FLOATS – BUOYS – ITS MATERIALS, TYPES THEIR PROPERTIES; CLASSIFICATION OF FLOATS: BASED ON SHAPE AND MATERIALS; CALCULATION OF BUOYANCY. SINKERS – TYPES, MATERIALS, PROPERTIES- NEGATIVE BUOYANCY

INTRODUCTION

- Floats are essential components of fishing gears.
- They help in keeping the gear in the desired depth, obtaining the proper shape during operation and maintaining vertical opening in gears like trawls.
- Fishing floats should have the following essential qualities.
- High buoyancy
- Should withstand the pressure of water
- Strong enough against rotting, shock and abrasion
- Easy to manufacture
- Low cost

TYPES OF FLOATS

- Low density floats made of materials like wood, cork, thermocole, sponge plastic etc.

- High density floats made of materials like glass, aluminum, steel, high density plastic and Fiber reinforced plastic (FRP)

LOW DENSITY FLOATS

WOOD

- This is used in Indian fishing gears like gill nets.
- The density of wood is 650g/1000 cc.
- They are relatively cheap.
- Continuous usage leads to absorption of water and crack even after drying.
- Reuse is not favorable.

- **CORK:**
- It is easily available and has high buoyancy.
- They are mostly used in surface gill net and purse seine.
- Generally they cannot withstand high pressure.

- **THERMOCOLE:** (Expanded polystyrene)
- It is light in weight and highly buoyant.
- It cannot withstand high pressure. Should be used only in surface.

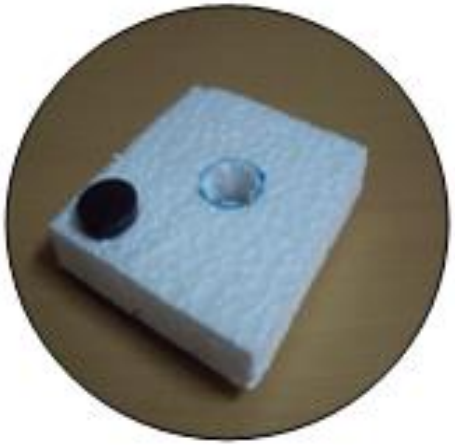
SPONGE PLASTIC:

- These are light, do not rot, do not absorb water, have high buoyancy, but pressure resistance is poor. Mainly used in gill nets.

SYNTHETIC RUBBER:

- This is having Low water absorption and high buoyancy.
- It can withstand high pressure.

Wood



Thermocol

Synthetic Rubber

Sponge

Sponge Plastic

Fig. Low density float materials

HIGH DENSITY FLOATS

GLASS*:*

- They are made in the form of sphere.
- This is covered by netting to facilitate fixing and for protection.
- Increases the drag while towing.
- They do not absorb water and can withstand pressure upto 40 m depth.
- Big glass floats are used in lines and traps.

ALUMINIUM FLOATS:

- These are made up of two halves and joined by means of welding at seams.
- They are more buoyant than glass and can withstand pressure up to 80m.
- Mostly used in trawls and gillnets.

STEEL:

- They are made in two halves and are welded together at the seams.
- They are not very popular.
- The buoyancy is reduced due to thick walls.
- Rust also get accumulated.

HDPE*:*

- These are useful in deep sea fishing up to 250 m.
- Not corrosive.

GRP:

- Like HDPE, GRP floats are expensive and not readily available.
- They are highly buoyant and can withstand pressure up to 400 m.

Fig. Glass float

Fig. Aluminium float

Fig. Steel float

Fig. HDPE float

Fig. GRP float

Fig. High Density Floats

SPECIAL FLOATS

TRAWL PLANE FLOAT:

- As the size of the vessel increases, there is a tendency to tow the gear at a speed more than 3 knots.
- While towing in faster speed all the ordinary spherical floats have a tendency to go downwards thus reducing the mouth opening of the trawl.
- The trawl plane floats have low resistance and more lifting at speed before 3 knots.
- These types of floats are suitable for mid-water trawling.

SIAMESE TWIN FLOAT:

- It is made by joining two spherical aluminum floats with a curved collar.

HYDRO FOIL FLOATS/UPTHRUST FLOATS:

- It is also a spherical float, but the difference is it has a collar around one third of the lower portion known as stabilizer.
- In experiment it is proved that when towed at 5knots, the lift of the float is equal to that of 10 floats and drag is of only 3 floats.

INFLATABLE FLOATS:

- Used in pelagic trawls.
- They are becoming popular for all floatation as storage is not a problem due to their inflatable nature.

HYDRODYNAMIC FLOATS:

- Hydrodynamic float has a streamlined top, and V shaped bottom .
- They are very efficient.

Calculation of buoyancy for floats

$$F = \frac{W(1 - \rho)g}{\rho}$$

F= Buoyancy

ρ = sp.gr.

Buoyancy:- For spherical shape $F = KD^3$

W= wt. in g. in air

F= Buoyancy

D= Diameter in cm.

K= Constant

Value of K varies with material

DETERMINATION OF BUOYANCY OF A FLOAT

- A suitable piece of netting is attached to an iron frame to form a scoop net.
- Three lines of equal length are tied together to which sufficient weight to keep the float submerged completely in water is attached.
- Two more lines are tied to the frame at diametrically opposite points of the frame, the free ends of which are tied to a wooden piece.
- A container of sufficient size with enough water is taken.
- A wooden platform with a pan balance is placed on the container.
- The scoop net with a weight is suspended in the water without touching the side and bottom of the container.
- The initial weight of the balance is noted.
- The float to be tested is inserted into the scoop net from below.
- Adjust the weight so as to submerge the float under water.
- Find the reading.
- The difference between the final and initial reading is the lifting capacity of the float.

BUOY

- The buoy is a floating object used for marking particular place in the sea for different purposes:-

- *To mark channel (Navigation)*
- *To mark course (Navigation)*
- *To mark fishing ground*
- *Locate the fishing gear during operation condition*
- *To keep the fishing gear at required depth*

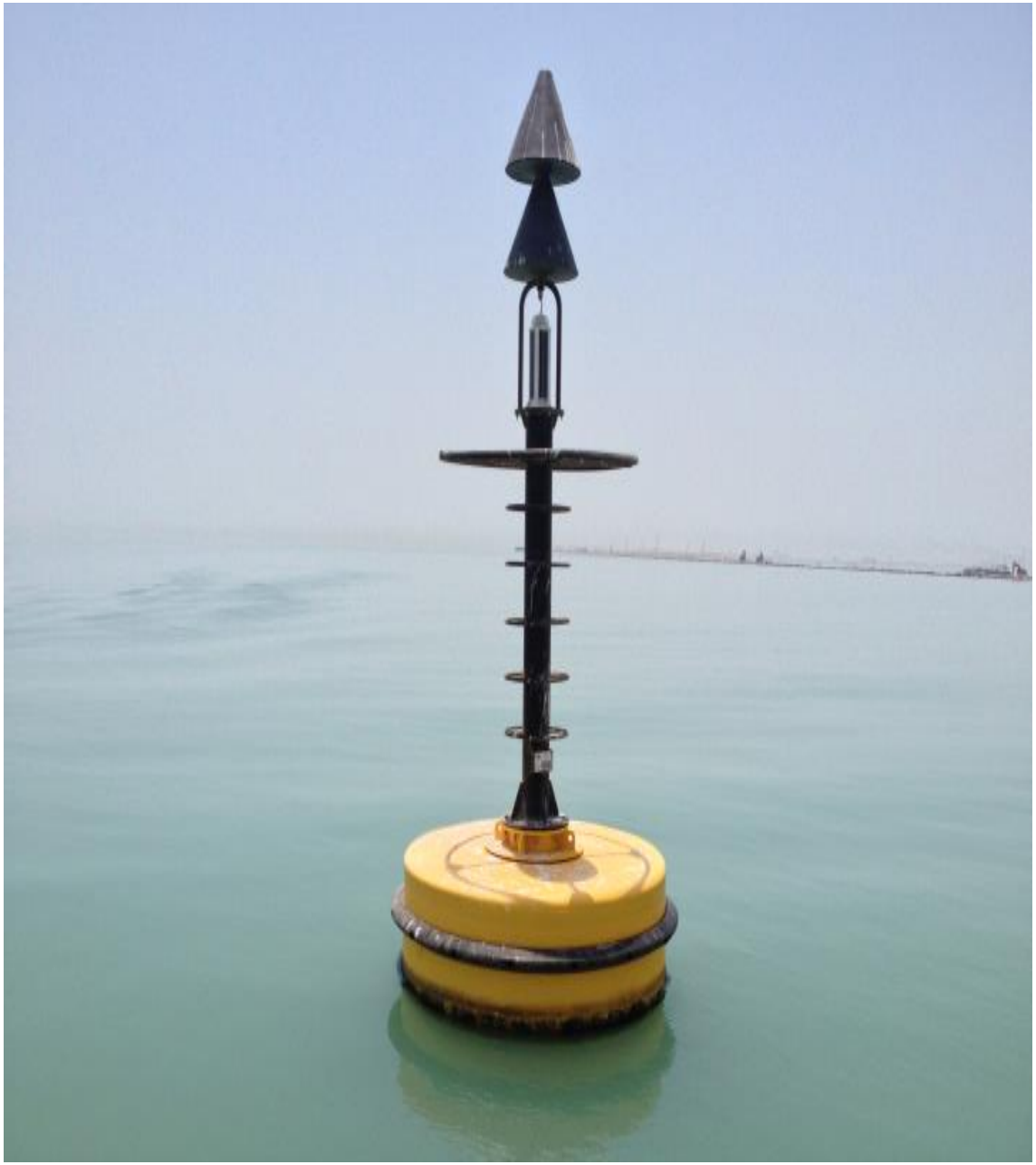
- The buoy is attached to the fishing gear by the buoy line.
- Empty water tight tins, wooden barrels, bigger floats made up of glass, aluminum and plastics are commonly used as buoy.

Some special type of buoy are:-

- Light buoy
- Radio buoy
- Dahn buoy

1. LIGHT BUOY:-

- These are battery operated buoy.
- It get used to locate tuna long line during night.
- They are attached at regular distance on the line.
- Light buoy consists of two water tight chambers.
- Lower chamber containing dry battery.
- Upper chamber containing 3 – 5 watt bulb.
- The bulb always remains above the water surface.
- The range of light buoy is about 50 meters.



2. RADIO BUOY:

- The range of radio buoy is about 50 km.
- They are also get used to locate tunas long line.
- It consists of transistorized transmitter.
- One type provides continuous signals.
- Other type provides intermittent signals.
- The signals get received by receiver which is installed on vessel.

3. DAHN BUOY

- Dahn buoy get set when the location of good amount of fish found.
- It consists of :-
  - A pole with ballast at the bottom
  - A float in the middle
  - Flag, light and radar reflector at upper end.
  - A buoy or drum
  - An anchor and anchor cable.

Danbuoy + Light + Bracket

ANCHORS

- An anchor is a large and heavy instrument designed to hold the ship in any desired locality and prevent her from drifting at the mercy of wind, tide and current.
- Anchors are very essential in case of engine failure or rudder breakdown when the mechanized boats are highly vulnerable.
- They also get carried in sailed boats when wind is not favorable.
- **Wood tied with stone, stone alone, iron, cement concrete or steel can also get used as anchor for set type of gear.**

SOME TERMS RELATED TO ANCHORS AND ANCHORING

- **Ground Tackle:** Collectively, all the rode, shackles and anchor used to anchor a boat.
- **Rode:** The chain, rope, cable, or a combination of these that attaches to the anchor.
- **Scope:** A ratio of the length of rode to the depth of the water.
- **Up and down:** An anchor chain is up and down when the boat is directly above the anchor and the chain is no longer lying on the bottom.
- **To weigh anchor:** To take on the weight of the anchor on the boat, to lift the anchor from the sea floor. Similar to Anchors Aweight (not anchors away!)
- **An anchor is broken off or broken out of the bottom:** When it is lifted off the bottom.

- **Come home:**To Drag
- **Set:**To drop and position an anchor so that it holds
- **Changing the NIP of the anchor line:** To prevent wear at the same place the anchor line is occasionally let out or taken in so that chafe is not always on the same spot on the rode.
- **Tripping an Anchor:** A tripping line is attached to the opposite end of the anchor. This line is used to pull the anchor out if it is caught or fouled.
- **Horizontal Load:** The force exerted on an anchor by the boat pulling horizontally.
- **Vertical Load:** The force exerted on the bow of a boat by the anchor rode.
- **Hawsepipe:** A pipe or moulding in a boats side where the anchor rode fits through the hull.

PARTS OF AN ANCHOR:

- **RING:** - It is a topmost part of anchor, helps to attach the warp.
- **SHANK:** - It is the middle portion of an anchor which helps to connect arm to the anchor ring.
- **CROWN**:- The terminal portion of the shank which helps to connect arm is called crown.
- **ARM**:- Arm is a curved part with fluke and terminals
- **FLUKE:-** The triangular structure at the end of arm which dig into the bottom is called fluke.
- **BILLS OR POINTS:-** The sharp end of fluke is called bills or points.
- **STOCK**:- A horizontal cross piece set at right angles to the arms and situated at the top of the shank, helps to turn the anchor when it hits the bottom enabling the fluke to dig into the bottom.
- **GRAVITY BAND:** - The anchor gets handled in and out of the boat by means of gravity band.
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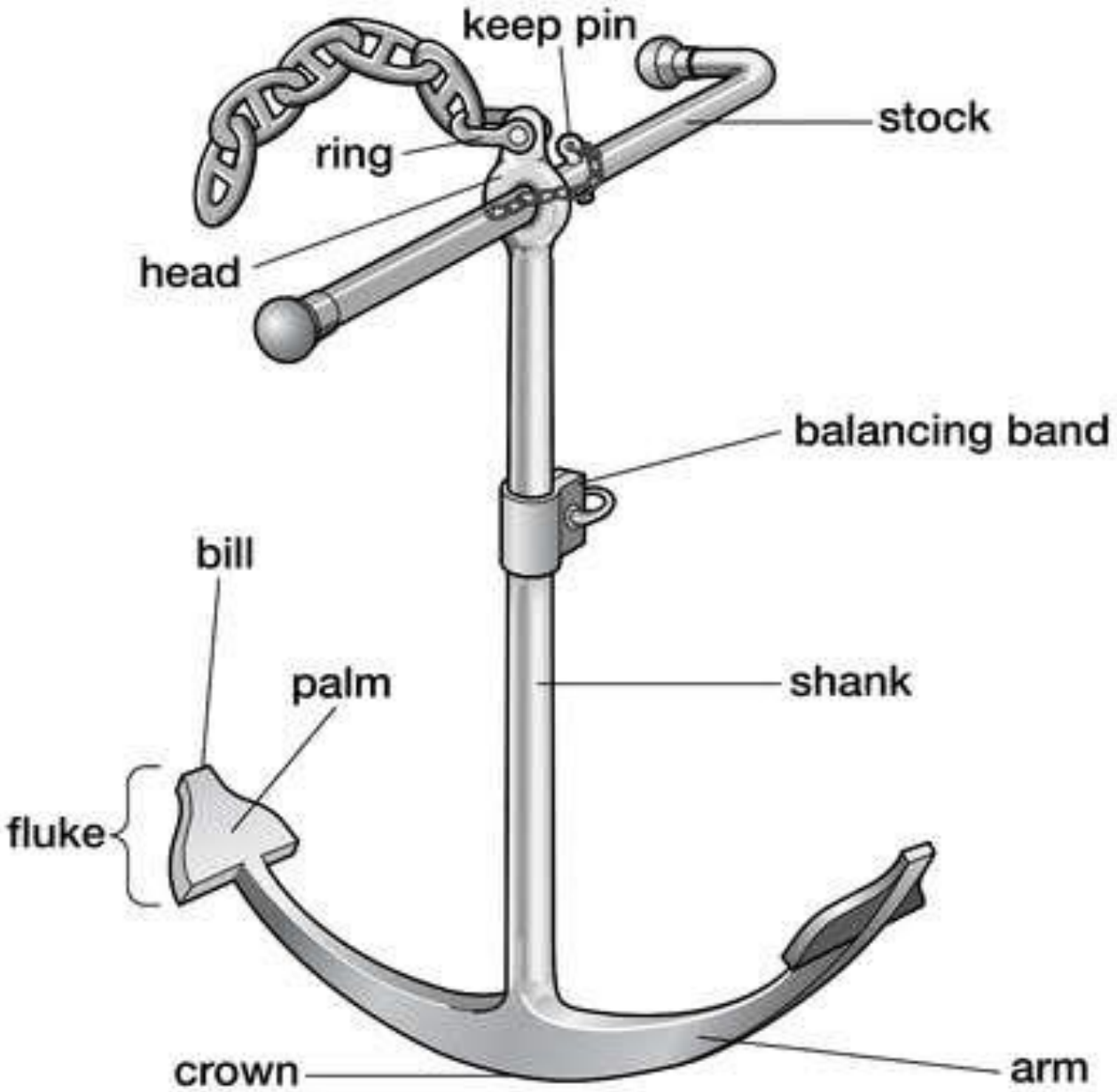
TYPES OF ANCHOR:

- There are different types of anchor get used during fishing according to bottom condition and size of boat.

ADMIRALITY ANCHOR:-

- Have very good holding power especially when chain gets used as cable.
- It has two fluke.
- Stock get fixed at right angle
- Also known as fishermen's anchor
- It is bulky in nature so take more space for stowage/storage.
- The use very rare.
- Suitable for Softer bottoms, hard sand, Rocks and Coral, Weeds
- Used for centuries they are the traditional anchor shape we are used to.
- Modern kedge style anchors are lighter and have been adapted for specialized use.
- Sharp bills and small flukes hold better in hard sand.
- Broader flukes and larger arms hold better in soft bottoms or rocks and coral.
- Fishermen's anchors are often used successfully in heavy vegetation.


keep pin
stock
ring
head
balancing band
bill
palm
shank
fluke
crown
arm

DANFORTH ANCHOR:-

- It is an American design.
- It takes less space for stowage/storage on deck of the boat.
- It consists of two broad flukes close to each other.
- It also having stock which passes through crown.
- Suitable for Clay, Sand and Mud.
- The anchor lands on the bottom flat on its side.
- The rod like stock extends on both sides to keep the anchor from rotating and the flat crown pieces keep the flukes in position.
- The anchor gradually buries itself.
- Can come undone if there is a large shift in the direction of pull from the boat such as in tide change.
- If the bottom does not allow for digging in such as hard or rocky, or weedy, then the flukes can't bury and the anchor will not set.


HI-SEA

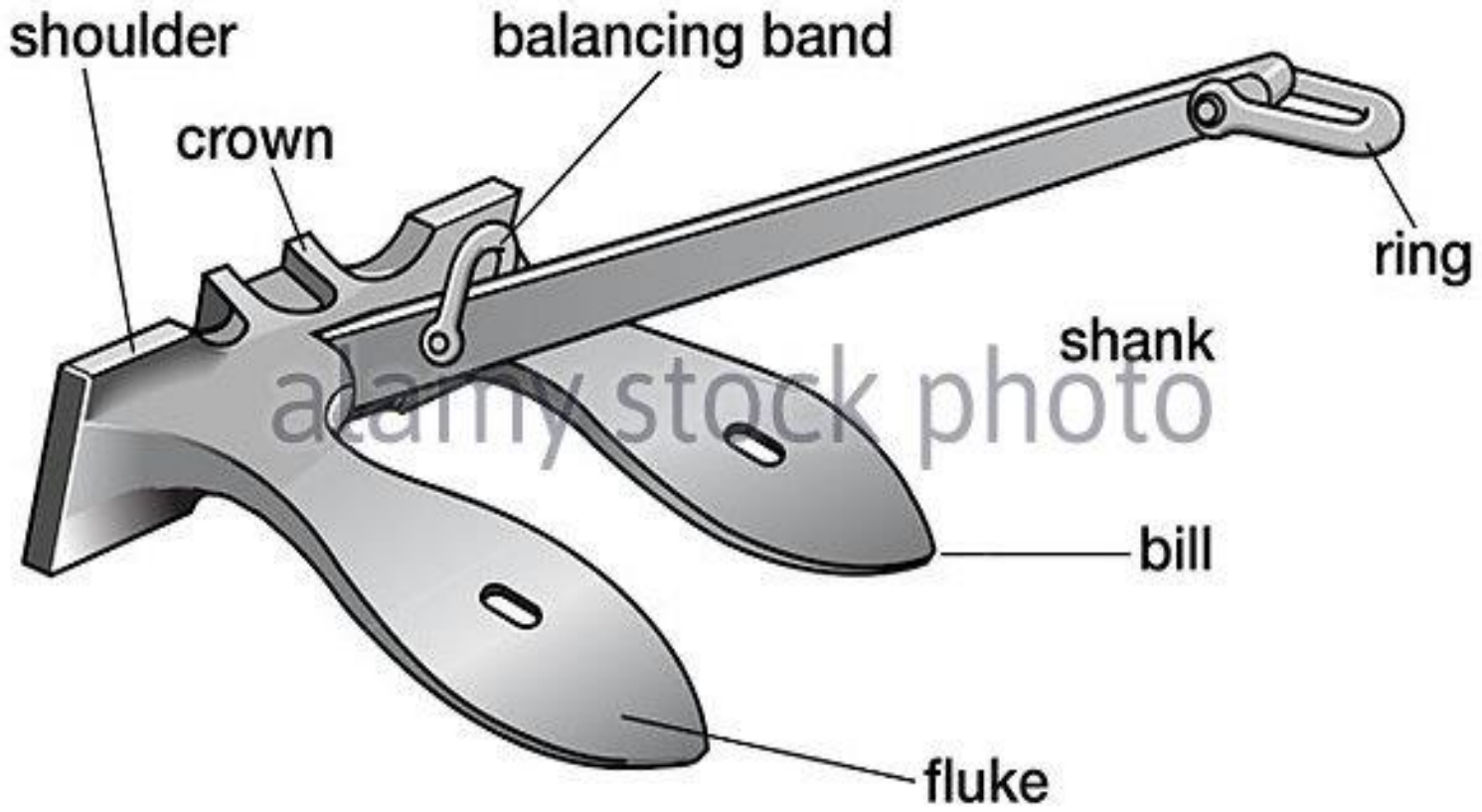
CQR ANCHOR:-

- It is a stockless anchor.
- Used only in smaller vessels
- Also known as plough anchor
- It has good holding power
- The fluke has the shape of a plough
- Fluke attached with shank with the help of a pin
- Suitable for Sand and stiff Mud, Grass pebble can hold in coral, less good in soft mud or clay.
- When the plough anchor first lands, it is on its side but as it gets pulled the anchor rights itself and gradually plows into the bottom.
- It buries itself and holds well.
- Because this anchor type swivels horizontally on a hinged shaft, it resists pulling out when the direction of pull changes as when the boat shifts because of tide change.
- The CQR is a robust anchor often chosen by blue water cruisers as a storm anchor.


20 LB CQR PAT No 3165945

4. PATENT ANCHOR:

- This is also a stockless anchor.
- The two arm can move about 45^0 on either side of the shank
- Tripping palm on tripping horn is fitted to the arm which helps the fluke to dig into the bottom.
- Patent anchor is easy to handle.



5. GRAPNEL ANCHOR:-

- It is a five prolonged stockless anchor
- Very good holding power
- Due to large and bulky in size storage/stowage is the main problem
- Suitable for Coral, Stone, heavy weeds
- Grapnel type anchors are useful in coral or where the flukes can grip something.
- Grapnel is less useful in mud or sand.
- Grapnel anchors are often used in dinghies or where their light weight or small size is an asset.
- Folding models and grapnels that come apart are available.
- Not for serious anchoring unless the bottom can be hooked.
- Sometimes useful when there is heavy vegetation and the thin flukes can penetrate while the outside ones grab vegetation.

- Floats and sinkers are special fishing gear accessories.
- Correct balance between buoyant force and sinking force helps to operate the fishing gear to the maximum efficiency at the required depth.
- The buoyancy of float made up of different floating materials can be calculated using the formula:-

$$\mathbf{F = W [(1/Sp) – 1]}$$

Where,

F = Buoyancy in gram

W = Weight of float in gram

Sp = Specific gravity of the material of float

- Specific gravity of certain float materials are:-

Materials	Specific gravity
Cork	0.22 – 0.26
Aluminum	2.70
Glass	2.60 – 3.70
Plastic	0.95

- Similarly the sinking force of the sinker can be calculated:-

  S = W (1 – 1/Sp) S = Sinking force in gram

- Specific gravity of certain sinking materials are:-

Materials	Specific gravity
Clay	2.2
Cement	2.0
Granite stone	2.70
Lead	11.30

THE ARCHIMEDES PRINCIPLE:

- The discovery of buoyancy is credited to the Greek mathematician Archimedes (c. 287-212 BC).
- While comparing the weight of the king's supposedly gold crown with other substances, Archimedes dropped the crown in water.
- He noticed a few gold coins were faster to sink to the bottom of his bathtub.
- Buoyancy applies to many settings from vessels surveying the ocean floor to weather balloons collecting data high into Earth's stratosphere.

- **POSITIVE BUOYANCY:**
- Positive buoyancy occurs when an object is lighter than the fluid it displaces.
- The object will float because the buoyant force is greater than the object's weight.
- A swimmer experiences a great amount of buoyant force.
- Israel's Dead Sea is famous for attracting floating tourists.
- Saltwater is less dense than fresh water and provides more buoyant force.
- Buoyant and net forces are not the same.
- An object's volume and density determine its buoyancy.

NEGATIVE BUOYANCY:

- Negative buoyancy occurs when an object is denser than the fluid it displaces.
- The object will sink because its weight is greater than the buoyant force.
- A submarine is designed to operate underwater by storing and releasing water through ballast tanks.
- If the command is given to descend, the tanks take in water and increase the vessel's density.
- Archimedes discovered the king's crown was made of a substance less buoyant than the sunken gold coins.

NEUTRAL BUOYANCY:

- Neutral buoyancy occurs when an object’s weight is equal to the fluid it displaces.
- A scuba diver is trained in techniques to regulate buoyancy underwater.
- Swimming horizontally and taking deep, long breaths allow the diver to propel forward, not upward.
- Fish control buoyancy through an internal swim bladder.
- Similar to a submarine, the bladder is filled with gas as a means of altering buoyancy.

- **SETTING AN ANCHOR:**
- Setting anchors can be difficult and many factors can come into play. Make sure you know how to set your type of anchor and have sufficient and proper type of rode.
- Its useful to look at the charts in order to know the kind of bottom and how deep the water is, don't forget to add the height of the tide to your water depth calculations.
- The recommended amount of rode (line + chain) depends on the water depth. As a general rule, your rode should be 7 to 10 times the depth of the water at high tide. If the weather is bad or the waves are higher, longer rode is better.
- Since most anchors set after being dragged horizontally it is important to have enough chain to keep the pull horizontal. There are practical limits to how much chain a small yacht can carry and handle but longer is better.

- To set an anchor it is dropped to the bottom, then the boat is allowed to slowly drift or slowly powers downwind or down current feeding out line. Once the line is out, the boat is allowed to drag the anchor to set it. Sometimes this is done when half of the line is fed out then the rest of the line is played out.
- Care needs to be taken not to pile up the chain on top of the anchor when it is dropped. This can foul the anchor and prevent it from setting.
- It is important to check periodically to make sure the anchor is holding and has set properly. In particular if there is a change in the current direction such as tide change, or if the wind pushes the boat around then the anchor can be dislodged. Some gps systems have an anchor watch feature that sounds an alarm if the boat strays outside it's expected circle when anchored.
- When anchoring check that your boat can safely swing around on its rode and not ground itself or bump into other boats

WHAT ABOUT RODE?

- An anchor is only good if it stays connected to your boat and can actually get into proper position. Without good and sufficient rode your anchor cannot do its job.
- Rode is the collective term for the chain, connectors and line that connect your boat to the anchor.
- Typically you will have a shackle to connect a length of chain to the anchor, then a length of chain of sufficient weight to keep the line pulling the anchor parallel to the bottom of the sea so that it can dig itself into a good holding position, then a long length of rope, at least 8 times the depth of water you intend to anchor in, connected by another shackle.
- An anchor bend knot will hold a line to an anchor but the line is subject to chafing and stress and should be monitored closely and the knot moved from time to time.