Where central operation is employed, a conveniently located remote control television camera 48 may be installed for viewing within each hold 15, as indicated in FIGURES 2 and 5.

Because the ramp 18 extends out from the hold 15 to an elevation, or significant height above deck 11 upon which all of the materials handling apparatus other than the scraper apparatus is located, no elevator or other equipment need be located within the cargo holds. This feature, also not found in other arrangements, avoids installation and maintenance problems, and permits greater utilization of available cargo-carrying space.

Thus, apparatus and an arrangement thereof has been described which is extremely simple and effective for imparting a self-unloading feature to bulk-cargo carrying ships. The unloading operation itself has been described, and there remains the description of the simple additional apparatus and features which will impart a self-unloading capability to the ship.

The boom conveyors 28, and the shuttle conveyor 27, as well as the longitudinal conveyor 26 are operated in reversed materials carrying direction during self-loading operations. Cargo material is fed from the dock on to the boom conveyor 28 from whence it is discharged on to the shuttle conveyor 27 for delivery and discharge on to longitudinal conveyor 26. Shuttle conveyor 27 is, of course, oriented with regard to its inclined position as foreseen for this operation.

The deck 11 is provided with bulk-cargo loading hatchways 49 through which bulk-cargo materials will pass into the holds 15, as shown in FIGURE 1. These hatchways 49 are disposed in longitudinal direction on either side of the centerline 12 of the ship so as to be alongside the longitudinal conveyor 26 to receive materials which is gravity discharged therefrom during the loading.

The longitudinal conveyor 26 is provided with any standard type belt-trimmer or unloading bar means to cause the conveyed material to be discharged laterally, or to either of the sides of the belt, to fall into the holds 15 through hatchways 49. The longitudinal conveyor 26 is long enough, as shown in FIGURE 1, to carry cargo material to all of the holds 15.

Any standard type of bulk-cargo trimmer apparatus (not shown) may be employed within the holds to spread the cargo material evenly throughout as it falls through hatchways 49. However, need for such trimmer apparatus has been avoided by the novel drag scraper mounting apparatus and arrangement described. The great flexibility of movement of the scraper as herein provided will permit use of the scrapers to spread the material within the holds during loading operations.

Other features and apparatus might be incorporated within the general arrangement and construction provided by the invention with or without departing from the principles thereof. For example, hoppers 23 might be provided with vertically arranged gate means at their inboard sides above feeders 25 to regulate the depth of the material flow upon the feeders. But these modifications, or the substitution of equivalent apparatus for that described, do not alter the invention in principle.

What is claimed is:

1. A ship for carrying bulk-cargo within a plurality of relatively flat-bottomed cargo holds thereof, said ship having bulk-cargo materials handling apparatus comprising a drag scraper means within each of said holds for moving said bulk-cargo materials storage therein to a discharge at one end of the hold, a ramp at the discharge end of each of said holds for elevating the drag scraper when the latter is moving said material to gravity discharge at the upper end of said ramp, said ramp of each hold extending from the bottom thereof to an elevation above an upper deck of said ship, a cargo hopper means on said upper deck below the top of each of said ramps for receiving the materials discharge of said drag scrapers, a feeder conveyor mounted on said deck below each of said hoppers for receiving the materials discharge therefrom and carrying the same to gravity discharge at one end of said feeder conveyor, a centrally located longitudinal belt conveyor mounted on said deck for receiving and carrying the materials discharge from all of said feeder conveyors to gravity discharge at an end of said longitudinal conveyor, a boom conveyor mounted at one of its ends on said deck at a side thereof for pivot movement out beyond said side for carrying and discharging bulk-cargo materials onboard of said ship, said mounted end of said boom conveyor being located in substantially the same plane of frame of said ship as said discharging end of the longitudinal conveyor, and a transverse belt shuttle conveyor on said deck arranged for receiving and carrying the materials discharge from said longitudinal conveyor to gravity discharge on said deck from conveyor, whereby said ship is self-unloading of said bulk-cargo.

2. A ship for carrying bulk-cargo within a plurality of relatively flat-bottomed cargo holds thereof, said ship having bulk-cargo materials handling apparatus within
each of said holds comprising a first monorail attached to the ceiling of the hold and extending longitudinally substantially the length thereof, a hauler trolley mounted for movement along said first monorail, shaeve means of said hauler trolley, means for shifting the location of said shifter trolley along said second monorail and for holding the trolley in said location, an inclined ramp at the opposite end of the hold extending from the bottom thereof to an elevation above an upper deck of said ship, and a drag scraper mounted for moving said bulk-cargo material stored within the hold the length thereof to gravity discharge at the top of said ramp, the drag scraper having an inhaul cable and a backhaul cable attached thereto, the backhaul cable being reeved through both the said shaeve means and both the said cables leading to said opposite end of the hold, the drag scraper being shiftable laterally within the hold by movement of said shifter trolley, and said ship having means for operating said inhaul and backhaul cables from said upper deck to impart hauling movement to the drag scraper, and materials handling apparatus comprising a surge hopper below each of said ramps for receiving the materials discharge from said drag scrapers, a feeder conveyor transversely of said ship below each of said ramps for receiving and carrying the materials discharge therefrom to gravity discharge at the inboard end of said feeder conveyor, a centrally located longitudinal conveyor for receiving and carrying the materials discharge from all of said feeder conveyors to gravity discharge at one end of said longitudinal conveyor, a boot conveyor mounted at one of its ends at a side of said deck for pivotal movement out beyond said side for carrying and discharging said bulk-cargo materials outboard of said ship, said mounted end of the boom conveyor being located in substantially the same plane of frame of said ship as said discharging end of the longitudinal conveyor, and a transverse shuttle conveyor arranged for receiving and carrying the materials discharge from said longitudinal conveyor to gravity discharge on said boom conveyor, whereby said ship is self-unloading of said bulk-cargo.

4. A ship for carrying bulk-cargo within a plurality of relatively flat-bottomed cargo holds thereof, said ship having bulk-cargo materials handling apparatus within each of said holds comprising a first monorail attached to the ceiling of said holds and extending longitudinally substantially the length thereof, a hauler trolley mounted for movement along said first monorail, shaeve means of said hauler trolley, means for shifting the location of said shifter trolley along said second monorail and for holding the trolley in said location, an inclined ramp at the opposite end of the hold extending from the bottom thereof to an elevation above an upper deck of said ship, and a drag scraper mounted for moving said bulk-cargo material stored within the hold the length thereof to gravity discharge at the top of said ramp, the drag scraper having an inhaul cable and a backhaul cable attached thereto, the backhaul cable being reeved through both the said shaeve means and both the said cables leading to said opposite end of the hold, the drag scraper being shiftable laterally within the hold by movement of said shifter trolley, and said ship having means for operating said inhaul and backhaul cables from said upper deck to impart hauling movement to the drag scraper, and materials handling apparatus comprising a surge hopper below each of said ramps for receiving the materials discharge from said drag scrapers, a feeder conveyor transversely of said ship below each of said ramps for receiving and carrying the materials discharge therefrom to gravity discharge at the inboard end of said feeder conveyor, a centrally located longitudinal conveyor for receiving and carrying the materials discharge from all of said feeder conveyors to gravity discharge at one end of said longitudinal conveyor, a boot conveyor mounted at one of its ends at a side of said deck for pivotal movement out beyond said side for carrying and discharging said bulk-cargo materials outboard of said ship, said mounted end of the boom conveyor being located in substantially the same plane of frame of said ship as said discharging end of the longitudinal conveyor, and a transverse shuttle conveyor arranged for receiving and carrying the materials discharge from said longitudinal conveyor to gravity discharge on said boom conveyor, whereby said ship is self-unloading of said bulk-cargo.
said ship between said longitudinal conveyor and each of said boom conveyors, whereby said ship is self-unloading of said bulk-cargo towards either side of said ship.

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