Cargo & Crew Safety
DUI 208E

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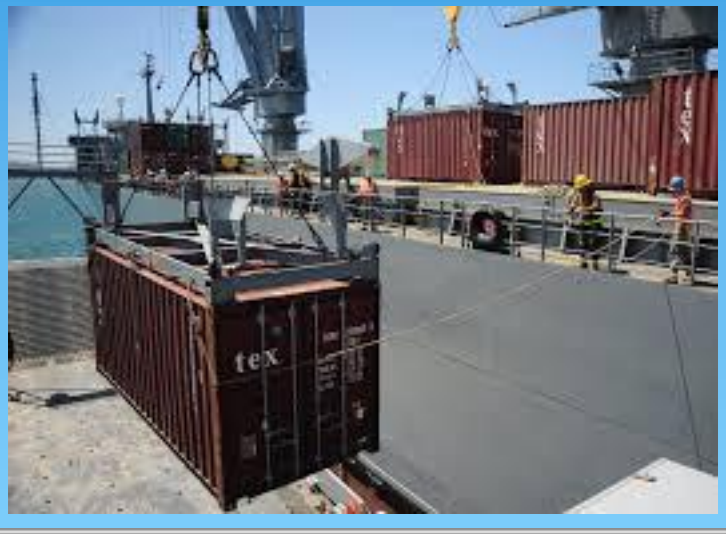
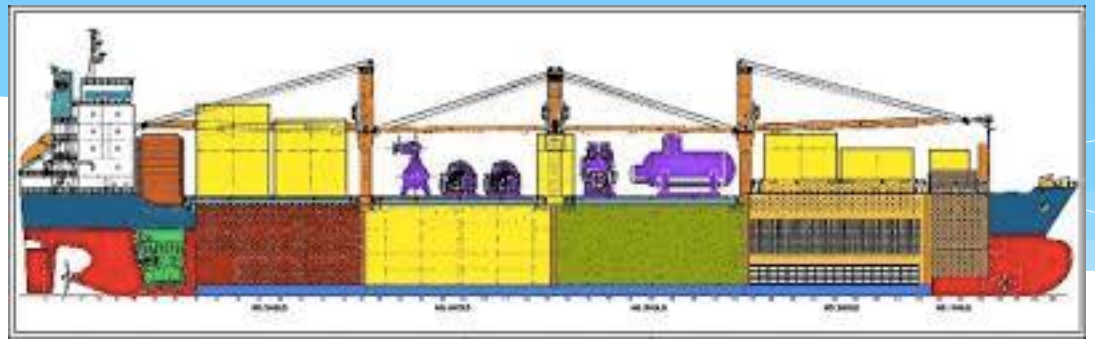
Course Content

* General terms of cargo handling
* Cargo equipment and cargo compartments
* Cargo handling affects on the stability and sea worthiness
* Cargo winches (craines) and hatch covers, and their maintenance
* Cargo securing and stowage, and their equipment

* Loading-discharging cargo operation
* Pipe and pump systems of tankers
* Enclosed spaces
* Calculation of draught survey and stress
* Receiving cargo, tallying and deliver procedures
* Cargo safely keeping and supervision

General Terms of Cargo Handling





* In shipping, break bulk cargo or general cargo are goods that must be loaded individually, and not in intermodal containers nor in bulk as with oil or grain. Ships that carry this sort of cargo are often called general cargo ships. The term break bulk derives from the phrase breaking bulk—the extraction of a portion of the cargo of a ship or the beginning of the unloading process from the ship's holds.
* 1950

* These goods may not be in shipping containers. Break bulk cargo is transported in bags, boxes, crates, drums, or barrels. Unit loads of items secured to a pallet or skid are also used (Wikipedia, 2014).

* A break-in-bulk point is a place where goods are transferred from one mode of transport to another, for example the docks where goods transfer from ship to truck.
* Break bulk was the most common form of cargo for most of the history of shipping. Since the late 1960s the volume of break bulk cargo has declined dramatically worldwide as containerization has grown. Moving cargo on and off ship in containers is much more efficient, allowing ships to spend less time in port. Break bulk cargo also suffered from greater theft and damage.

Loading and Unloading

* Although cargo of this sort can be delivered straight from a truck or train onto a ship, the most common way is for the cargo to be delivered to the dock in advance of the arrival of the ship and for the cargo to be stored in warehouses. When the ship arrives the cargo is then taken from the warehouse to the quay and then lifted on board by either the ship's gear (derricks or cranes) or by the dockside cranes. The discharge of the ship is the reverse of the loading operation.

* Loading and unloading ships requires knowledge of the operation of loading equipment, the proper techniques for lifting and stowing cargo, and correct handling of hazardous materials. In earlier days before the introduction of containerisation, men who loaded and unloaded ships had to tie down cargoes with rope.

* A type of stopper knot is called the stevedore knot. The methods of securely tying up parcels of goods is called stevedore lashing or stevedore knotting.
* Today, the vast majority of non-bulk cargo is transported in intermodal containers. The containers arrive at a port by truck, rail or another ship and are stacked in the port's storage area. When the ship that will be transporting them arrives, the containers that it is offloading are unloaded by a crane. The containers either leave the port by truck or rail or are put in the storage area until they are put on another ship (Wikipedia, 2015)

* Seaport terminals handle a wide range of maritime cargo
* Break bulk cargo is typically material stacked on pallets and lifted into and out of the hold of a vessel by cranes on the dock or aboard the ship itself. The volume of break bulk cargo has declined dramatically worldwide as containerization has grown. One way to secure break bulk and freight in intermodal containers is by using Dunnage Bags.

* Bulk cargo, such as salt, oil, tallow, and scrap metal, is usually defined as commodities that are neither on pallets nor in containers. Bulk cargoes are not handled as individual pieces, the way heavy-lift and project cargoes are. Alumina, grain, gypsum, logs, and wood chips, for instance, are bulk cargoes. Bulk cargo is classified as liquid or dry.

* Container Cargo: Containers are the largest and fastest growing cargo category at most ports worldwide. Containerized cargo includes everything from auto parts, machinery and manufacturing components to shoes and toys to frozen meat and seafood.

* Neo-bulk cargo comprises individual units that are counted as they are loaded and unloaded, in contrast to bulk cargo that is not counted, but that are not containerized.
* Project cargo and the heavy lift cargo include items like manufacturing equipment, air conditioners, factory components, generators, wind turbines, military equipment, and almost any other oversized or overweight cargo which is too big or too heavy to fit into a container.

* Roll-on/roll-off Cargo: Automobiles are handled at many ports and are usually carried on specialized roll-on/roll-off ships.

https://en.wikipedia.org/wiki/Bulk_cargo

* Bagged cargo
* Bagged cargo is stowed on double dunnage and kept clear of the ship's sides and bulkheads. Bags are kept away from pillars and stanchions by covering it with matting or waterproof paper.

Bulk cargo

* Bulk cargo is commodity cargo that is transported unpackaged in large quantities. It refers to material in either liquid or granular, particulate form, as a mass of relatively small solids, such as petroleum/crude oil, grain, coal, or gravel. This cargo is usually dropped or poured, with a spout or shovel bucket, into a bulk carrier ship's hold, railroad car/railway wagon, or tanker truck/trailer/semi-trailer body.

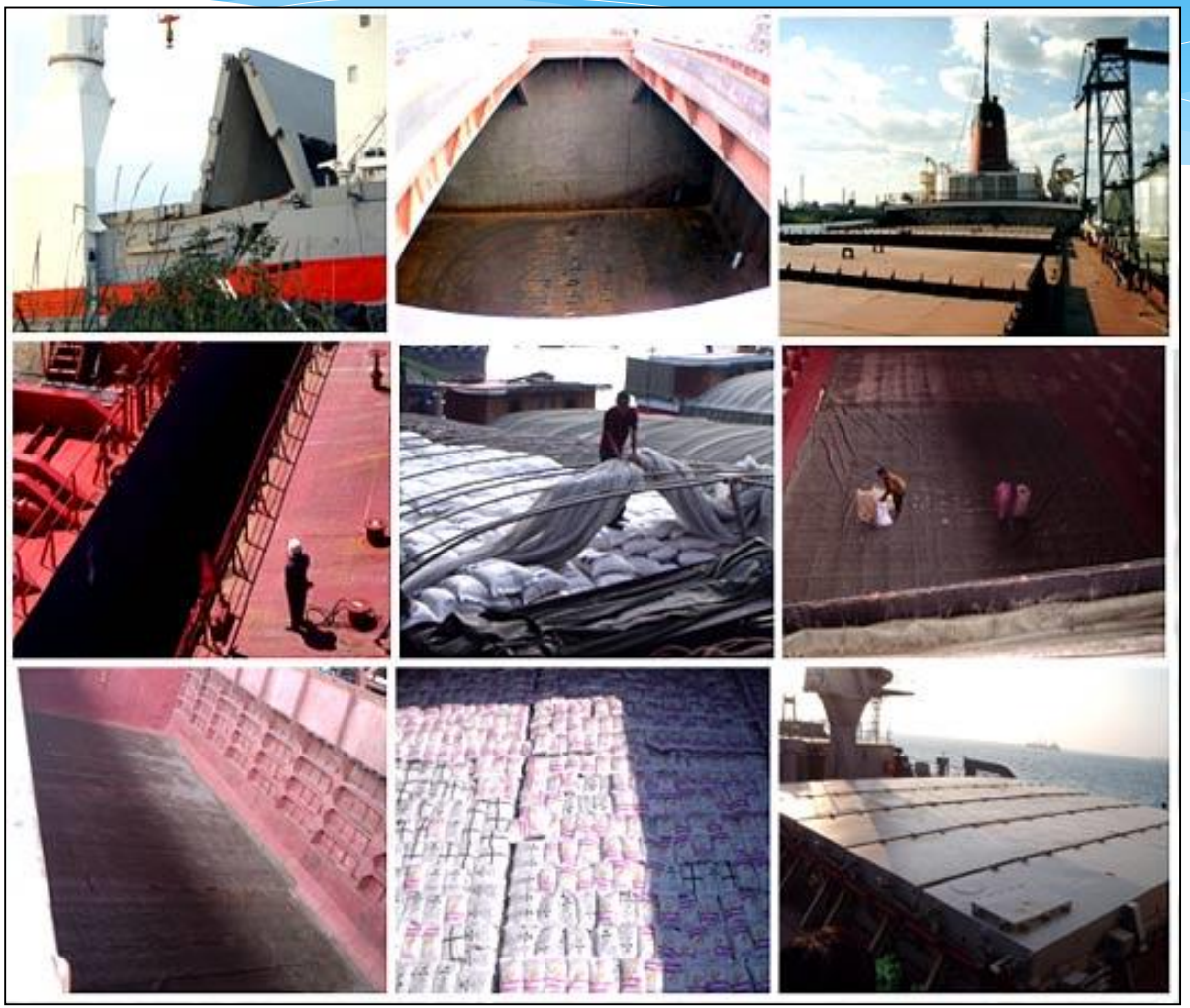
Smaller quantities (still considered "bulk") can be boxed (or drummed) and palletized. Bulk cargo is classified as liquid or dry (Wikipedia, 2015).

* Bauxite
* Bulk minerals (sand & gravel, copper, limestone, salt, etc.)
* Cement
* Chemicals (fertilizer, plastic granules & pellets, resin powder, synthetic fiber, etc.)

* Coal
* Dry edibles (for animals or humans: alfalfa pellets, citrus pellets, livestock feed, flour, peanuts, raw or refined sugar, seeds, starches, etc.)
* Grain (wheat, maize, rice, barley, oats, rye, sorghum, soybeans, etc.)
* Iron (ferrous & non-ferrous ores, ferroalloys, pig iron, scrap metal, pelletized taconite), etc.)

Cargo Equipment and Cargo Compartments

Hatch Covers



* A ship's hold is a space for carrying cargo. A large steel structure fitted over a hatch opening to prevent the ingress of water into the cargo hold. It may also be the supporting structure for deck cargo. Various designs exist for particular applications. The hatch cover has to be weatherproof and has to remain so when conditions change as a result of waves, temperature and cargo.

* Cargo in holds may be either packaged in crates, bales, etc., or unpackaged (bulk cargo). Access to holds is by a large hatch at the top. Ships have had holds for centuries; an alternative way to carry cargo is in standardized shipping containers, which may be loaded into appropriate holds or carried on deck (Wikipedia, 2014).

Hydraulic Folding Types

With ever more efficient cargo working in port being the objective, modern dry cargo vessels are tending to develop to a more 'open' trend, i.e. the size of the hatches compared with the deck area is growing. This implies that there is less stowage space available for the hatch covers, which has made the high-stowing hydraulic folding covers very popular. Hydraulic operation results in smooth and positive control of the big panels during opening and closing of the cover. A major advantage with the hydraulic folding covers is the
low number of panels. Fewer big panels are advantageous when designing the covers for container loads.

Hydraulic Folding Type

Lift-away Hatch Covers

Lift-away covers comprise several separate panels for each hatch opening. They are used for cellular container ships in the case of longitudinal joints, and for multipurpose cargo ships and heavy cargo tonnage in the case of transversal joints. Mainly have use in container ships and some bulk carriers.

To open the hatch, the lift-away covers are generally removed by lifting tackle or spreader using the ship's or shore cranes. In the case of single-panel and single opening abreast versions, special lifting gear fitted to the legs of the gantry crane is used; and in the case of single-panel covers and multi-panel covers with longitudinal joints a shore crane (usually a container bridge crane) is normally used.

* As a rule lift-away panels are operated with a spreader using the vessel's cranes or shore side container cranes. The hatch cover panels can be stowed on top of adjacent covers which are placed on the quay or the ship's deck. Non-sequential operation and partial opening possibility enables flexibility in loading and discharging, and is therefore preferred by many ship owners.
* Lift-away hatch covers for use on the weather deck are divided into two categories: single-panel covers and multi-panel covers (Cargo tech, 2014).

* Single-panel types comprise one cover for each opening, i.e. there are no joints. They are normally specified for bulk carriers in the case of single-opening abreast, and for cellular container ships in the case of multi-opening abreast configurations.
* Multi-panel covers comprise several separate panels for each hatch opening, they are used for cellular container ships in the case of longitudinal joints, and for multipurpose cargo ships and heavy cargo tonnage in case of transversal joints (Cargo Tech 2014).

Lift-away Hatch Covers

Rolling (Side&End) Hatch Covers

* Side-rolling and end-rolling hatch covers are popular for use on the weather decks of larger bulk carriers such as Panamax and Capesize types. In the case of ore/bulk/oil (OBO's) and ore/oil carriers, the covers are designed to sustain internal liquid loads.

* Side-rolling hatch covers stow in a transverse direction. The traditional side-rolling cover consists of two panels per hatch, each panel rolling sideways on a pair of transverse ramps, thus presenting a minimum obstacle when loading.
* n some cases both panels can be stowed together on one side to further enhance access when loading and unloading. This alternative reduces daylight opening by approximately 50% (Cargo Tech, 2015).

Traditional Side Rolling

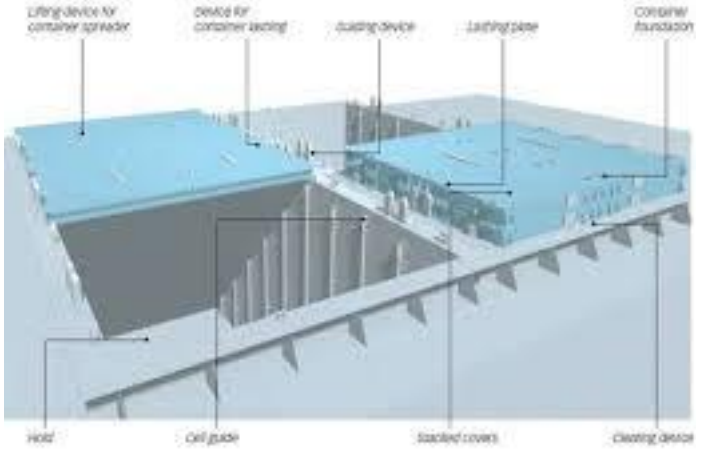
One Side Rolling

* Single-panel types where the panel stows transversally or longitudinally are mainly used on very large ore carriers (VLOC's), with sufficient free deck area. The covers open by lifting to the rolling position and rolling out by the drive mechanism. Drive systems of the rack and pinion, rack and pinion plus wire or chain drive types, or the MacRack ensure efficient operation

Rollling hatch covers Technical Information H3

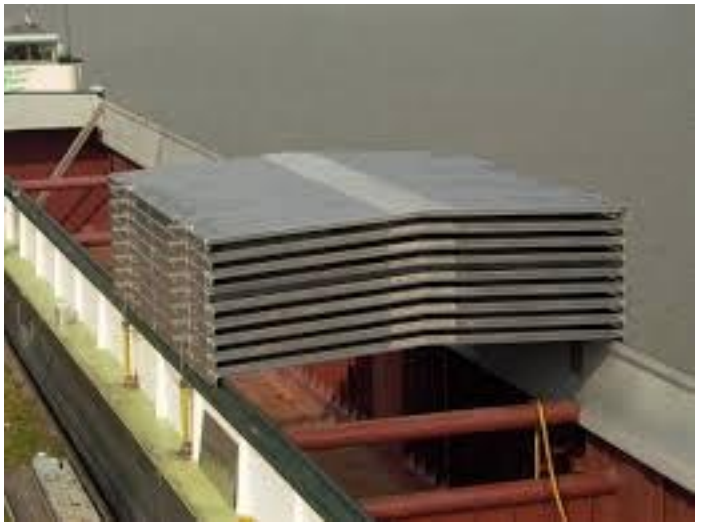
Piggyback type hatch cover

* For open hatch bulk carriers (OHBC's), rolling covers of the piggyback type are preferred as the deck allows little or no free space for stowing the covers when the hatches are open.
* This system always comprises two panels, with one panel being raised high enough for the other to roll underneath and to support the lifted panel on to its 'back'. Both panels can then be rolled back and forth.
* The system can either be applied to a pair of hatches or to the two panels of a single hatch. If the number of panels exceeds two, the system is called 'stacking', and special high lifters are needed (Cargo Tech, 2015).


Lifting device for container spreader
Device for container lashing
Guiding device
Lashing plate
Container foundation
Hold
Cell guide
Stacked covers
Closing device

Stacking hatch covers

* Instead of two panels, several rolling panels are stacked on top of each other. The chain-driven stacking hatch cover system has the same idea as the piggy back system (Cargo Tech, 2015).



Tweendeck hatch covers

* Tweendeck hatch covers can be designed to serve multiple functions:
* as grain bulkheads
* as ballast when filled with water
* as counter weight when lifting heavy loads
* as lifting beams
* as working platforms (Cargo Tech, 2015).

* Folding tweendeck hatch covers can be operated quickly and independently. As no crane is needed, crane capacity can be released for other cargo operations. Folding type of covers require auxiliary coaming and stowage space.

Movable bulkheads

* Efficient and flexible utilization of cargo space is the key to vessel profitability. Bulkheads improve the vessels cargo efficiency and flexibility by enabling segregation of different types of cargoes. Movable bulkheads can be flexibly moved with weather deck hatch covers and are hooked and locked by means of hydraulic systems.

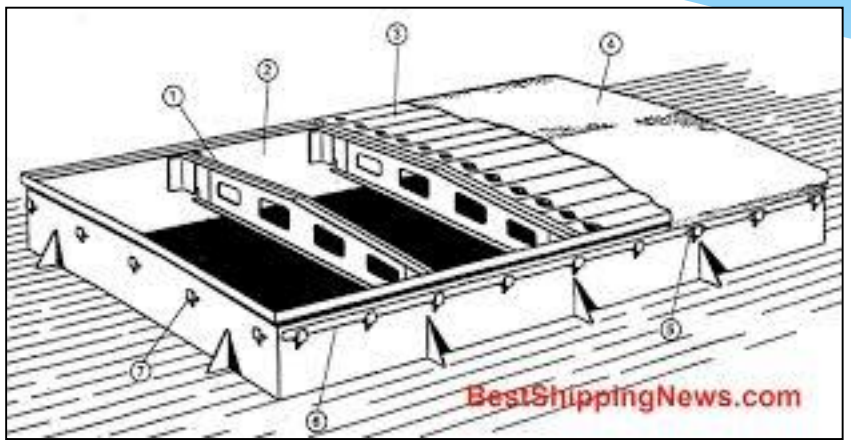
Bulkhead sealing gear

SINGLE PULL MACGREGOR TYPE HATCH COVER

They are still in use formerly, old ships. A Dc electric motor driven belt is over and under the sides of hatch cover. You have to manually lock or unlock the cover in order to open or close the hatch cover. They wear easily and cause problems by overheating the Dc motor also took some time to open the hatch, especially in sudden rain conditions this is a very bad disadvantage. They are still in use in old ships because are very cheap to obtain and maintain.

* The classic modern hatch cover is the ‘single pull’ which remains the most common of the all the various forms now in service and may rightly be described as the natural successor to traditional beams and boards. This cover derives its name from its immediate predecessor, the ‘multi-pull’ cover, which consisted of a series of individual panels similar to those of the single pull, but unconnected. Each panel had to be rigged before being pulled one at a time into stowage.

SINGLE PULL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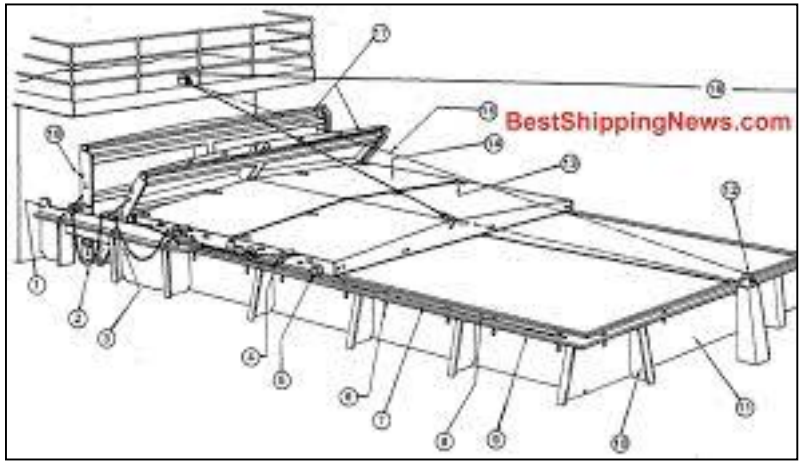
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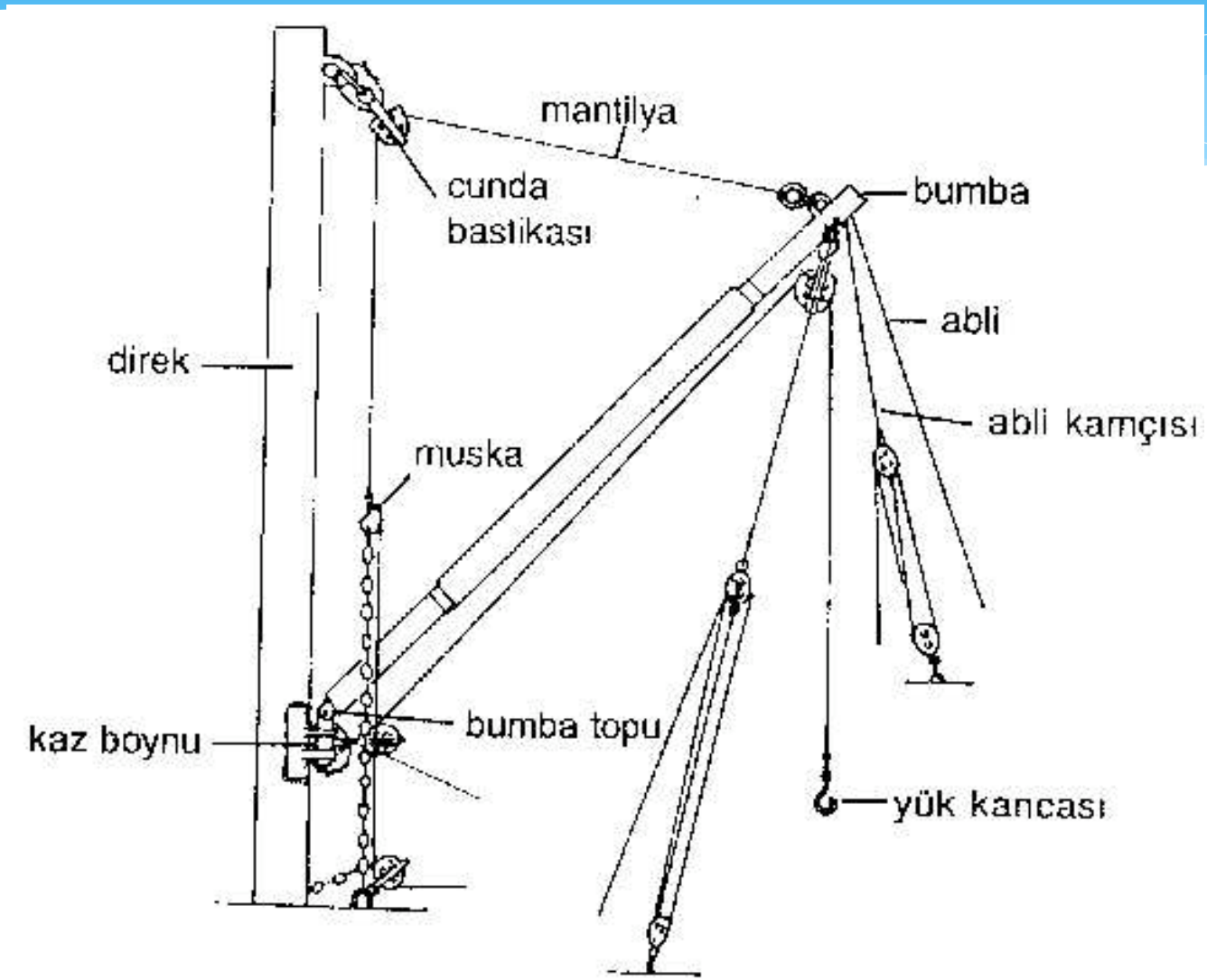
Ship's Crane & Derricks/Booms

Ship's Boom (Gemi Bumbası)



Conventional booms

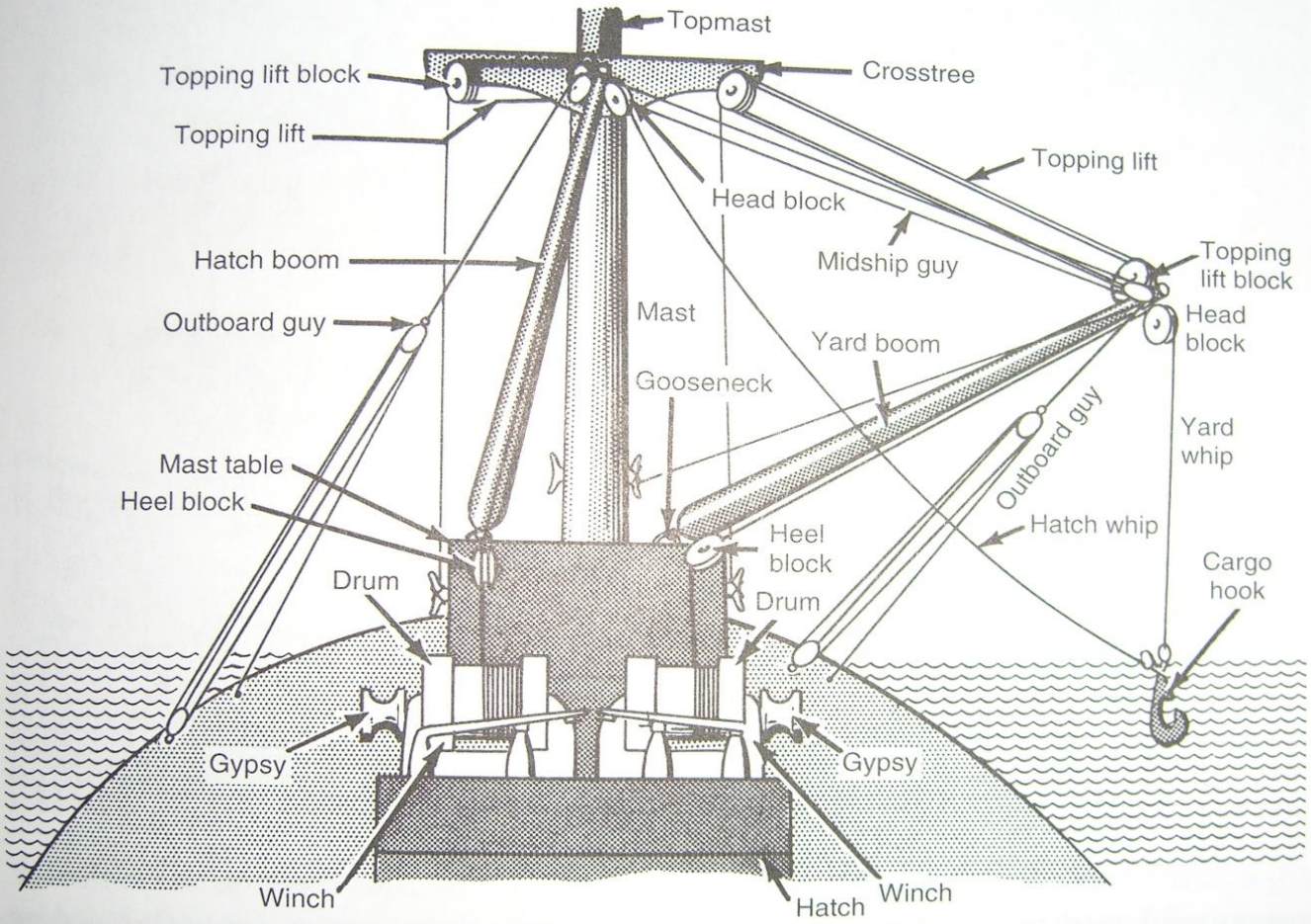


Figure 5-17. Typical cargo gear. Courtesy U.S. Navy.

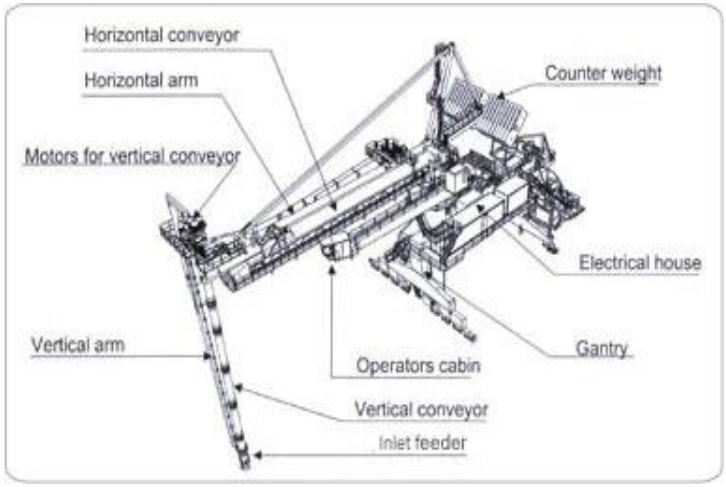
Ship’s Crane (Gemi Vinci)

* Old ship is used booms but new ship is modern crane.

Cargo Discharge Equipment

Continuous Screw Type Unloader

- With a totally enclosed conveying line the unloader ensures environment-friendly operation. It is suitable for a wide range of dry bulk cargoes such as cement, coal, grain, derivatives, fertilizers, minerals etc. One and the same unloader unit can be used for such different materials as coal, cement, fertilizers and grain as an example.
- Sumitomo




HEUSSER
GARANT

Mobile Unloader

* Mobile Unloaders are generally using screw type system and used in ports which doesn't have developed systems or if discharging must be done quicker.
* Hamburg port

Pneumatic Dischargers

* Pneumatic Dischargers are second fastest way of discharging bulk cargo and work on a vacuum-suction system.

Euroslide Type

* It is much like the screw type unloader but works backwards, rather than taking in it is giving out and preferred for agricultural products such as grain because it has a soft mechanism which doesn't give any damage or dirty the cargo.

Conveyor Belt Systems

- Conveyor belt is the fastest way of loading bulk cargo, especially ore and grain but pretty much can take use in most bulk cargo. Because the mechanisms connected the harbour area can kept clean. They can load up to 16000 tons/hour, which it is hard for ships to discharge their ballast tanks.

Conventional Systems (For Both Load&Disch.)

* Most commonly used way to both loading and discharging is grab scoop. These scoops are generally attached to the gantry or mobile cranes. Their capacity can be up to 1500 tonnes/hour. Mostly far east and African countries uses this systems because they are cheap, easy to manufacture and easy to maintain.

Dissipating of Cargo

- The cargo has to be dissipated, balanced after we load it, before departure. To do this we can either use a dozer or excavator. But in some ports bunch of workers with shovels do this.

Cargo Handling Gear of Container Vessels

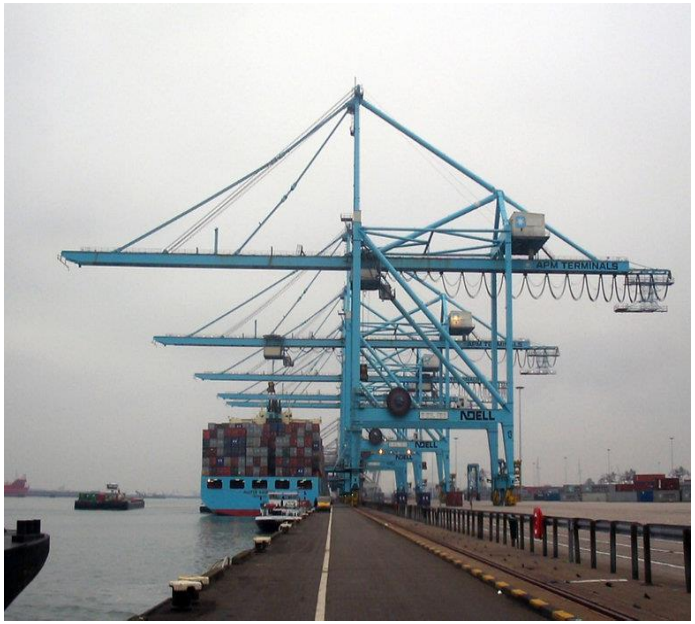
- Container vessels are built mainly for standardization which allows us to create combined shipping such as carrying same container via railway, trucks and ships. The second big advantage is to carry cargo separately without effective other goods in enclosed, watertight containers. They are vessels of the future shipping industry.

Cargo Load & Disch. Gear

* In container vessels cargo operations generally carried out by harbour cranes. Usage of self-sustaining ships are near end, because the container terminals are highly sophisticated and developed.

Gantry Cranes

- Gantry cranes are fast and reliable also economic because they use electricity to operate.They have sliding systems to move container diagonally and vertically in one direction, today they are mainly used systems in container terminals.



Mobile Cranes

* Mobile Cranes Generally used in ports which doesn`t have separate container terminal, general cargo vessels carrying cargo above deck, rent by the companies to finish operation faster to help lifting heavy and extraordinary pieces. Can work with gas, electricity or both.