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STUDENTS' NOTES

MINING MACHINERY

TOPIC-DETACHING SAFETY HOOK

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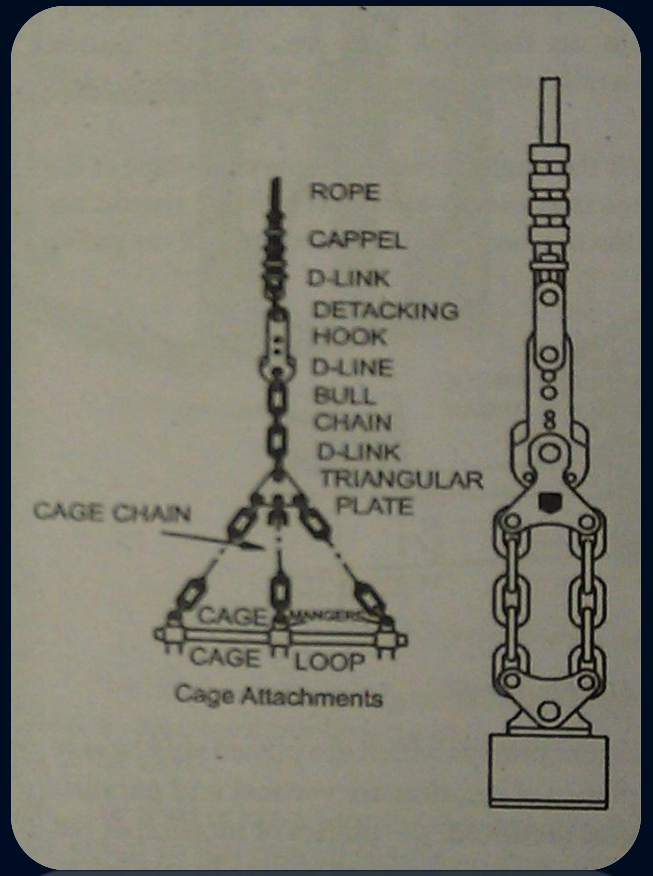
Detaching Safety Hook

- Before starting any discussion about detaching safety hook, a brief discussion about the setup of which the detaching Safety hook is part of, is necessary i.e.

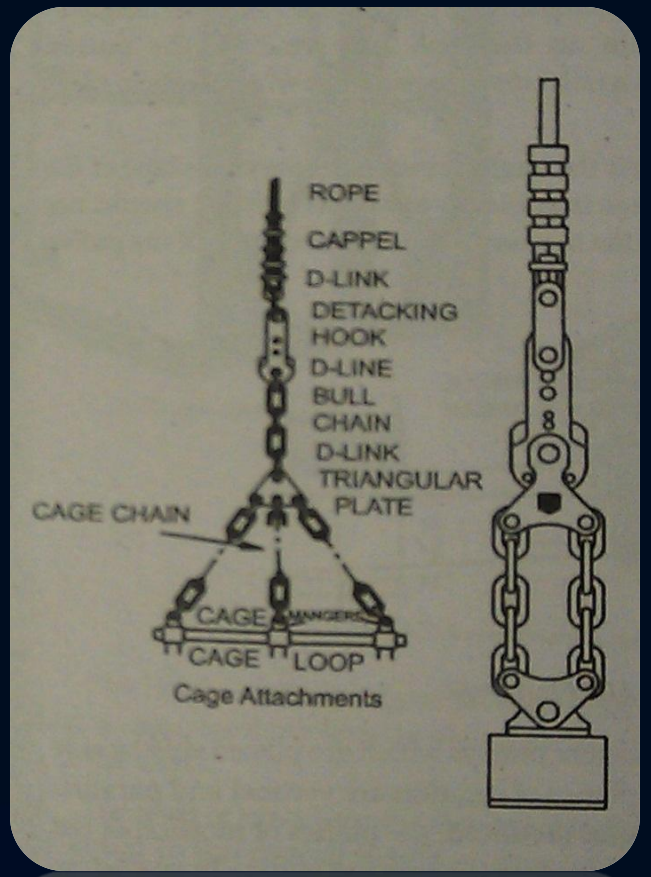
- How the cage is attached to the winding rope?

Cage Attachment To Winding Rope:

- In a typical arrangement four cage chains in the case of single cage and six chains in case of tendem cage are used
- These chains attach the cage to a triangular distribution plate which is connected to a safety detaching hook through D-links or bull chains.
- The detaching hook is attached to the rope capel which may be a cone type capel or reliance capel.
- The triangular distribution plate is wrought iron or mild steel. The cage chains and all the D links or shackles and bolts are of wrought iron or mild steel.



- As an alternative to wrought iron or mild steel , the various chains, links and shackles, the distribution plate of 1.5% manganese steel which is exempted from periodical heat treatment.



Detaching Hook

- Detaching hook is a safety device which acts when an overwind takes place.
- It refers to the hoisting of the cage above the normal banking level due to failure of brakes or any technical or manual error.
- Overwind is an event which can lead to serious accident if any safeguard is not present.
- The purpose of Detaching Hook is to suspend the cage/skip in the headgear if an overwind occurs, at the same time to release the rope to go over the pulley.

Detaching Hook

- Detaching hooks are only used in vertical shafts served by drum winders but they are not used on koepe winders.

Detaching Hook & Friction Winder

- Detaching hooks must not be fitted in friction winding systems, (where the rope(s) are not wound on the driving drum but only pass over the top part of the driving drum or sheave)
- as detaching the ascending cage would cause both cages and winding rope(s) to fall down the shaft.
- In friction winding systems, protection for the ascending cage in the event of an overwind is provided by a cage 'receiver' fitted with tapering guides to slow down the cage and a 'bumper beam' at the top of the receiver to finally stop the retarded cage.
- The drum or sheave will then be able to turn against the friction grip of the ropes.
- If the worst case happens i.e., the rope(s) break then spring loaded catches in the receiver prevent the cage from falling down the shaft.

TYPES OF DETACHING SAFETY HOOK:

- ORMEROD DETACHING SAFETY HOOK

TYPES OF DETACHING SAFETY HOOK:

- KING DETACHING SAFETY HOOK

ORMEROD DETACHING HOOK

It consists of three mild steel plates i.e. one inner plate and two outer plates.

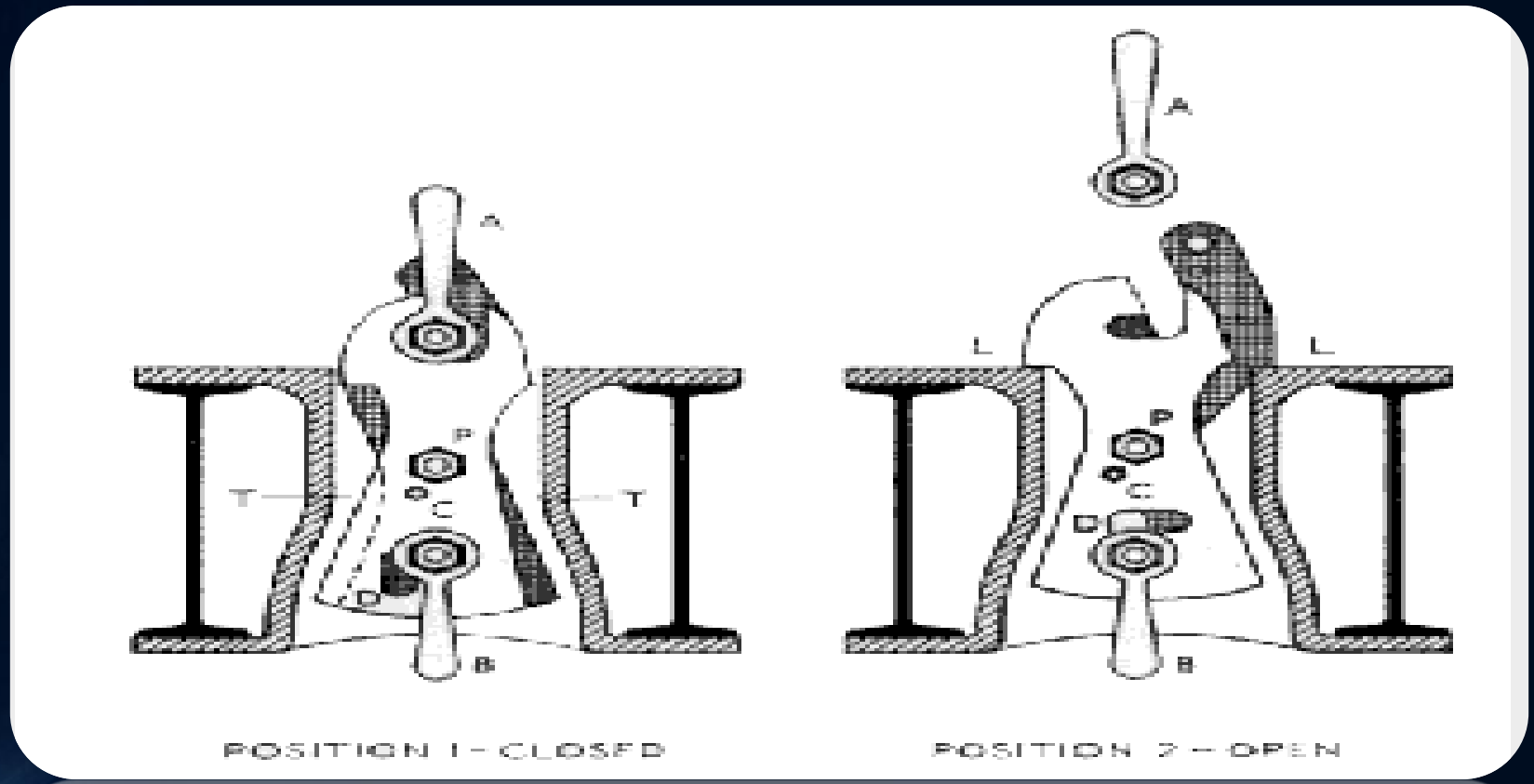
The plates are pivoted on a central bolt P.

Held in position by a copper pin C passing through the three plates.

Slots are cut in the plates to enclose the pin in shackle A to which the winding rope is attached.

The cage or skip is suspended from shackle B, the pin being passed through a shaped slot in the lower part of the plate.

ORMEROD DETACHING HOOK



ORMEROD DETACHING HOOK

IN CASE OF OVERWIND

- If there is an overwind, the hook is drawn up into the bell (position 1)
- The narrow throat TT, forces the lower parts of the plates together
- Shearing the copper pin C and open the slot in the top of the hook to release shackle A (position 2)
- The projections L on the plates are also forced outwards
- And engage with the top of the bell to retain the hook
- At the same time the pin in shackle B drops into vertical slot D, securely locking the three plates in position
- The cage or skip is then suspended in the bell.

ORMEROD DETACHING HOOK

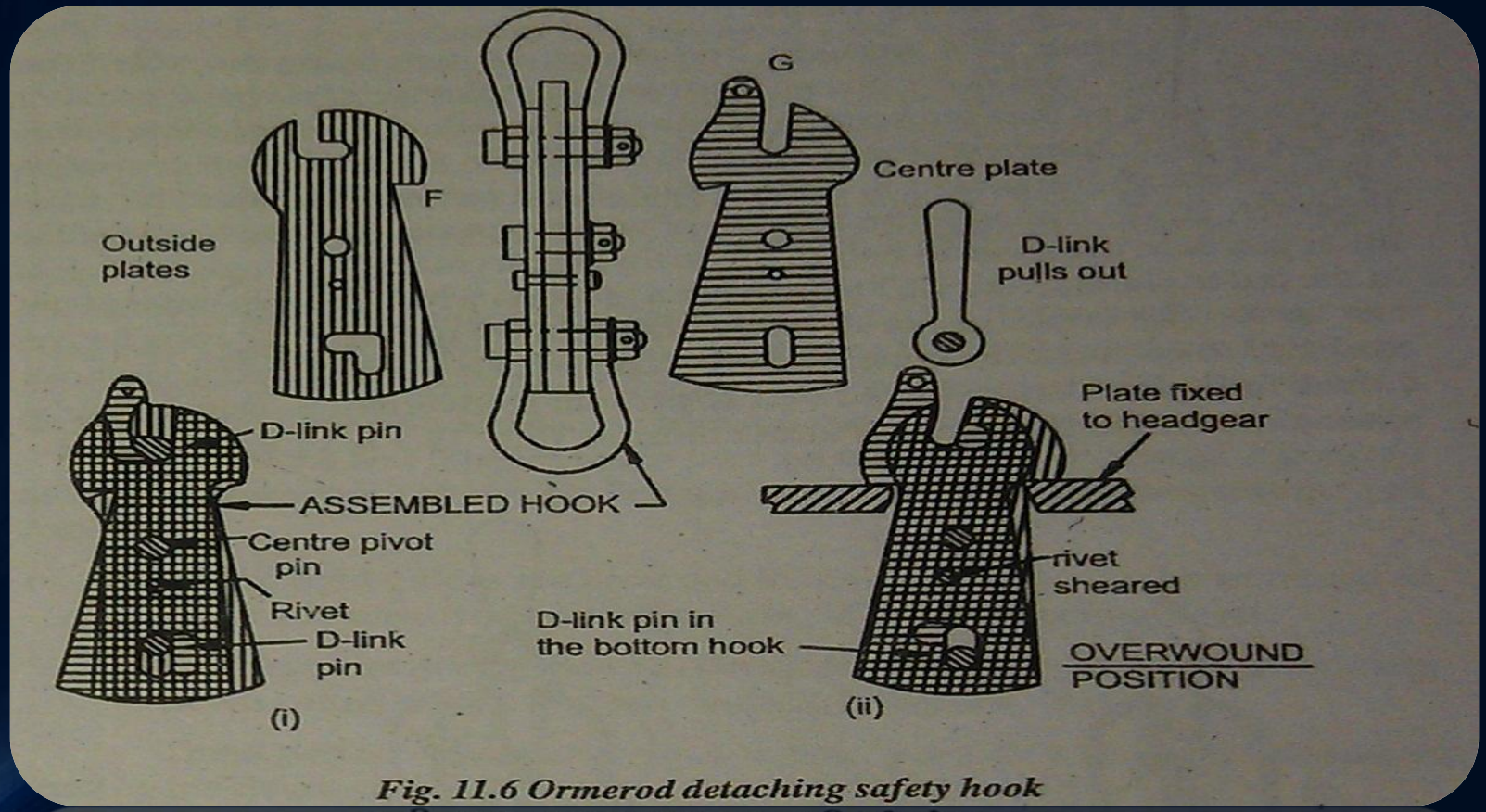


Fig. 11.6 Ormerod detaching safety hook

KING DETACHING SAFETY HOOK

- It consists of 4 plates, i.e. two being movable inner plates and the two fixed outer plates.
- These are made up of wrought iron or of 1.5% manganese steel or of good quality mild steel.
- A main bolt or center-pin passes the hole carved in the center of all the four plates and serves to bind them, to provide a pivot on which the two inner plates can move and also to transmit the tension in the winding rope from the hooks of the inner plates to the shackle-bolt of the main D-link.
- A pin, made of ductile copper, is placed through the hole just below the center hole I all the 4 plates and riveted over to prevent inadvertent movement of the inner plates when they are not in tension.

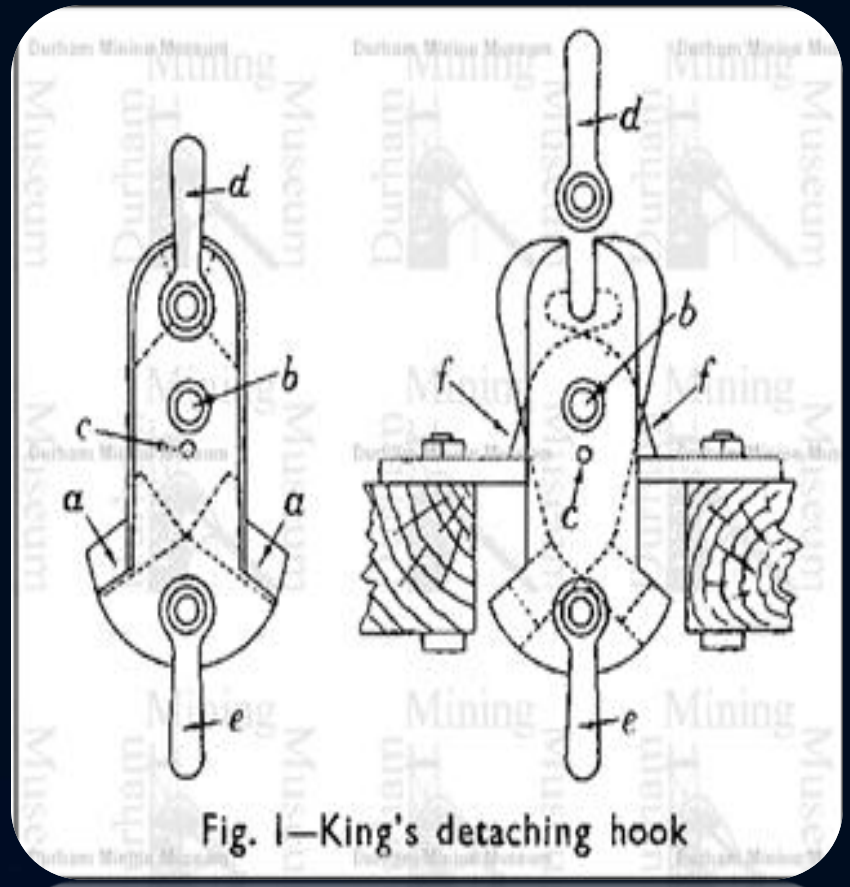


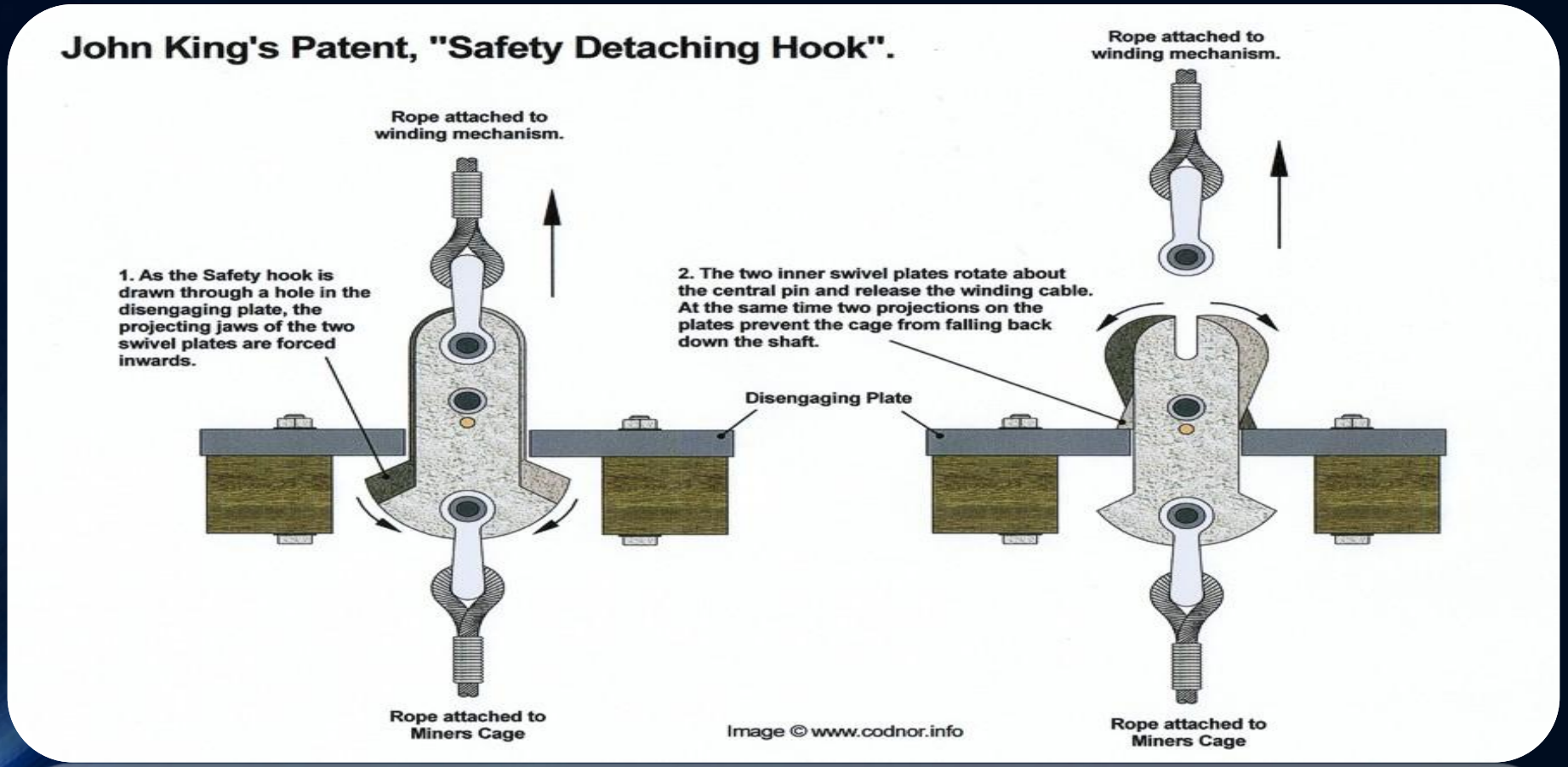
Fig. 1—King's detaching hook

KING DETACHING SAFETY HOOK

Functioning of king detaching hook

- During an overwind as the ascending cage rises, the hook is partially drawn through the circular hole in the catch plate e, securely attached to the horizontal member of the headgear and the lower wing d of each inner plate is forced inwards. The copper pin is thus sheared and the hooks m are forcibly separated, thus releasing the D-link attached to the rope capel
- The catches gg on the inner plate are forced outwards so that they rest on the upper side of the catch plate and the cage is thus safely held.

Functioning of king detaching hook



KING DETACHING SAFETY HOOK

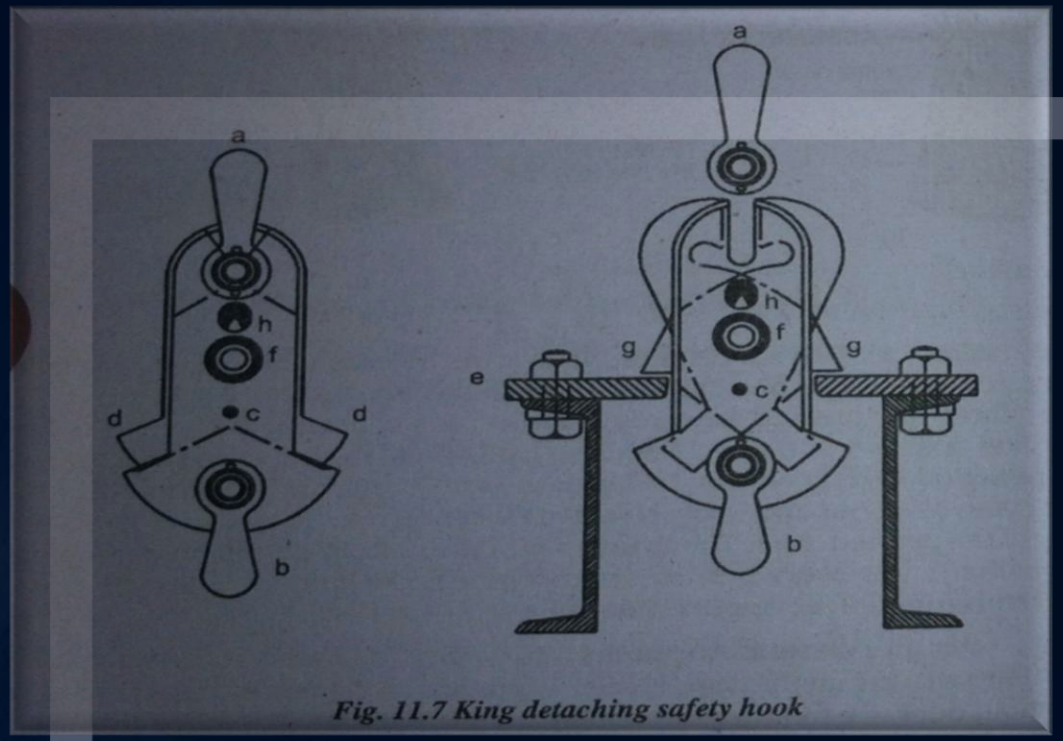
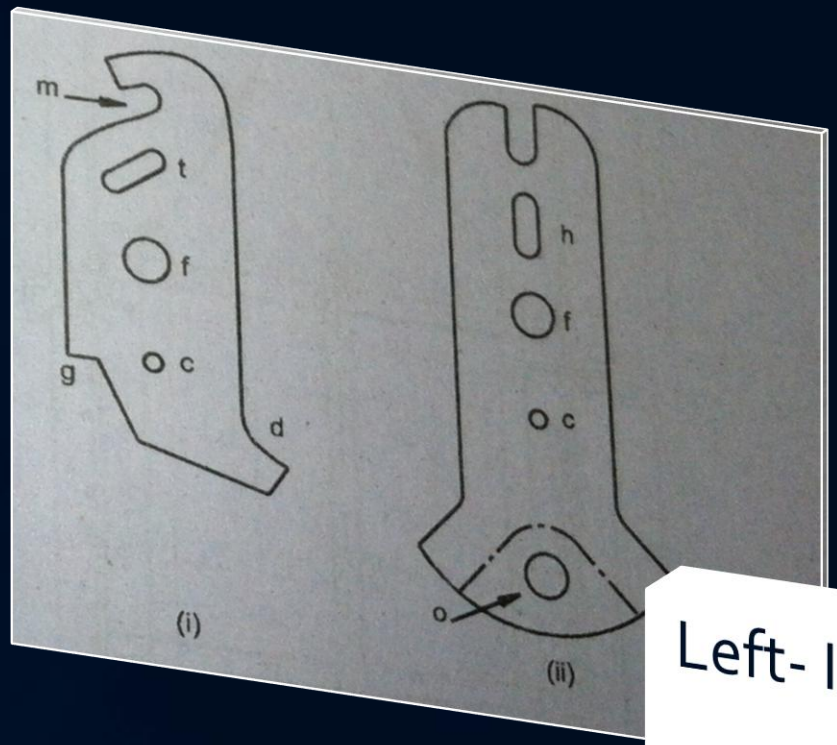


Fig. 11.7 King detaching safety hook

Left - Hook assembled and in working order

Right - Hook detached and cage suspended during overwind

KING DETACHING SAFETY HOOK



Left- Inner plate; Right- Outer plate

KING DETACHING SAFETY HOOK

What to do after overwind?

- For lowering the cage after an overwind, a vertical slot h is provided in each outer plate and an inclined slot in each inner plate. The cage being suspended, the slots in the outer plates remain vertical but those in the inner plates take different positions so that a clear, almost circular hole is still maintained through all four plates.
- To restore the cage, place a few rails across the shaft top, bring the winding rope capel back over the pulley and attach it to the plates by special D-Link whose pin should pass clear through the hole at h.
- Raise the cage slightly and the pull of the rope on new D-link pin causes the latter to rise along the inclined faces of the inner slots. This forces the hooks m and catches g inwards to their normal positions.
- Now lower the cage to the banking level. Replace the hook and fit it with a new shearing pin. The catch plate e also should be changed.

Regulations related to Safety Hook

- The safety detaching hook shall be installed such that its centre line matches that of the catch plate or bell.
- The alignment of the safety detaching hook to the catch plate or bell should be checked weekly.
- Detachment Test On commissioning, the conveyance and winding rope will be supported in the headgear and the safety detaching hook will be pulled through the catch plate or bell until full detachment of the winding rope occurs. (The copper shear pin shall be removed during this test.)
- Modifications No site modifications to any component of a safety detaching hook will be permitted, unless approved by a Professional Engineer.
- Installed safety detaching hooks should be protected against corrosion by applying grease or another suitable coating to all surfaces.
- Every detaching bell or plate used in connection a safety-hook shall be examined, and the Opening therein checked by callipers or gauges, once at least in every 30 days.
- End Attachments Ninety degree (90 °) chase blocks, which offers flexibility in both directions, are preferred as end connections to both ends of safety detaching hooks.
- Traceability of all components must be maintained throughout the life of the hook.

Prepared By :-

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