इंटरनेट मानक

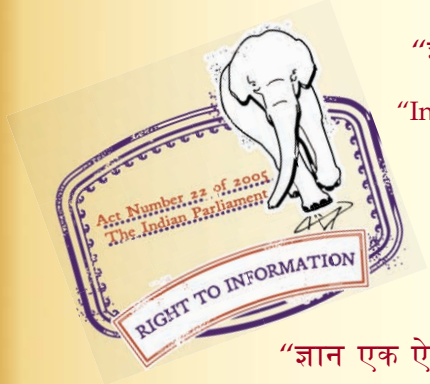
Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 4410-16-1 (1999): Glossary of Terms Relating to River Valley Projects, Part 16: Gates and Valves, Section 1: Gates and Terms Related with Gates [WRD 12: Hydraulic Gates and Valves]



"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

BLANK PAGE

IS 4410 (Part 16/Sec 1) : 1999
(Reaffirmed 2004)

भारतीय मानक

नदी घाटी परियोजना से संबद्ध परिभाषिक शब्दावली

भाग 16 दरवाजे तथा वाल्व

अनुभाग 1 दरवाजों तथा दरवाजों से संबंधित शब्दावली

(पहला पुनरीक्षण)

Indian Standard

GLOSSARY OF TERMS RELATING TO RIVER VALLEY PROJECTS

PART 16 GATES AND VALVES

Section 1 Gates and Terms Related with Gates

(First Revision)

ICS 001.4 : 627.833

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

November 1999

Price Group 12

FOREWORD

This Indian Standard (Part 16/Sec 1) (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Terminology Relating to River Valley Projects Sectional Committee had been approved by the River Valley Division Council.

A large number of Indian Standards have already been printed covering various aspects of river valley projects and some more similar standards are in the process of formulation. These standards include technical terms, the precise definitions of which are required to avoid ambiguity in their interpretation. To achieve this aim the River Valley Projects Sectional Committee has brought out Indian Standard 'Glossary of terms relating to river valley projects', (IS 4410) in different parts.

This part (Part 16) covers the terms in the field of Gates and Valves in two different sections, namely :

Section 1 Gates

Section 2 Valves

This standard (Section 1) was first published in 1977. In this revision some additional terms have been added besides modifying some of the terms so as to bring them in line with the latest technology. Some of the terms relating to hoists have been removed from this section and added in a separate standard namely, IS 4410 (Part 23) 'Glossary of terms relating to river valley projects : Part 23 Hoists, cranes and other related terms'.

Indian Standard

GLOSSARY OF TERMS RELATING TO RIVER VALLEY PROJECTS

PART 16 GATES AND VALVES

Section 1 Gates and Terms Related with Gates

(First Revision)

1 SCOPE

This standard (Part 16/Sec 1) covers the terminology relating to gates, types of gates and other related terms used in river valley and hydropower projects.

2 TERMINOLOGY FOR GATES AND TYPES OF GATES

2.1 Gate or Shutter

A gate or shutter is a closure device in which a leaf or a closure member is moved across the waterway from an external position to control the flow of water.

2.2 Aluminium Gate

A gate structure having basic material as aluminium.

2.3 Automatic Gate/Shutter

A gate/shutter which functions without external manual attendance. Fig. 1 illustrates a typical automatic gate.

2.4 Auxiliary Lock Gate

See 2.58.

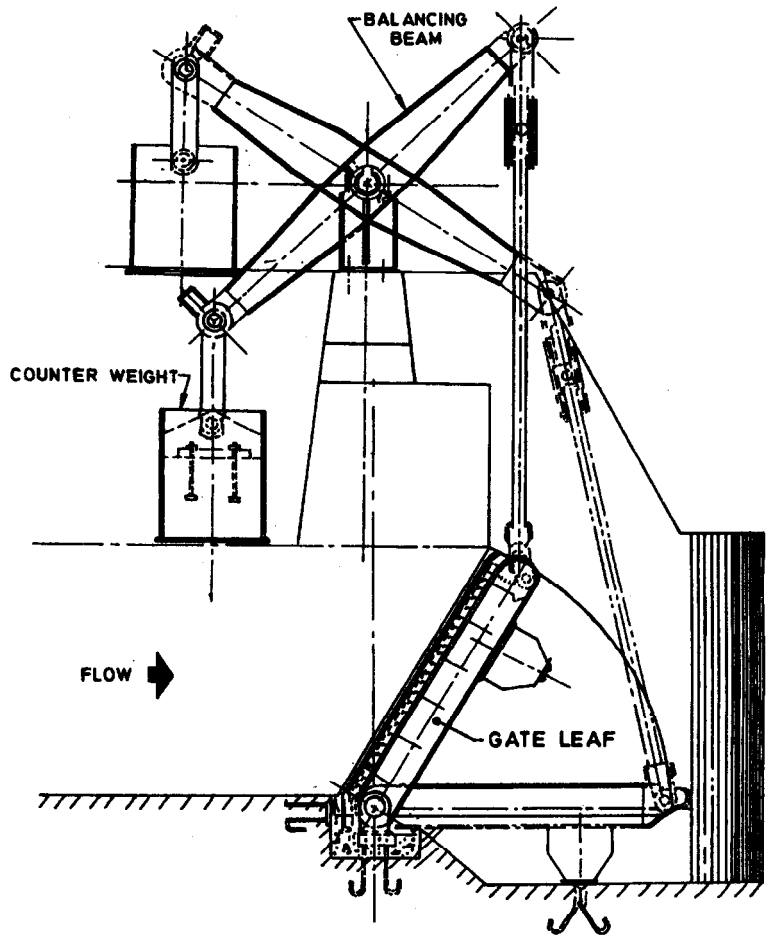


FIG. 1 AUTOMATIC GATE/SHUTTER

2.5 Balancing Gate

A gate used for the purpose of balancing water levels on either side.

2.6 Bascule Gate

A patented gate, automatically controlled by means of a level sensing device so that a predetermined water level is maintained. Fig. 2 illustrates a typical design.

2.7 Bear Trap Shutter/Bear Trap Gate Shutter

A shutter comprising an upstream leaf hinged and sealed along its upstream edge and a downstream leaf hinged and sealed along its downstream edge. When both are lowered, they rest in a horizontal position with one leaf lying on the top of the other (*see* Fig. 3).

2.8 Bulkhead Gate

A gate which is operated only under balanced pressures and is invariably kept in either fully-open or fully-closed position (*see* Fig. 4).

2.9 By-Pass Gate

A relatively small gate for by-passing a main gate.

2.10 Caterpillar Gate

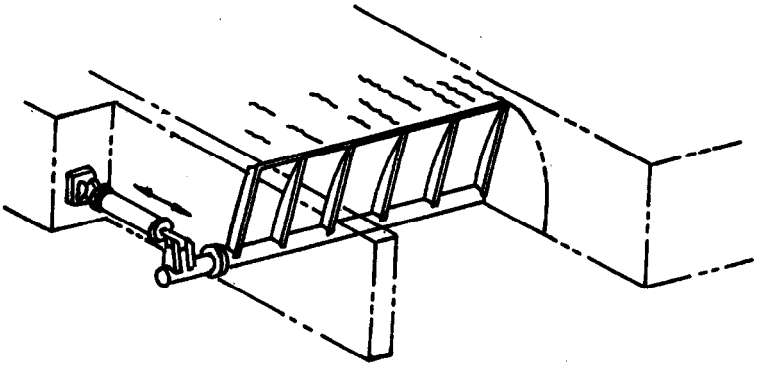
A stoney gate in which the roller trains are arranged as continuous chains (This type of gate is not much in vogue).

2.11 Computer Controlled Gate

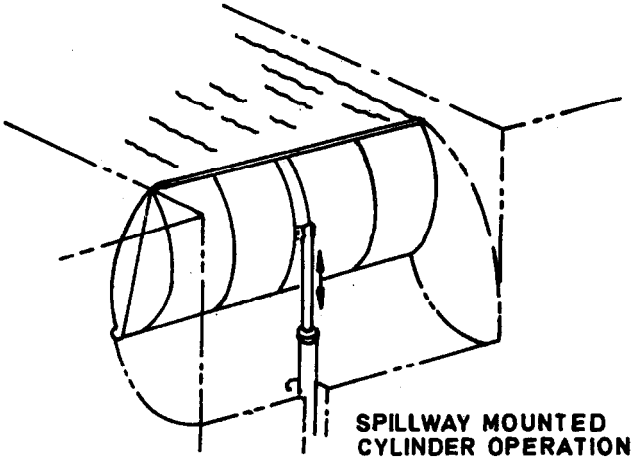
A gate, operation of which is controlled by computer such that either predetermined water level is maintained or predetermined discharge is set-out.

2.12 Constant Level Gate

A gate designed to maintain automatically the upstream/ downstream water surface at a predetermined constant level.



Bascule Gate is practical upto heights of approximately 3 m, depending on the length of the gate



Pelican Gates over 4 m have been built and heights over 6 m are feasible

FIG. 2 BASCULE/PELICAN GATE

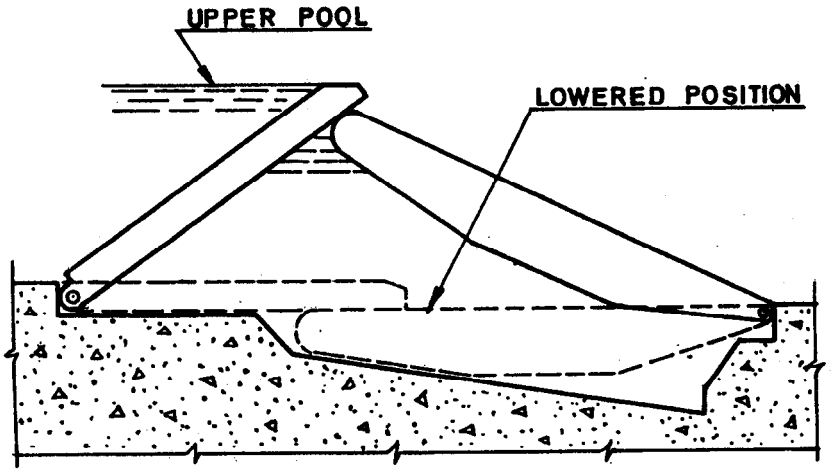


FIG. 3 BEAR TRAP SHUTTER

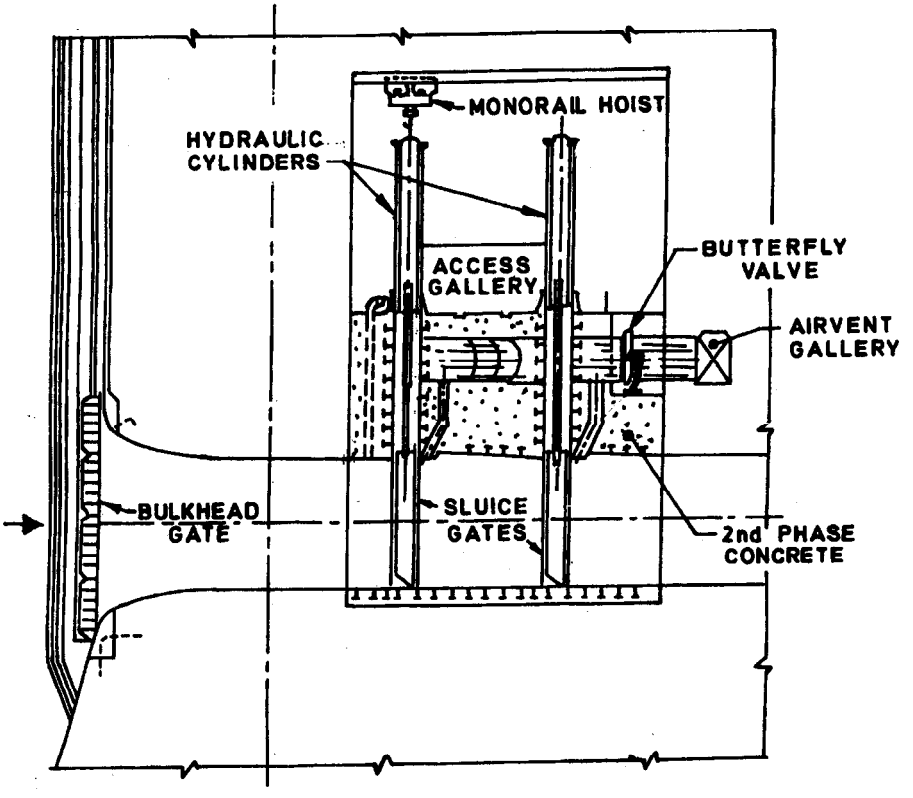


FIG. 4 BULKHEAD GATE AND SLUICE GATE

2.13 Construction Sluice Gate

This gate is meant for closing construction sluice which is normally plugged after construction.

2.14 Counter-Weight Operated Gate

Gate operated by counter weight which is actuated by upstream water level (*see* Fig. 1).

2.15 Crest Gate

A gate mounted on a crest for the purpose of controlling the discharge.

2.16 Cross Regulator Gate/Check Gate

A gate across an irrigation channel for the purpose of raising the water level (*see* Fig. 5 where radial gate is shown however vertical gates are also widely used.).

2.17 Cylindrical Gate

A gate in the form of a hollow cylinder placed in a vertical shaft (These gates are used usually for intake towers, upstream of dams for shutting off the water to penstocks and control values. These may also be used in outlet works.) (*see* Fig. 6).

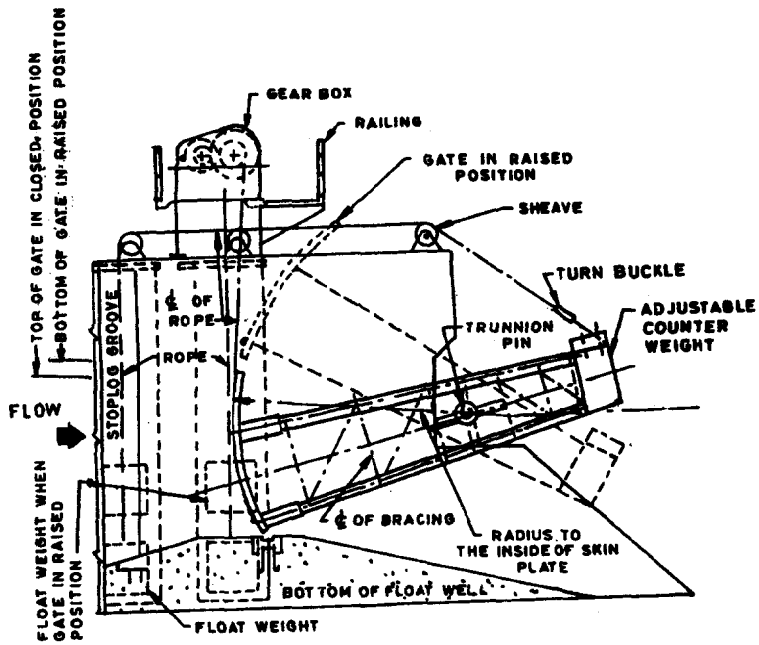


FIG. 5 AUTOMATIC FLOAT OPERATED RADIAL GATE (CROSS REGULATOR GATE)

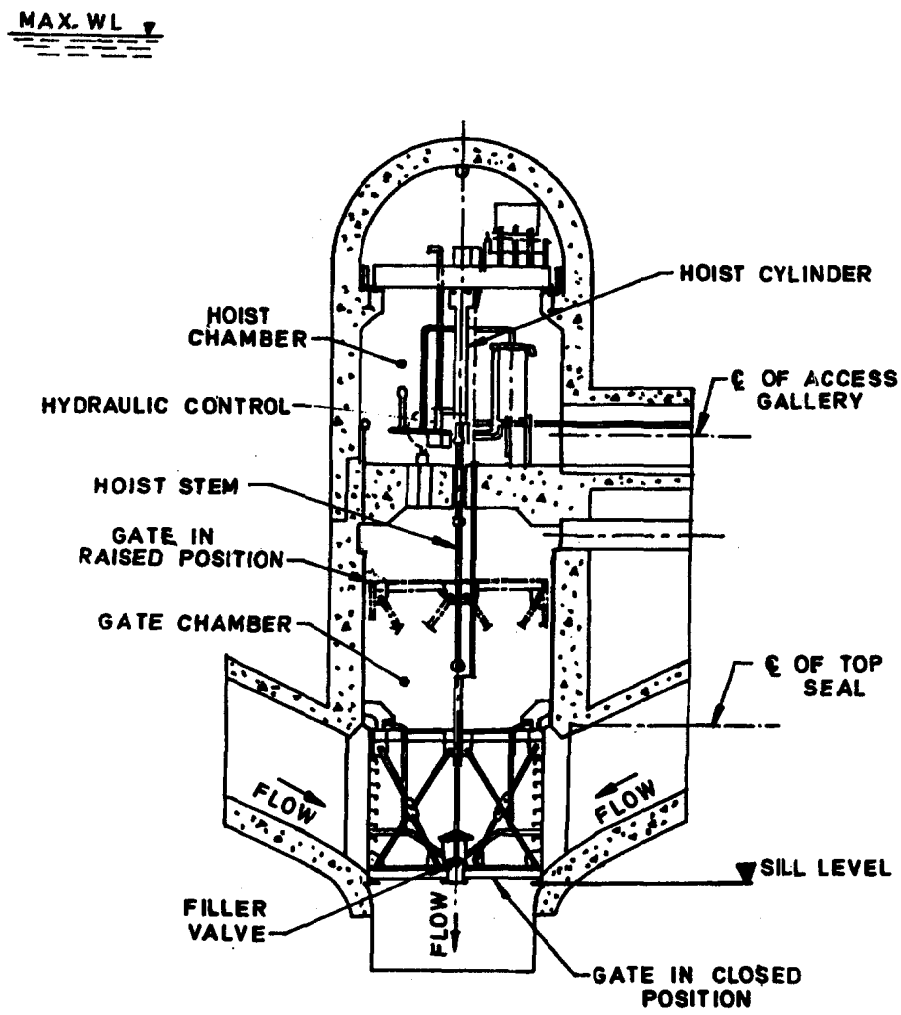


FIG. 6 CYLINDER GATE

2.18 Deep Seated Radial Gates

These are low level radial outlet gates. These gates have sealing on top apart from on all sides. They are located at sluices in the bottom portion of dam (*see* Fig. 7). The hoisting arrangement is shown at top. This could also be provided near the elevation of top seal to reduce hoist stroke.

2.19 Depletion Sluice Gate

A gate located at lowest level in the body of the dam to deplete the reservoir in the event of distress. It may be either wheel mounted or slide type.

2.20 Desilting Chamber Gate

A gate located at the exit of desilting chamber of a hydroelectric plant to flush out accumulated silt.

2.21 Disc Gate

A gate in the form of disc which rotates about its plane to control the flow of water.

2.22 Diversion Tunnel Gate

This gate is meant for making diversion tunnel dry, when it has to be plugged after construction (*see* Fig. 8). Normally such gates are meant for one time operation while plugging the tunnel.

2.23 Down-Stream Seal Type Gate

Gate having seals located on its downstream side.

2.24 Double Opposed Gate or Ebb/Tide Gate or Flood Tide Gate or Over-Pour Gate

A set of gates, usually of mitre type installed in either of two bays or both bays in tidal locks. The gate at the higher or tidal river end is called the flood tide gate and at the lower or canal end is called the ebb tide gate. Such gates are also known as over-pour gates.

2.25 Double-Safety Lock Gates

An additional pair of lock gates provided for inspection and repair of the main lock gates or for use in an

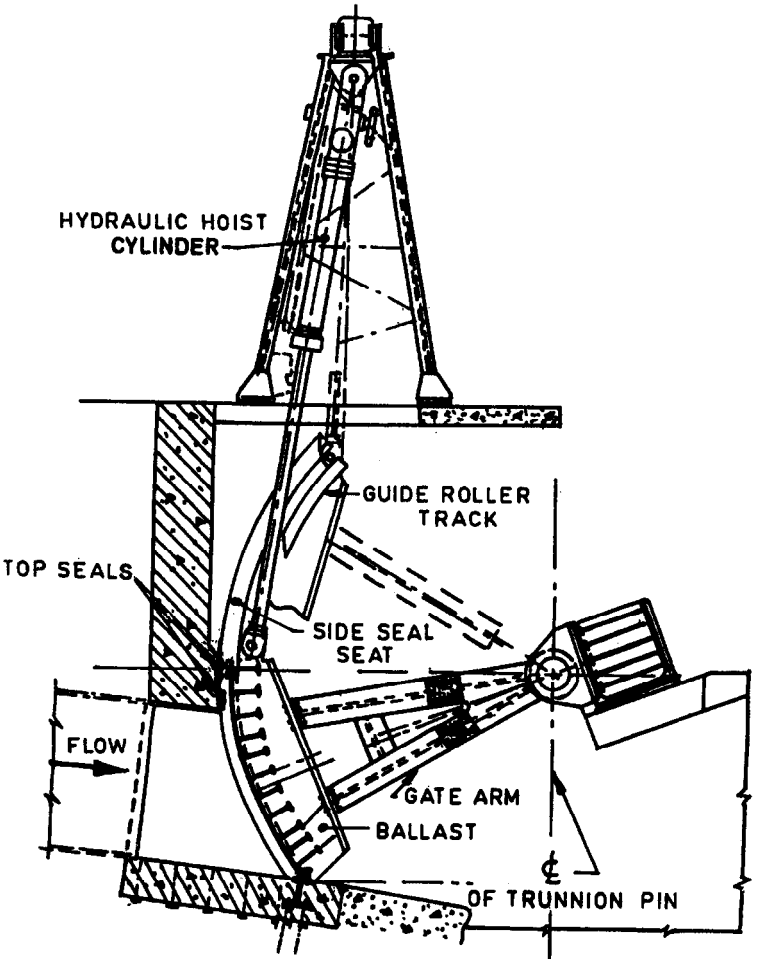
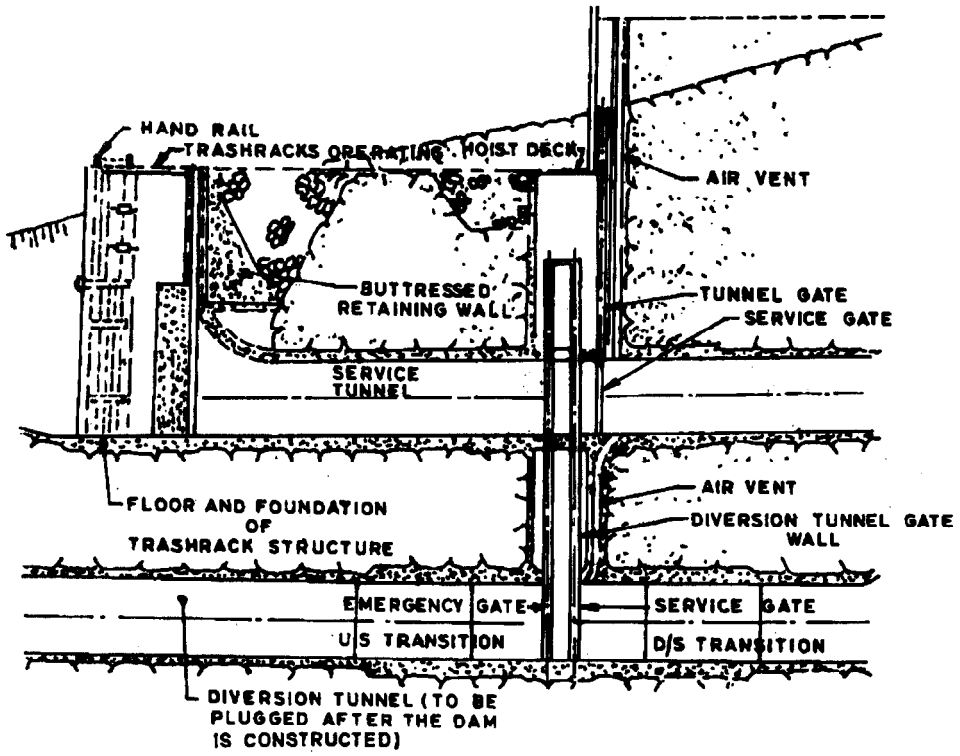


FIG. 7 DEEP SEATED RADIAL GATE



NOTE — Service Gates are lowered for plugging the diversion tunnel, emergency gates are provided to take care of any eventuality resulting from malfunctioning of the service gate

FIG. 8 DIVERSION TUNNEL GATE

emergency when the main lock gates can not be operated.

2.26 Drift Gate or Ice Gate or Trough Gate or Trash Gate

A small gate at the top of main gate in order to pass ice or floating drift without damaging the main gate.

2.27 Draft Tube Gate

A bulkhead gate used to permit dewatering of the draft tubes for inspection and repair of turbine parts and draft tubes (*see* Fig. 9).

2.28 Drum Gate

A movable crest gate in the form of a sector of a circle hinged at the crest. The arc face affects water seal with the edge of a recess into which the gate may be lowered. The gate is raised and held up by the pressure of water admitted to the recess from the head water. It is lowered by closing the inlet port to the recess and draining the water from it. The top surface of the drum matches with the curve of the spillway (*see* Fig. 10).

2.29 Ebb Tide Gate

See **2.24**.

2.30 Emergency Gate or Guard Gate

A gate provided on the upstream of a service or a regulating gate to shut off the flow under unbalanced head (*see* Fig. 8).

2.31 Emergency Closure Gate or Emergency Penstock Gate

This type of gate is provided to close quickly. It is normally meant to close under flowing water conditions and opened in balanced water head conditions. This gate is operated by hydraulic hoists which are quick acting type and are required to close in short duration. These are also called emergency closure gates as these are often used when turbine rejects the load and they are to be pressed in operation due to emergency (*see* Fig. 11).

2.32 Fabric Gate

A gate having basic material made of fabric which may be synthetic or natural (*see* Fig. 12).

2.33 Falling Shutters

Low head gates installed on the crest of dams, barrages or weirs which fall at a predetermined water level. Generally these are fully closed or fully open, that is, fallen flat (*see* Fig. 13).

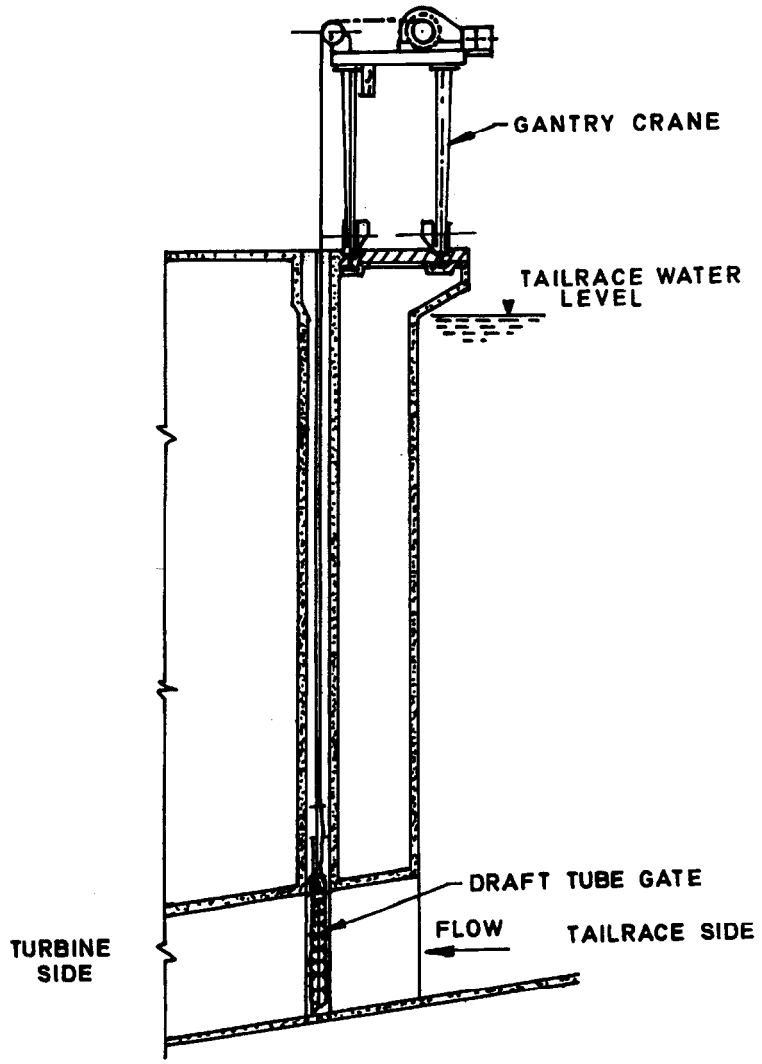


FIG. 9 DRAFT TUBE GATE

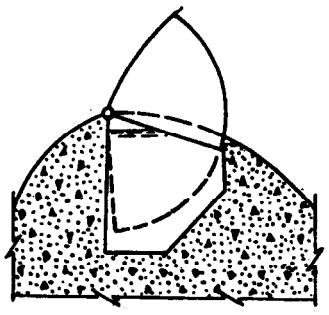


FIG. 10 DRUM GATE

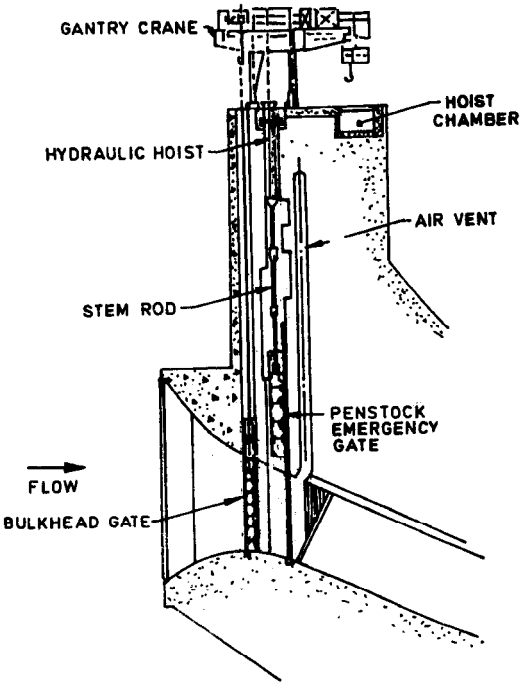


FIG. 11 PENSTOCK EMERGENCY GATE

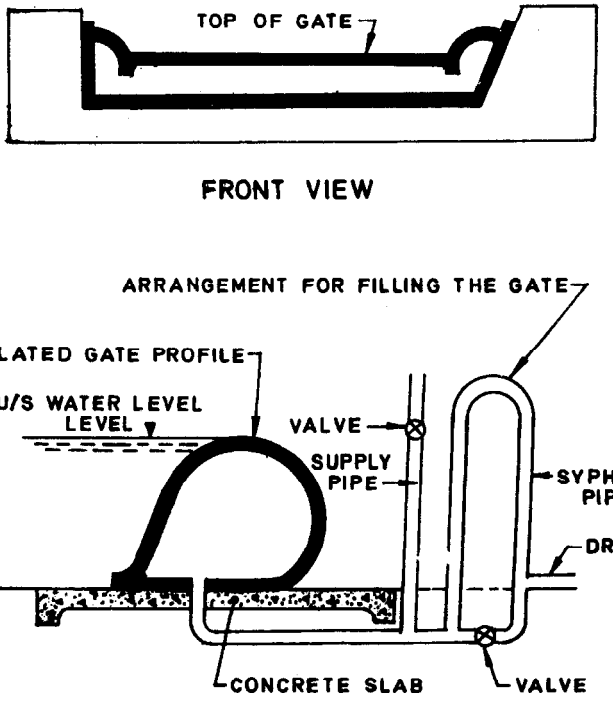


FIG. 12 FABRIC/RUBBER GATE

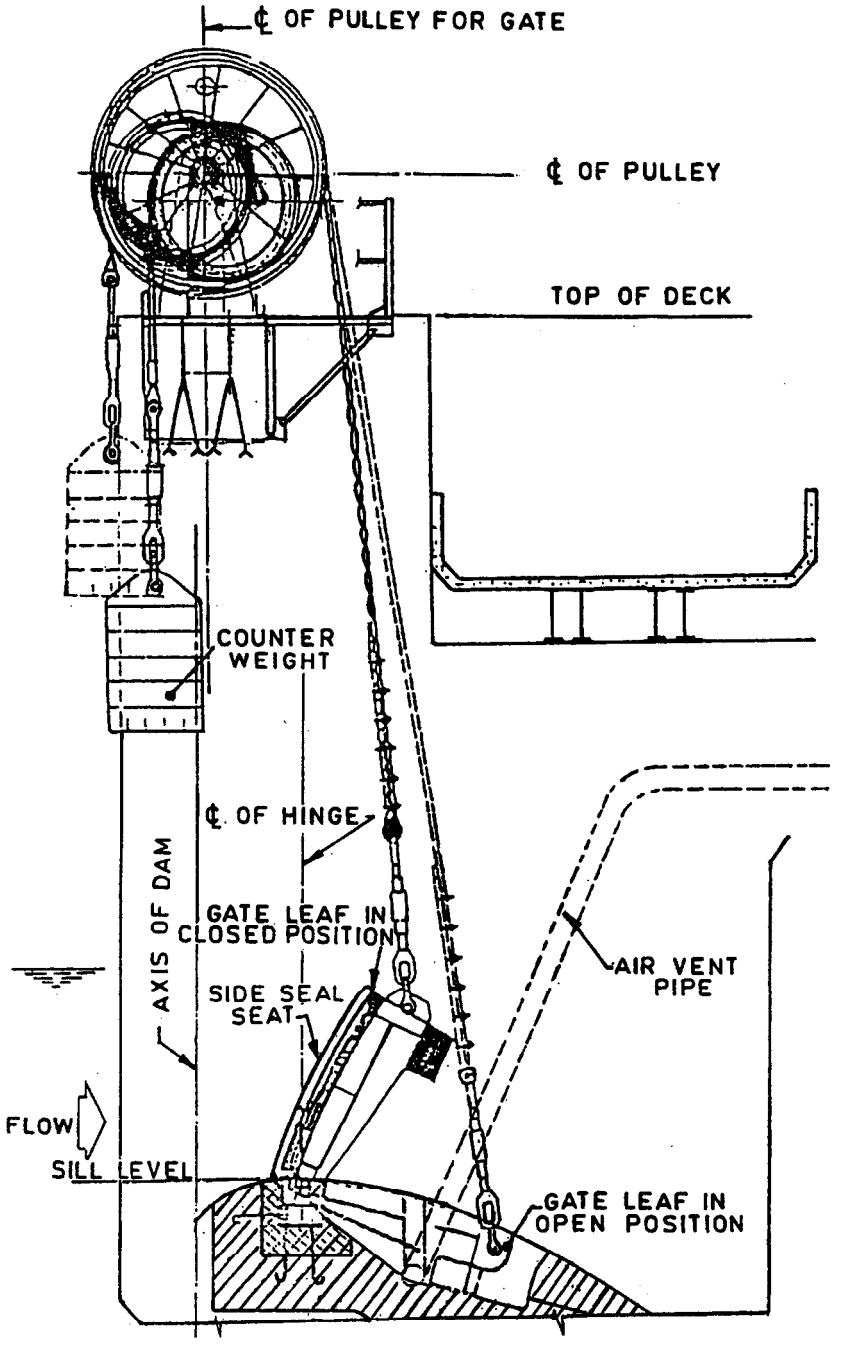


FIG. 13 AUTOMATIC/FALLING SHUTTER CENTRIC PULLEY TYPE

2.34 Filler Gate

A subsidiary gate installed in the main gate to equalise water pressure on the two sides of the main gate.

2.35 Fixed Wheel Gate or Wheel Mounted Gate

A gate mounted with wheels having axles fixed to the gate (*see* Fig. 14).

2.36 Fishbelly Gate

A gate having the shape of the gate leaf similar to profile of a fishbelly (*see* Fig. 15).

2.37 Flap Gate

A gate which operates by rotation about a hinge or hinges (*see* Fig. 16).

2.38 Flash Board

A temporary barrier, of relatively low height, placed on the crest to allow water surface to be raised above crest.

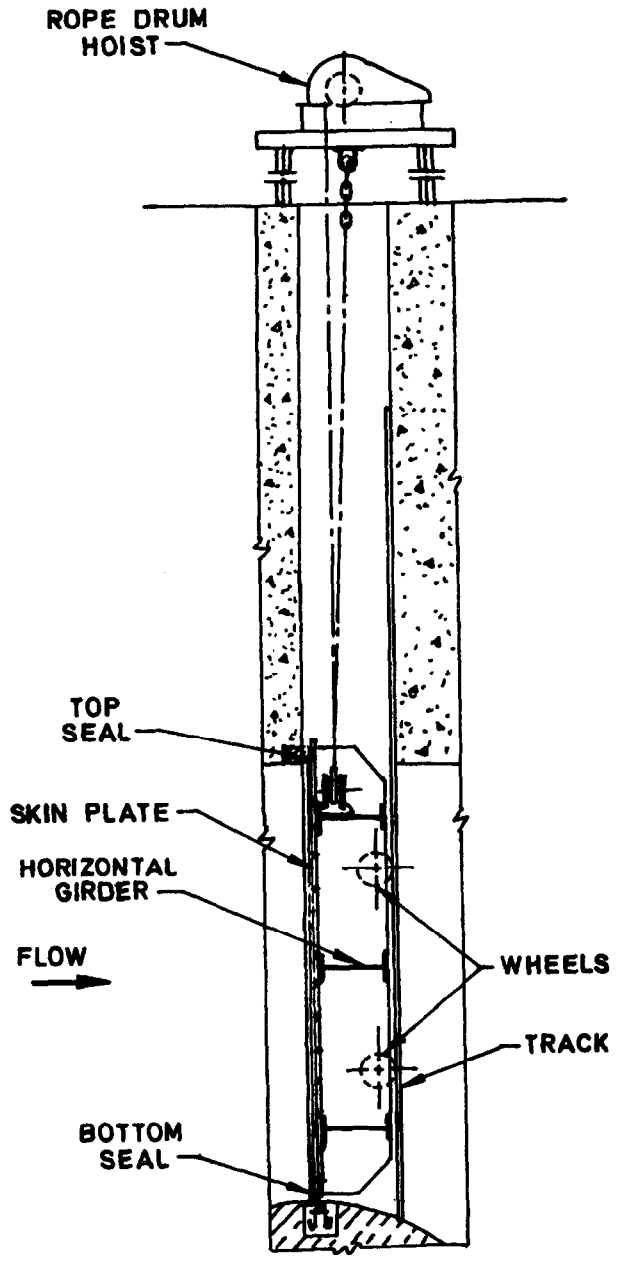


FIG. 14 VERTICAL LIFT GATE (WHEEL MOUNTED)

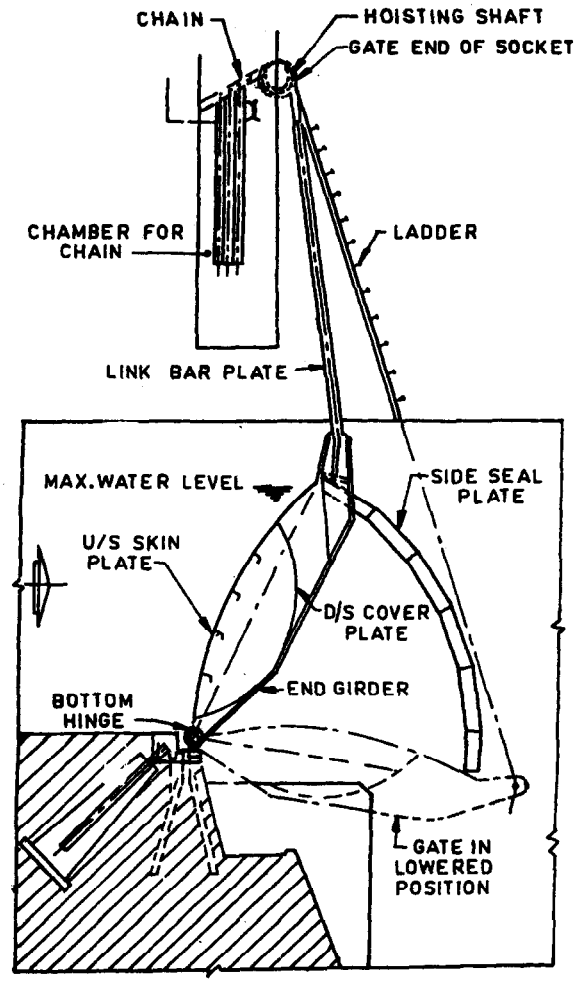


FIG. 15 FISHBELLY GATE

2.39 Float Operated Gate

A gate in which operating mechanism is actuated by a float which is pre-set to a predetermined water level (*see* Fig. 5).

2.40 Free Discharging Gate

A gate in which flow past the gate is in open air that is the tail water level is below the sill level of the gate and there is no submergence of gate bottom.

2.41 Flood Tide Gate

See **2.24**.

2.42 Gate For Submerged Flow

When the tail water level is above the sill level of the gate such as deep radial gate and sluice gate.

2.43 Gate With Downstream Skin Plate

Gate having skin plate on the downstream side with respect to the flow of water.

2.44 Gate With Upstream Skin Plate

Gate having skin plate on the, upstream side with respect to the flow of water.

2.45 Head Gate or Upper Gate

a) A gate at the entrance to a conduit, such as pipe line, penstock or canal.

b) A lock gate located at the high water side of the lock.

c) A control work constructed on a canal for an off taking channel.

2.46 Head Race Tunnel Gate

A gate installed at the entrance of head race tunnel of hydroelectric project. It is generally a wheel mounted gate.

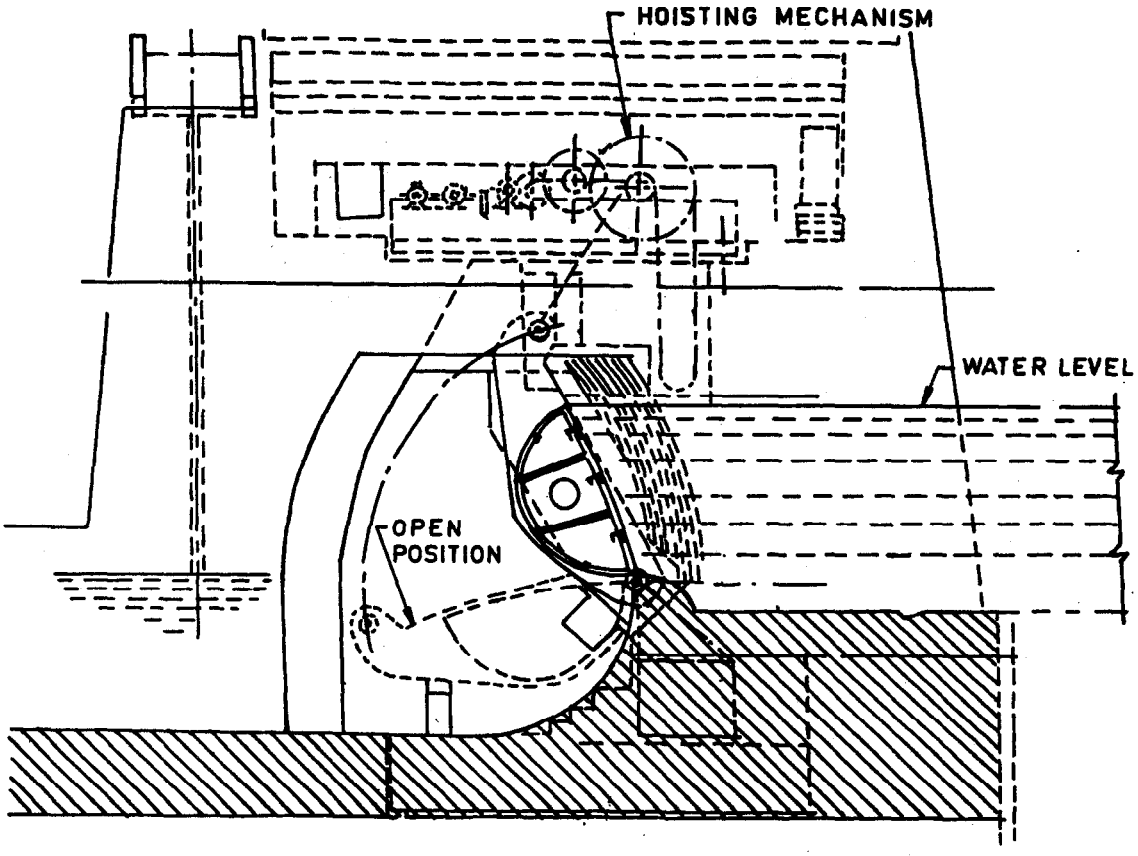


FIG. 16 FLAP GATE

2.47 Head Regulator Gate

Gates used for regulating water from reservoir to main canal. It is generally wheel mounted gate.

2.48 High Head Gate or High Pressure Gate

A gate which is subjected to a water head of 30 m or more above the gate sill.

2.49 Hinged Gate or Swing Gate

A gate that rotates about a fixed or movable hinge during operation.

2.50 Hinged Leaf Gate

A gate similar to hinged/swing gate.

2.51 Hook Type Tainter Gate or Hook Gate

A vertical or radial gate with two leaves. The upper leaf is light and hook-shaped. When discharge has to be passed over the gate the upper leaf rolls over the shield of the lower leaf (*see* Fig. 17).

2.52 Inflatable Gate

A gate which has expandable cavities. When inflated either with air or water it expands and forms an obstruction to flow thus effecting control (*see* Fig. 12).

2.53 Intake Bulkhead Gate

A bulkhead gate located at the upstream end of a river outlet, conduit or penstock.

2.54 Intake Gate

A gate located at the upstream end of a river oulet, conduit or penstock.

2.55 Ice Gate

See **2.26**.

2.56 Jet Flow Gate

A high pressure regulating gate in which the leaf and the housing are so shaped as to make the water issue from the orifice in the form of a jet which skips over the gate slot without touching the downstream edge of the slot (*see* Fig. 18). They are adopted when very fine control of discharge is desired.

2.57 Lock Gate

A gate (or system of gates) at one end of a lock serving in conjunction with a similar gate (or system of gates) at the other end to raise or lower the level of water within the lock chamber. Sometimes a lock gate (or a system of gates) is also provided in the chamber to

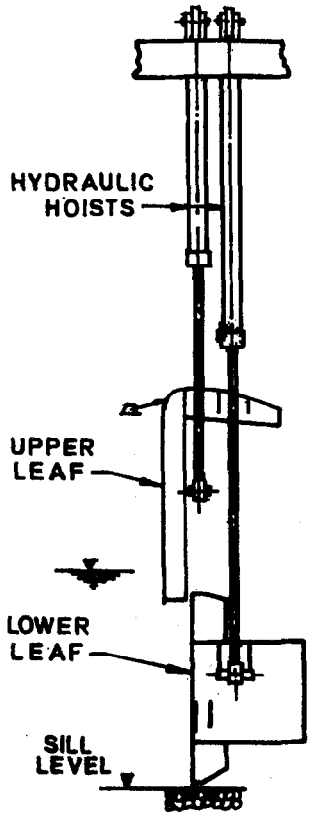


FIG. 17 HOOK GATE

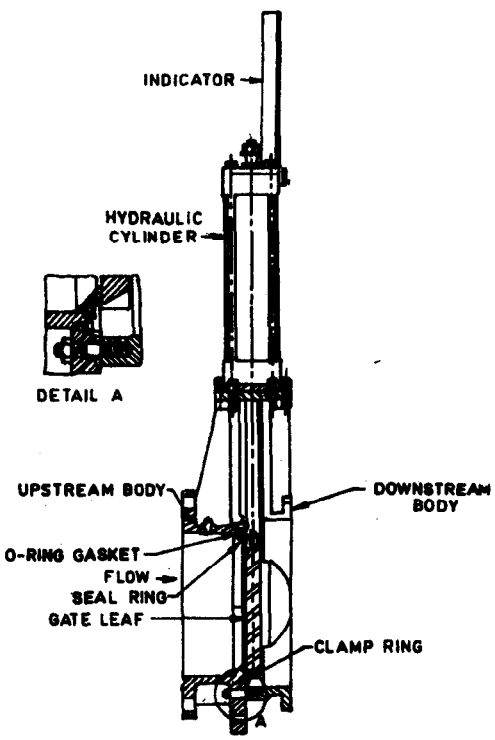


FIG. 18 JET FLOW GATE

divide it into two compartments. Such a gate is also clalled an auxiliary lock gate (*see* Fig. 19).

2.58 Low Head Gate

A gate which is subjected to water head upto and including 15 m above gate sill.

2.59 Low level Gate

A gate located at the low level of dam, generally at an outlet.

2.60 Main Gate

These are the service gates used for regulation and routine operation.

2.61 Maintenance Gate

Bulkhead gate, emergency gate and stoplogs which are used for maintenance.

2.62 Manually Operated Gate

Gate in which operation of gate is achieved by manual effort (*see* Fig. 20).

2.63 Medium Head Gate

A gate which is subjected to water head of 15 m and above but less than 30 m over the gate sill.

2.64 Mitre Gate or Mitre Lock Gate

A lock gate comprising of two hinged symmetrical leaves which meet at the centre of the lock channel when in the closed position and fit into recesses in the side walls of the channel when open.

2.65 Multileaf Gate

Hook gate with vertical gate or it is a combination of flap gate with radial gate, etc.

2.66 Navigation Lock Gate

A gate provided on a navigation lock.

2.67 Needle Gate/Needle

A timber element placed vertically or horizontally against supports on stream bed or weir crest to close an opening for the control of water (*see* Fig. 21).

2.68 Non-Regulating Gate

Gate not suitable as well as not intended for operation under partial gate openings.

2.69 Over-Pour Gate

See **2.24.**

2.70 Penstock Gate

A gate provided at the upstream end of the penstock

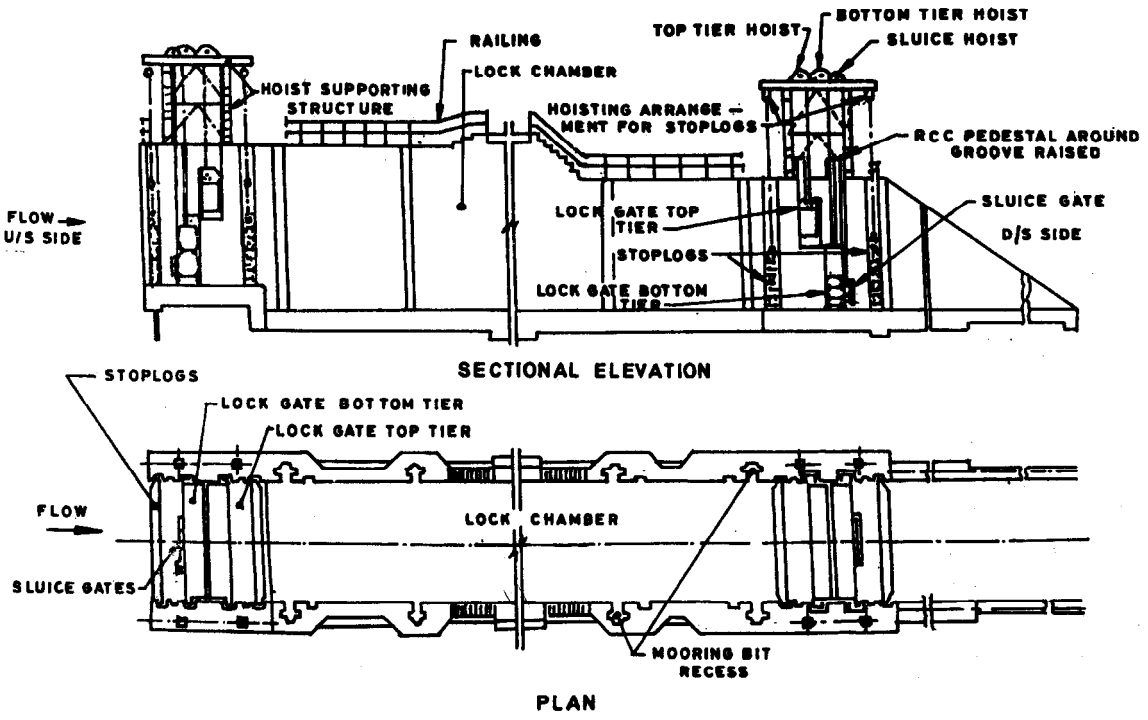


FIG. 19 LOCK GATE

(*See also* Intake Bulkhead Gate **2.53** and Intake Gate **2.54**).

2.71 Pivot Lever (Flap) Gate

A gate normally having hinge at top and opens as flap to release water.

2.72 Plastic Gate

Gate made of synthetic plastic material.

2.73 Plug (Telescopic) Gate

A small gate fixed over a big gate.

2.74 Pneumatically Operated Gate

A gate for which operation is actuated by pneumatic efforts.

2.75 Pelican Gates

A gate similar to Bascule gates (*see* **2.6**), but generally provided for water surface heights more than 4 m (*see* Fig. 2).

2.76 Radial Gate or Tainter Gate

A hinged gate, the leaf of which is usually a circular arc with the centre of curvature at the hinge or trunnion (*see* Fig. 22).

2.77 Radial Value or Radial Lock Gate

A Radial gate used in locks.

2.78 Regulating Gate

Gate operated under partial opening. Generally the main regulating gates are the service gates.

2.79 Reinforced Concrete Gate

A gate using reinforced concrete as basic material.

2.80 River Sluice Gate

These gates are used to control the flow of water to the river on downstream side.

2.81 Ring Gate

A cylindrical drum which moves vertically in an annular hydraulic chamber so as to control the peripheral flow of water from reservoir to a vertical shaft (*see* Fig. 23).

2.82 Ring Follower Gate

A slide gate with a circular ring (a leaf with a circular hole) extending below the gate leaf. The diameter of the circular hole is equal to the diameter of the conduit. When the gate leaf is raised above the conduit, the circular hole forms an unobstructed passage for the flow of water in the conduit. When the gate is lowered to shutoff the flow, the circular ring fits into a recess below the invert of the conduit. It is used as emergency gate upstream of a regulating or service gate and is operated either in fully closed or fully open position (*see* Fig. 24).

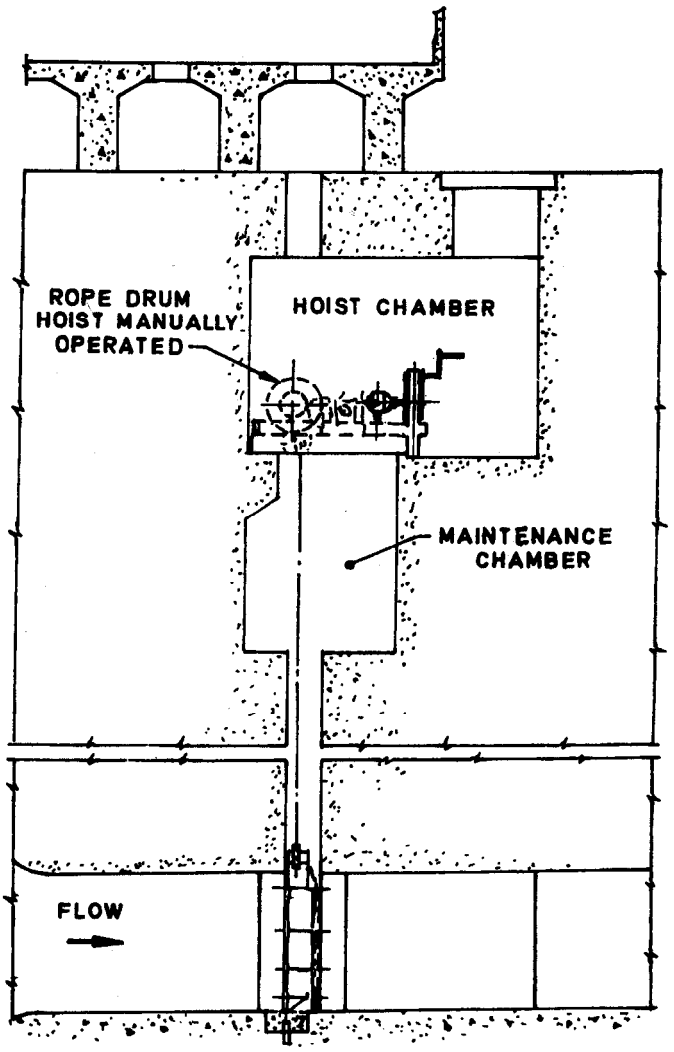


FIG. 20 MANUALLY OPERATED GATE

2.83 Ring Seal Gate

A roller or wheel mounted gate in which the upper portion of the gate leaf forms a bulkhead section to stop the flow of water and the lower portion forms a circular opening of the same size as the conduit so as to produce as unobstructed water passage with the leaf in the open position. Complete closure of the leaf in the lower position is made by extending a movable ring seal actuated hydraulically from the water pressure in the conduit to contact a seat on the leaf. Usually used as either service or emergency gates in the penstocks or other conduits (*see* Fig. 25).

2.84 Rolling Gate

A hollow cylindrical gate with spur gear at each end meshing with an inclined rack anchored to a recess in the end pier or wall. It is raised or lowered by being rolled on the rack. It may close at greater depth then its diameter by means of shield or aprons attached to the cylinder (*see* Fig. 26).

2.85 Both Side Sealed Gate

A gate having sealing arrangement on both sides of gate. This gate is generally provided where water is expected on both sides of gate.

2.86 Self Closing Gate

A gate closing by gravity and which does not require any positive thrust for closure and ensures enough seating load when closed.

2.87 Semi-Automatic Gate

A gate which falls automatically when a predetermined water head is exceeded. But for getting original position external efforts are needed.

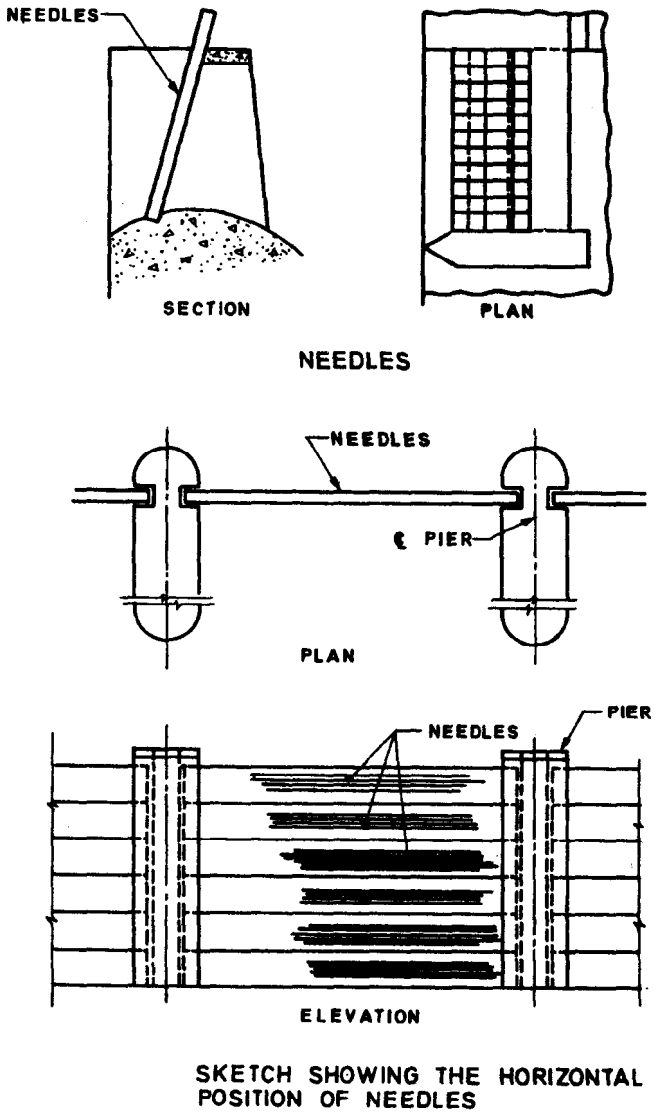


FIG. 21 NEEDLE GATE

2.88 Semi-Automatic Shutter/Falling Crest or Permanent Flashboard

A shutter which falls automatically when the head water level is exceeded and raised manually when required.

2.89 Semi-Flexible Gate

A fixed wheel gate which has a gate leaf built up with serveral horizontally placed units, each having only two wheels on either end. Semi rigid joints are provided at the horizontal joints so that pressure on each unit is independently transmitted through full contact of its wheel with the track.

2.90 Sector Gate

A pair of circular arc gates which are hinged on vertical axis in a lock (*see* Fig. 27).

2.91 Service Gate

A gate which operates under unbalanced conditions at partial gate opening and is normally used to control the discharge through sluices.

2.92 Shutter

A crest gate whose leaf rotates about hinges fixed to the crest and is used to raise the head water to desired level above the crest (*see* Fig. 28). This type of gate may be automatic, semi-automatic or manually operated.

2.93 Silt Flushing Gate

A gate provided at exits of desilting arrangements. It is used to flush off the silt accumulated.

2.94 Slide Type Gate

A gate that slides on the bearing plates without the use of rollers.

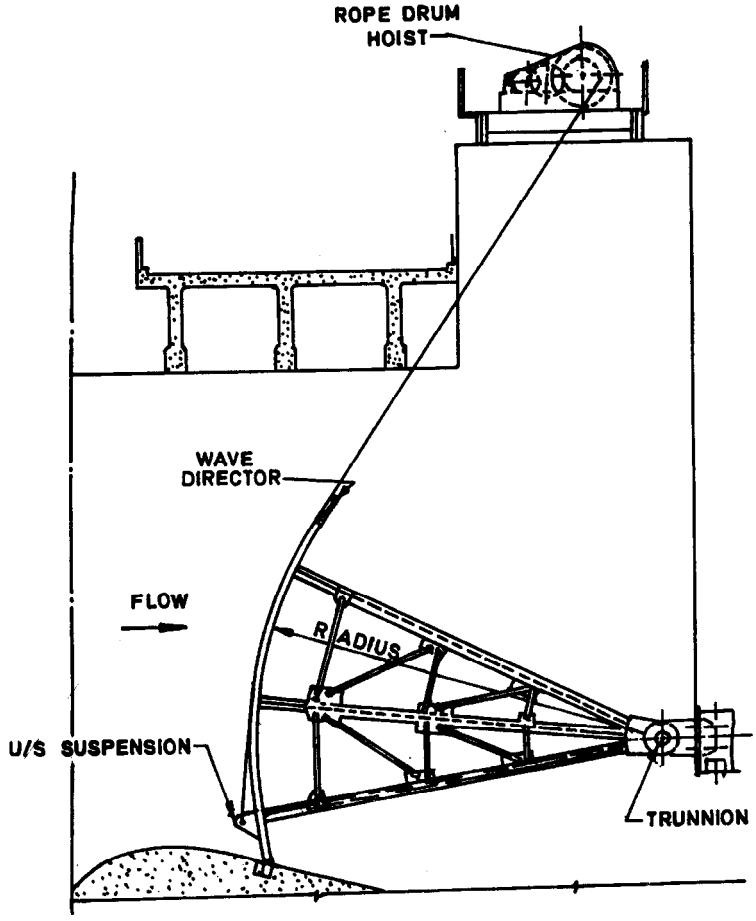


FIG. 22 RADIAL GATE

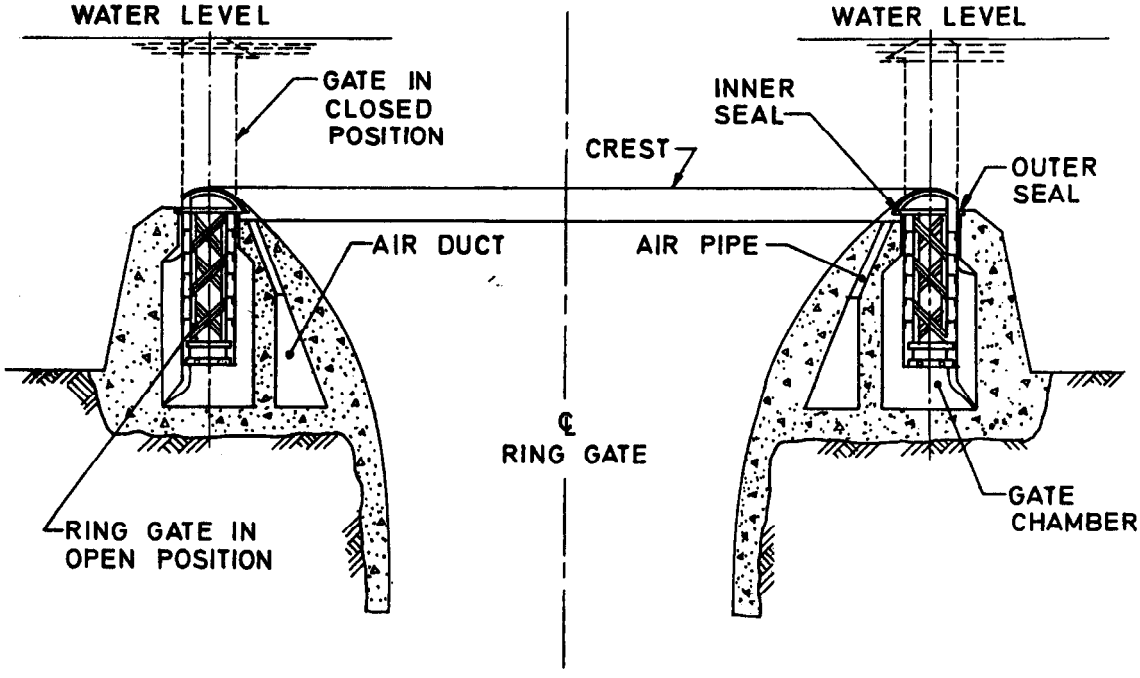


FIG. 23 RING GATE

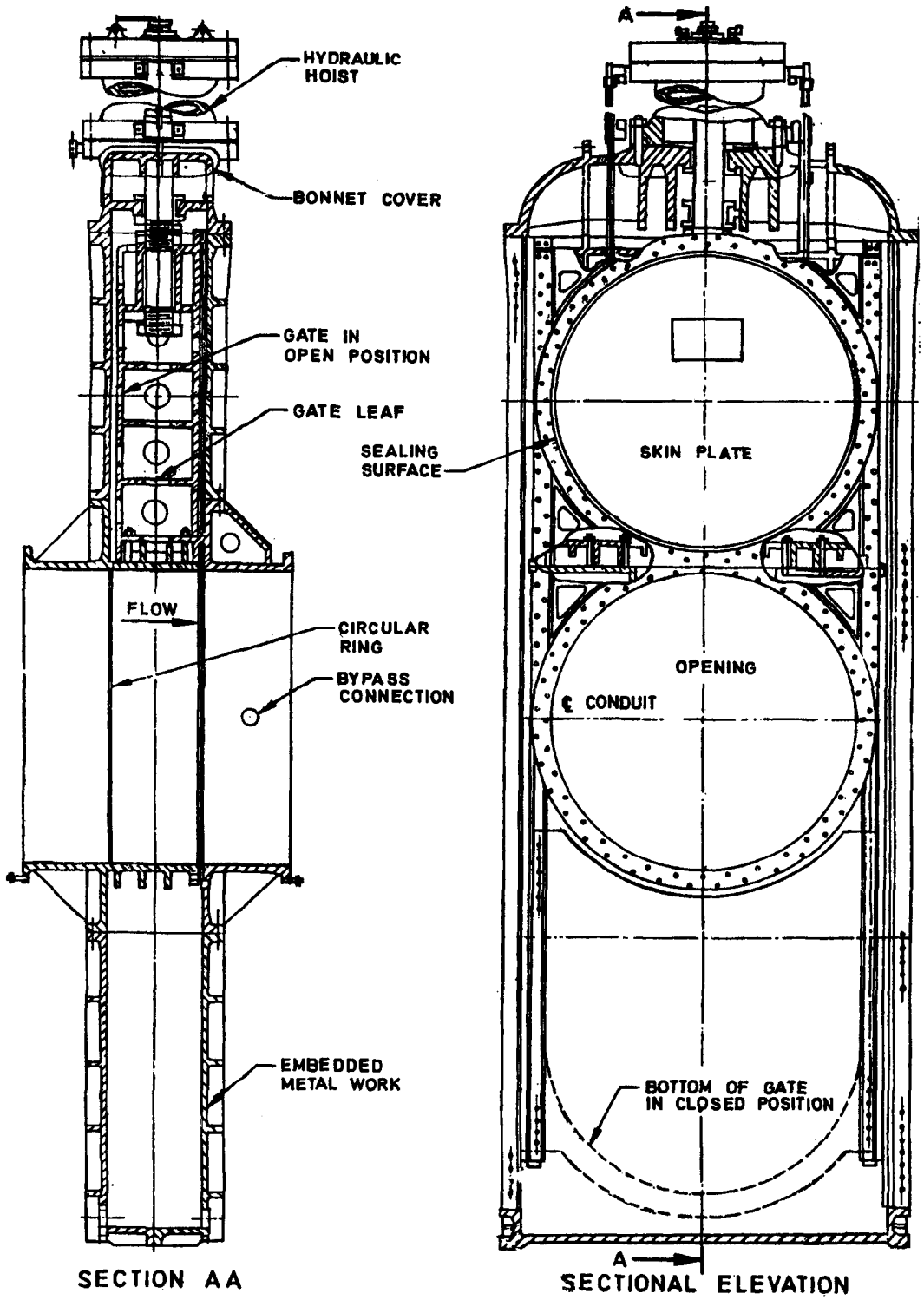


FIG. 24 RING FOLLOWER GATE

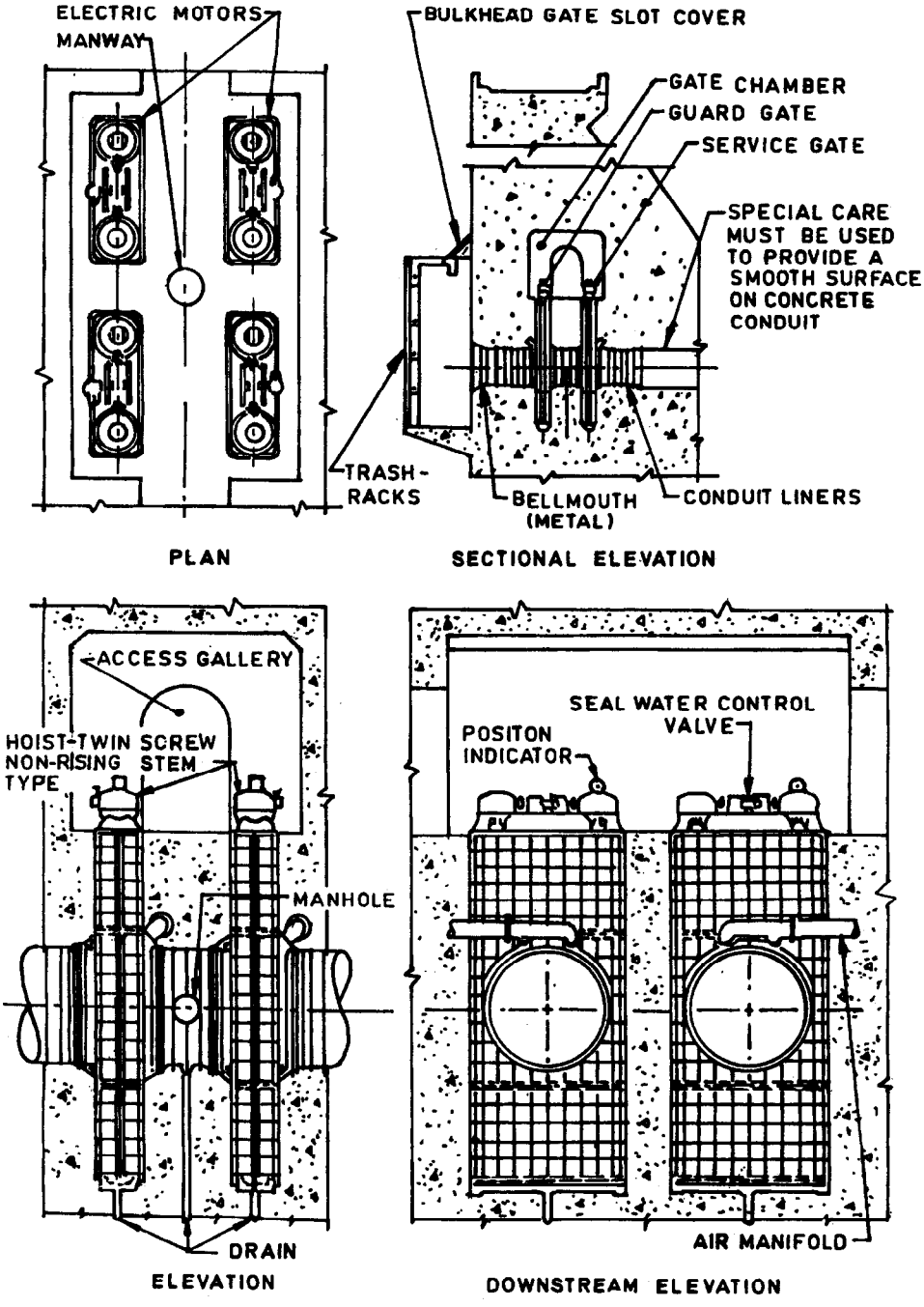


FIG. 25 RING-SEAL GATES (TYPICAL TANDEM INSTALLATION)

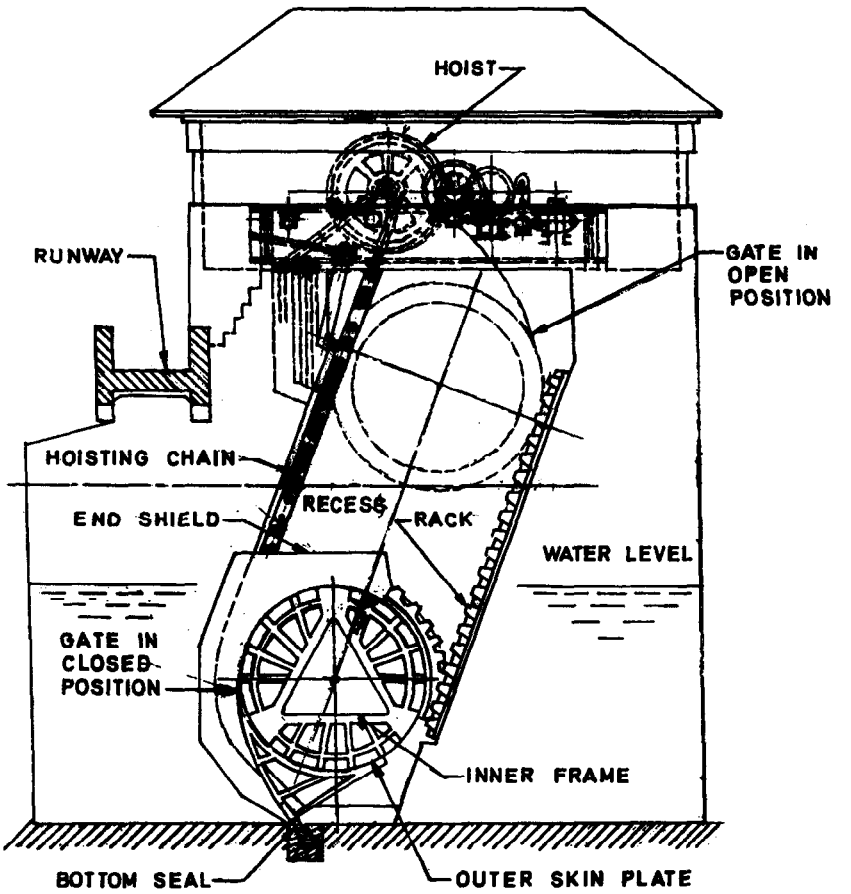


FIG. 26 ROLLING GATE

2.95 Sluice Gate

A gate which controls or regulates flow through an opening or sluice where the upstream water level is above the top of opening (*see* Fig. 4).

2.96 Solar Powered Gate

A gate in which operation is achieved by hoists which are powered by solar energy instead of electric power.

2.97 Spillway Gate

A gate used to regulate flow over a spillway.

2.98 Stickney Gate

A forerunner of the drum gate. It has two perpendicular leaves with lengths so proportioned that the pressure of water on the lower leaf supports the gate against the head water acting on the upper leaf. As the upstream water level rises the pressure on the upper leaf increases much more than on the lower, causing it to tilt and pass the water. When the level falls, the gate is restored to its closed position manually (*see* Fig. 29).

2.99 Stoney Gate

A gate which bears on roller trains which are not attached to the gate but in turn move on fixed tracks. The roller train travels only half as far as the gate (*see* Fig. 30). This type of gate is not much in use now.

2.100 Stoplog

A log, plank cut timber, steel or concrete beam fitting into end grooves between walls or piers to close an opening under unbalanced conditions, usually handled or placed one at a time (*see* Fig. 31).

2.101 Submerged Gate

A gate which is subjected to submergence by water on both sides during its operation.

2.102 Surface Type Gate

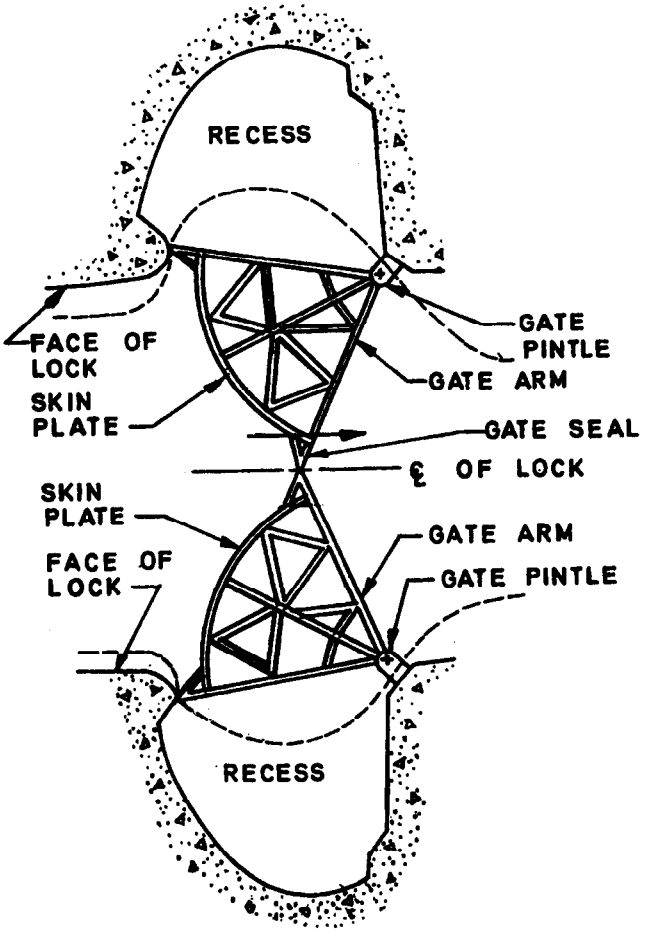
A gate located on surface of structure housing gate.

2.103 Surge Shaft Gate

Surge shaft gate is used for inspection of tunnel/ penstock and is located in the vicinity of surge shaft and tunnel junctions.

2.104 Tail Gate or Lower Gate

a) A gate located at the low water end of a lock.



NOTE — Arrows show direction of flow when gate is open.

FIG. 27 PLAN OF SECTOR GATE (USED ON A NAVIGATION LOCK)

b) A gate located at the downstream or tail end of a structure.

2.105 Tail Race Gate

A gate provided at the tail race of power house (*see* Fig. 9).

2.106 Tide Gate

A free swinging gate, which is placed near or at the outlet of a conduit into a body of water. Subject to high water from tides or floods, the gate swings shut when high water level would cause back flow into the conduit, and swings open when water level recedes below the outlet level.

2.107 Tilting Gate or Automatic Flap Gate

A crest gate, hinged at the top or bottom and counter balanced by weights, which automatically tilts or drops as water rises and flows over it due to an increase in discharge and which automatically resumes its original position when the flow is reduced (*see* Fig. 1).

2.108 Translatory Gate

Rolling gate such as fixed wheel gate, stoney gate, slide type gate, etc.

2.109 Trash Gate

See **2.26**.

2.110 Tumble Gate

A single leaf gate which turns about a horizontal axis on the floor of the gate bay. In the lowered position, it lies on the floor of the gate bay and in the raised position, it remains slightly inclined upstream. It is generally used in navigtion locks.

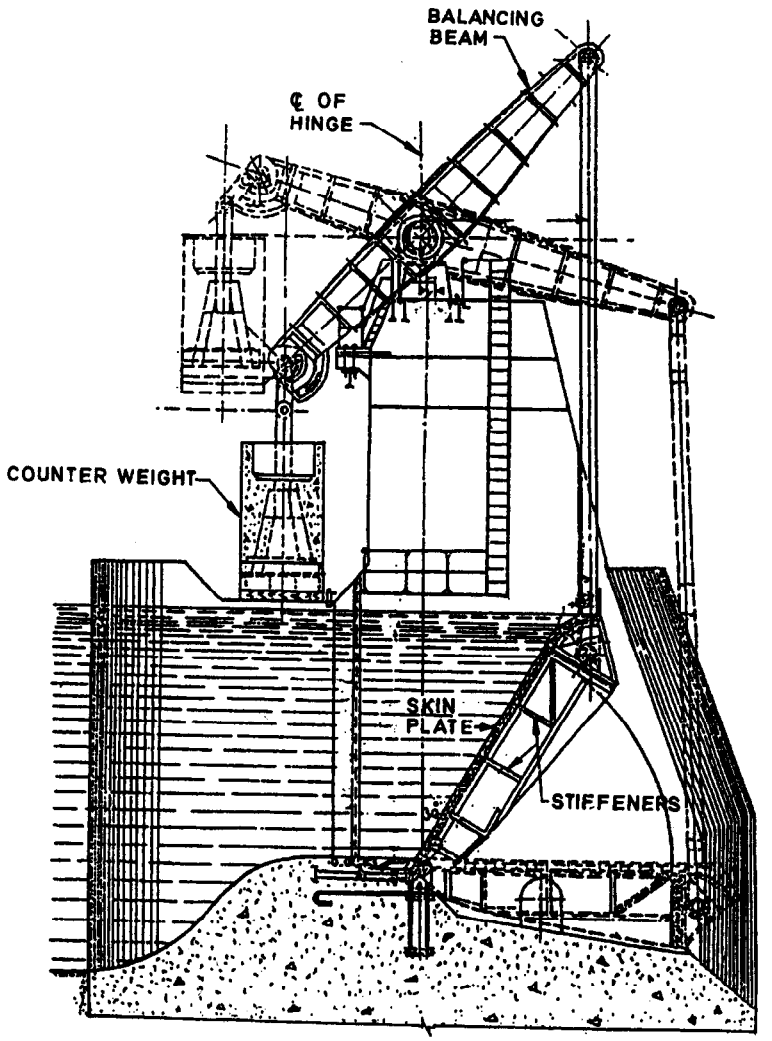


FIG. 28 SHUTTER GATE

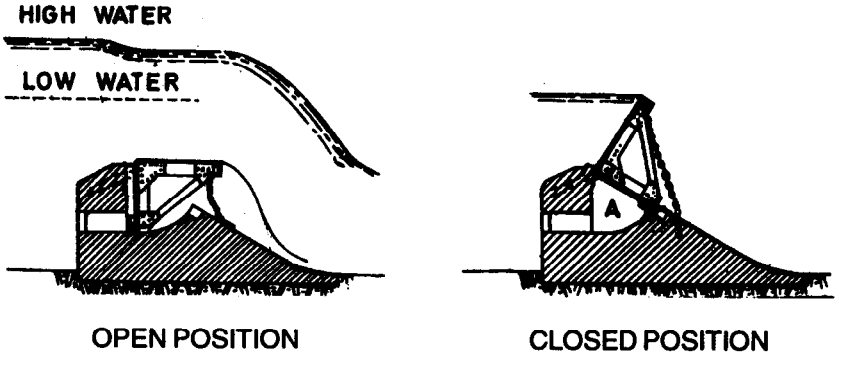


FIG. 29 STICKNEY GATE

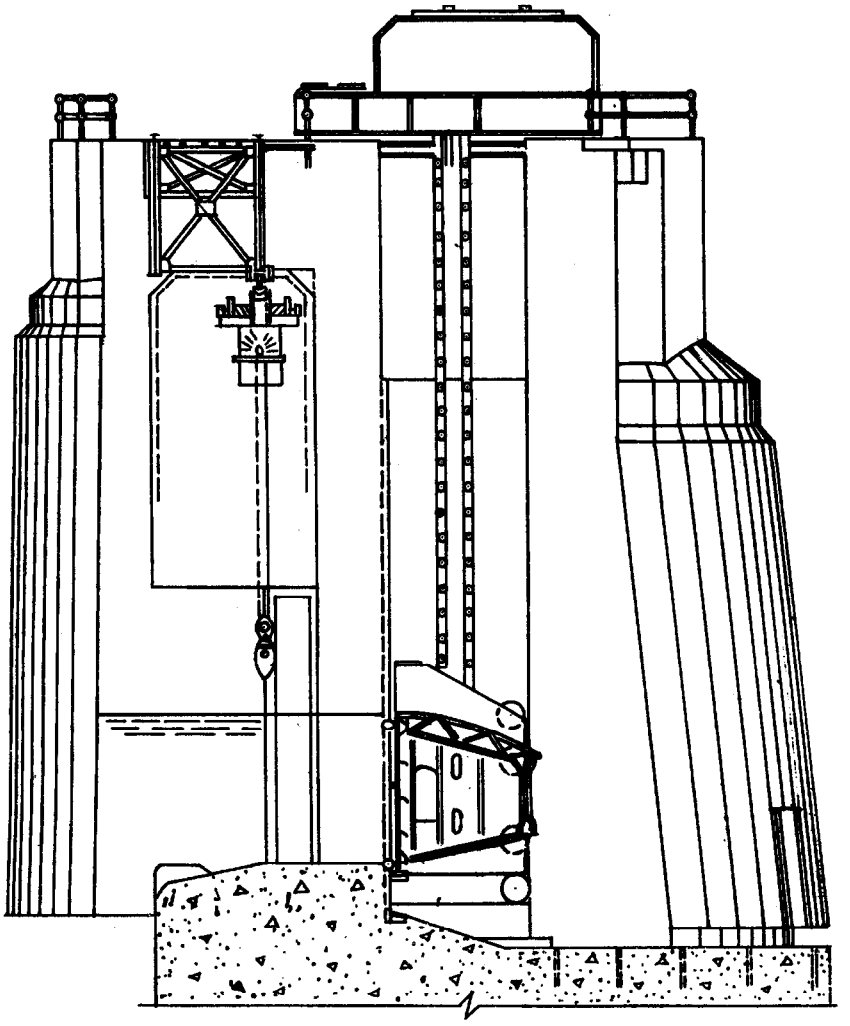


FIG. 30 STONEY GATE SHOWING THE SUPPORT OF ROLLERS

2.111 Two-Tier Gate

A gate used in two leaves or tiers which can be operated separately, but when fully closed act as one gate. These types of gates are used to reduce the hoist capacity or the lift of the gate (*see* Fig. 32).

2.112 Upstream Seal Gate

A gate having seals located on the upstream side of the gate with respect to flow (*see* Fig. 33).

2.113 Vertical Gate/Vertical Lift Gate

A gate operating in vertical grooves.

2.114 Visvesvaraya Gates

These are float operated automatic gates working in pairs so that the movement of one is in opposite direction to that of the other. These are named after the inventor Sir M. Visvesvaraya (*see* Fig. 34).

2.115 Water Powered Automatic Gate

A gate of an inflatable type anchored to the dam sill. Profile of the gate is achieved by pumping water in it (*see* Fig. 12).

2.116 Wooden Gate

A gate using basic material as wood.

3 TERMINOLOGY RELATED WITH GATES

3.1 Air Vent

A passage of suitable size provided on the downstream of the gate for venting/admitting air during filling/ draining a conduit or for delivering a continuous supply of air to the flow of water from a gate (*see* Fig. 8).

3.2 Anchor or Tension Bar

A structural tension member provided for transferring water load from the trunnion girder of a radial gate to the pier/abutments (*see* Fig. 35).

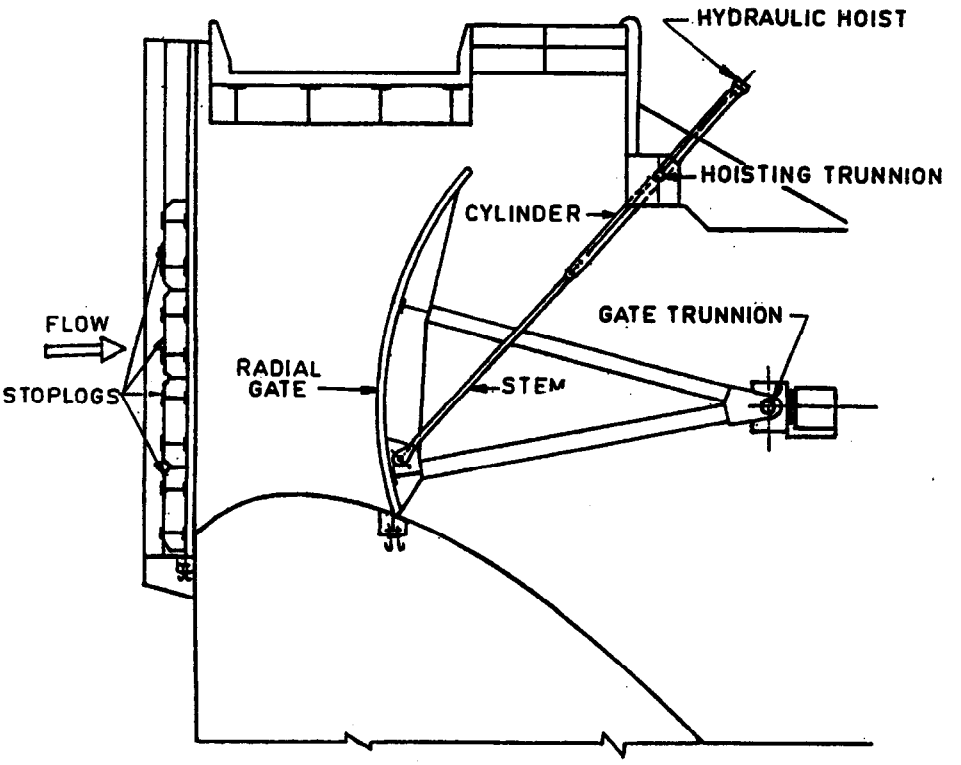


FIG. 31 STOPLOGS AND RADIAL GATE WITH HYDRAULIC HOIST

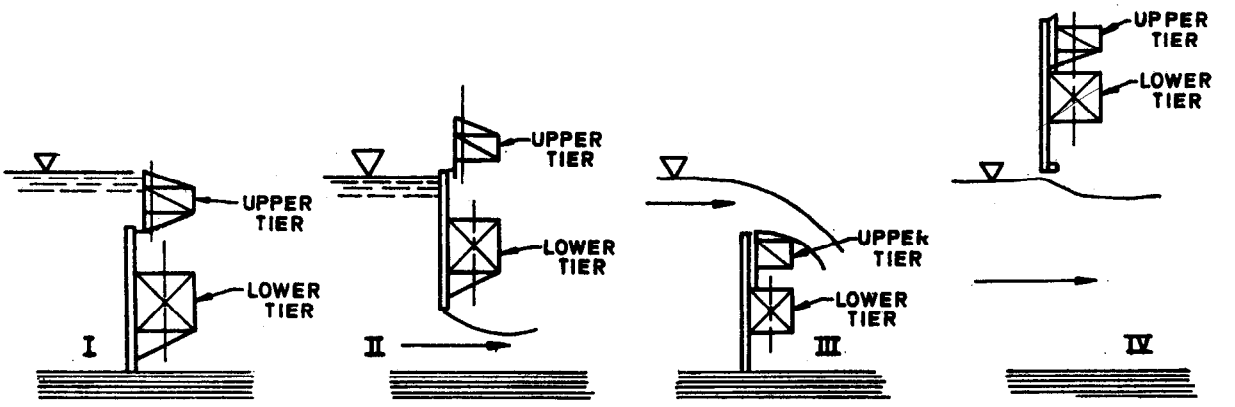
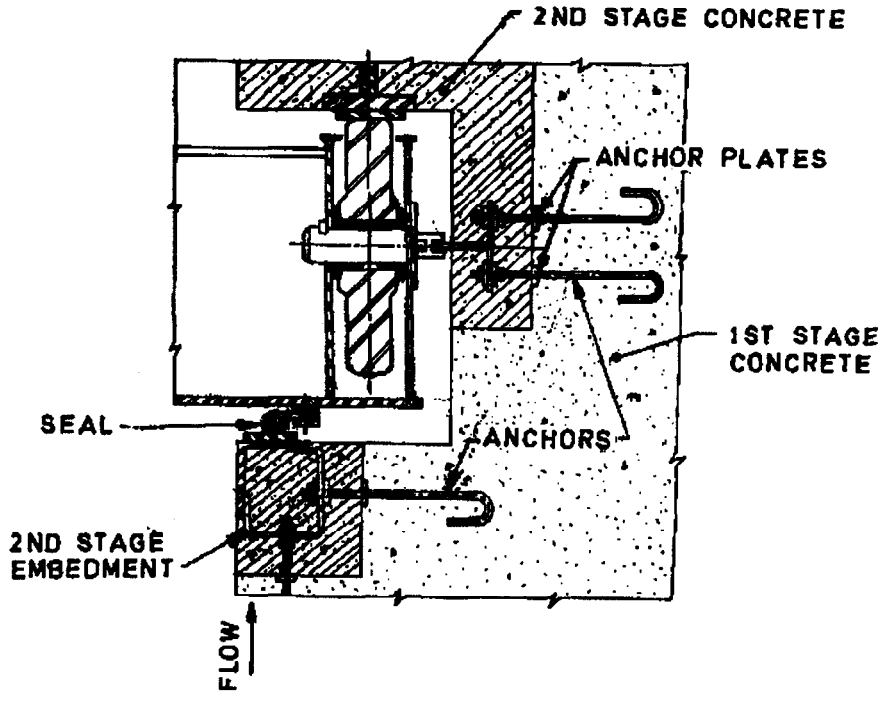


FIG. 32 TWO-TIER GATE AT VARIOUS POSITIONS



NOTE — First stage anchors for wheel mounted vertical gate. A typical gate groove details.

FIG. 33 ANCHORAGES

3.3 Anchorage/Anchor

A structural member embedded in concrete for aligning and holding the embedded parts of a gate in position (*see* Fig. 33).

3.4 Anchorage Girder or Anchor Girder

An embedded structural member, transferring load from gate to its surrounding structure (*see* Fig. 36).

3.5 Antifriction Bearing

Spherical/Cylindrical roller bearing having very small rolling resistance (*see* Fig. 37).

3.6 Back-Filling of Gate

A process of equalizing the water pressure on the two sides of gate.

3.7 Balanced Head Condition

A condition in which there is equal hydrostatic pressure on both sides of a gate.

3.8 Ballast

An extra weight added to the gate over and above its structural requirement so as to make the gate self closing.

3.9 Bearing Plate

A metal plate fixed to the surrounding surface of the frame to transfer water pressure to gate frame (*see* Fig. 38).

3.10 Block-Out

A temporary recess/opening left in the surrounding structure of a gate for installing the embedded parts of a gate (*see* Fig. 38).

3.11 Bonnet

A heavily ribbed housing provided in the gate shaft above the conduit.

3.12 Bonnet Cover

A steel cover fixed over a bonnet designed to resist the full internal pressure (*see* Fig. 39).

3.13 Bottom Seal

A seal provided at the bottom of the gate leaf (*see* Fig. 40).

3.14 Brass-Clad Seal

A seal in which the sealing surface is clad with brass (*see* Fig. 41).

3.15 Clad Seal

A rubber seal clad with any material (metal or non-metal) on its sealing surface (*see* Fig. 41).

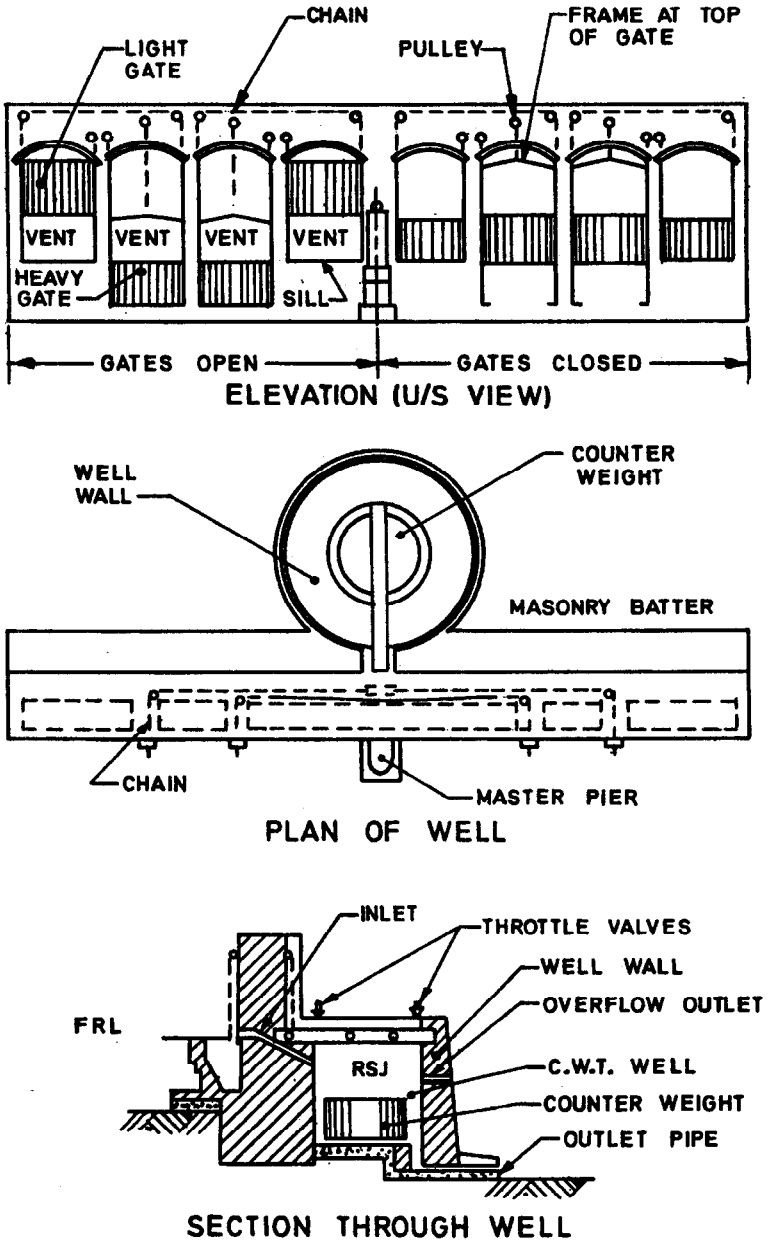


FIG. 34 VISVESVARAYA AUTOMATIC GATE

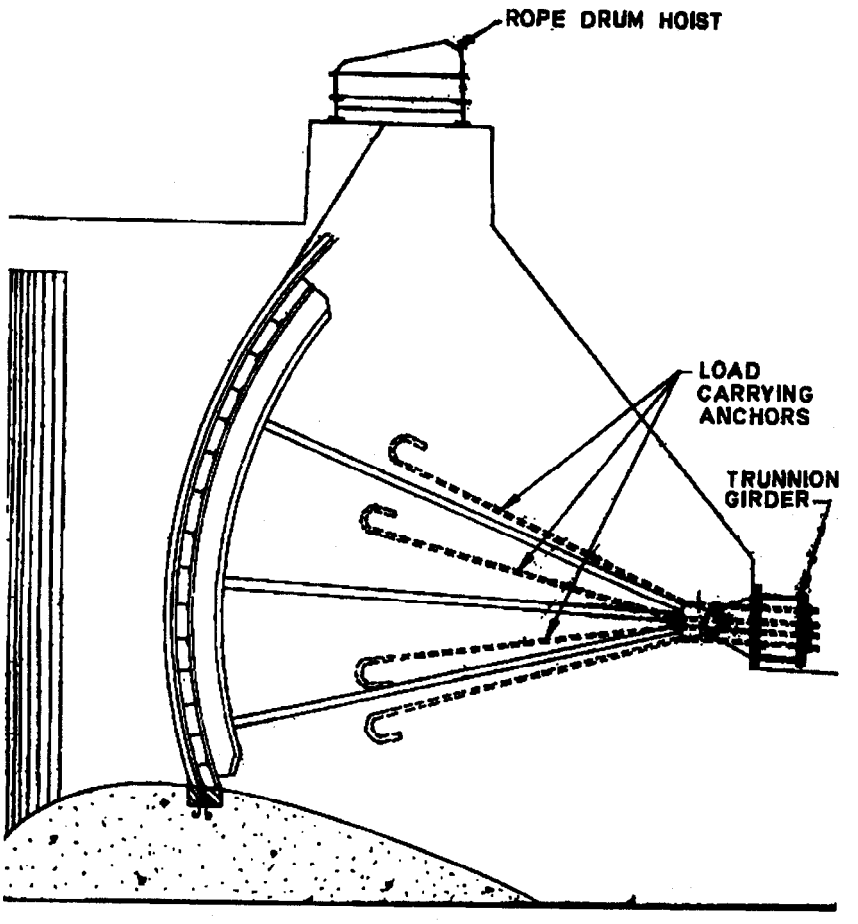


FIG. 35 ANCHOR (BOND ANCHORAGE FOR RADIAL GATE)

3.16 Clamp Plate or Keeper Plate

A metal plate used to keep the rubber seal in proper position and grip (*see* Fig. 40).

3.17 Connectors

A liner connecting two gates in tandem.

3.18 Counter-Guide Roller or Shoe

A device provided on the sides of the gate to restrict its transverse movement.

3.19 Counter Guide

A guide provided for restricting the transverse movement of a gate during operation.

3.20 Crest Control Device

A device which changes the effective crest level.

3.21 Deflector

i) A projection provided at the top of the skin plate to check the spilling of water over a gate.

ii) A projection into the flow to converge or deflect the flow.

3.22 Depth of Groove

The dimension of a gate groove inside the pier/abutment measured across the direction of flow.

3.23 Dogging Device

A latch for suspending or supporting a gate in its open position when it is disconnected from its hoisting mechanism.

3.24 Double Stem Seal

A flexible seal made of natural/synthetic rubber in which the stem extents tangentially on both sides of the bulb (usually used for high head gates) (*see* Fig. 40 and 41).

3.25 End Girder

A vertical structural member used at each end of the gate leaf to transfer the load to the gate frame.

3.26 Filling Valve

A valve fixed over a gate to create balanced water head conditions for gate operation (*see* Fig. 42).

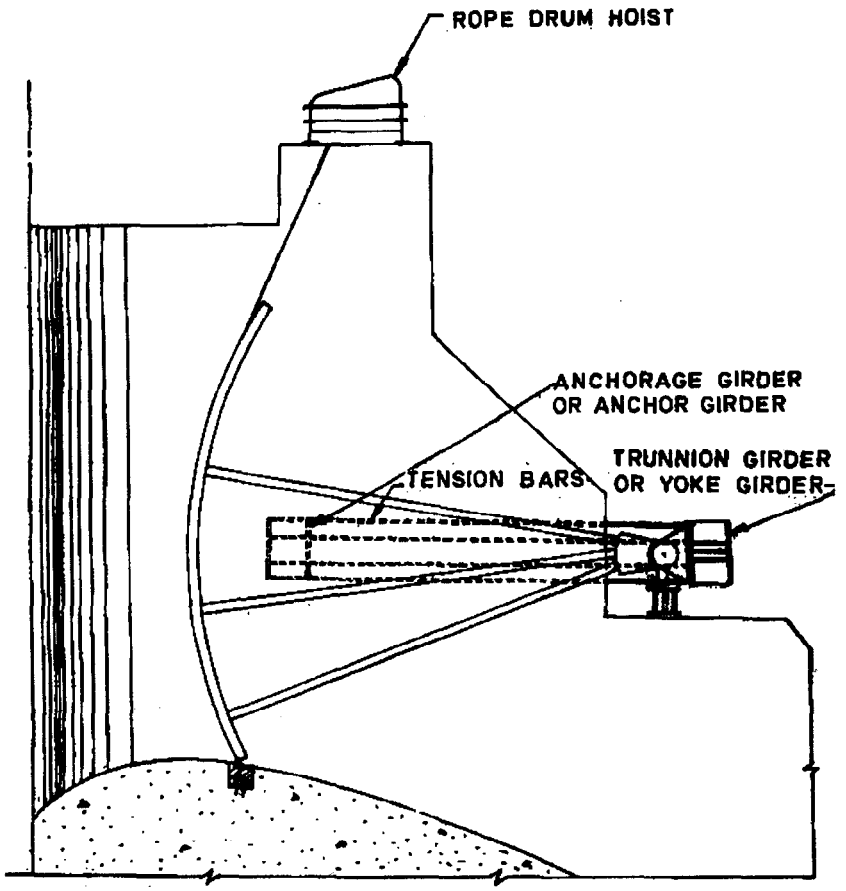


FIG. 36 ANCHORAGE GIRDER OR ANCHOR GIRDER
(INDEPENDENT ANCHORAGE SYSTEM)

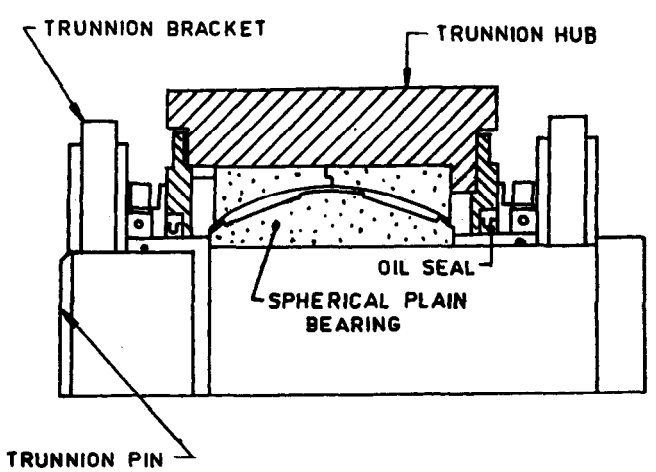


FIG. 37 ANTIFRICTION BEARING

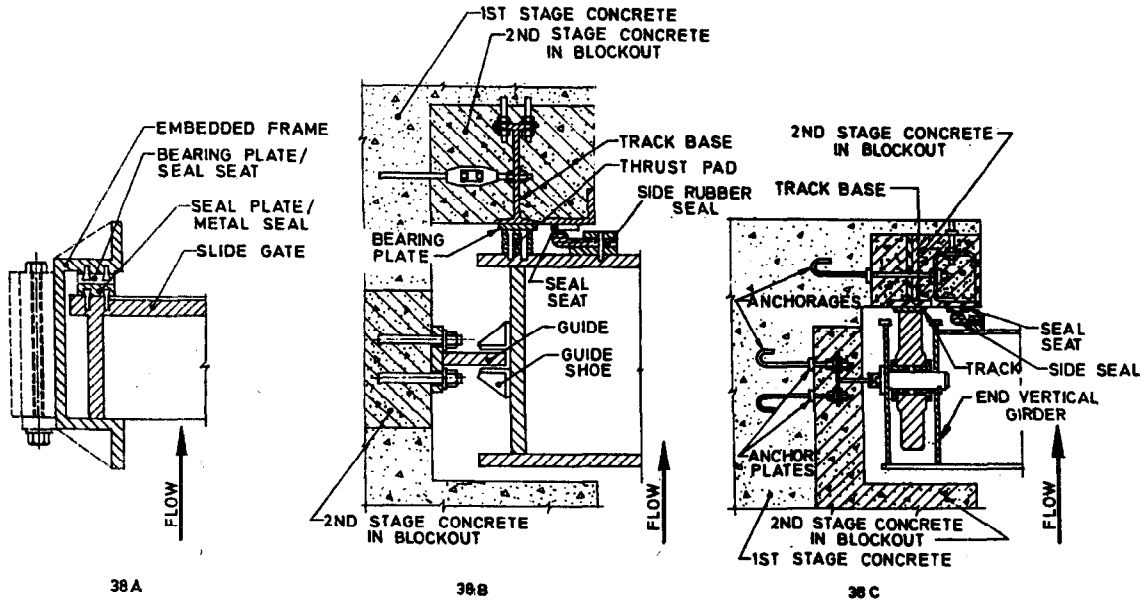


FIG. 38 BLOCK-OUT SHOWING EMBEDDED PARTS AND SEALING ARRANGEMENTS

3.27 Flow Arrestor

A device meant for checking the vertical flow in a gate groove or gate slot.

3.28 Gate Counter Weight

A weight used for opposing the dead weight of a gate so as to reduce the hoisting capacity. A counter weight may also be used for making the gate 'Self closing'.

3.29 Gate Frame or Embedded Part of Embedment

A structural member embedded in the surrounding supporting structure of a gate, which is required to enable the gate to perform the desired function (*see* Fig. 38).

3.30 Gate Groove or Gate Slot

A groove or slot is a recess provided in the surrounding structure in which the gate moves, rests or seats.

3.31 Gate Hanger

A device meant for suspending or supporting a gate in the open position when disconnected from its hoisting mechanism (*see* Fig. 39).

3.32 Gate Hoisting Capacity

The maximum capacity for which the hoist is designed to raise a gate.

3.33 Gate Leaf

The main body of a gate consisting of skin plate, stiffeners, horizontal girders and end girders (*see* Fig. 39).

3.34 Gate Lip

The lower most segment of a gate which is suitably shaped from hydraulic consideration (*see* Fig. 39).

3.35 Gate Seal

A device for preventing the leakage of water around the periphery of a gate (*see* Fig. 40).

3.36 Gate Sill

The top of an embedded structural member on which a gate rests when in closed position.

3.37 Guard Sill or Back Sill

A sill on the upstream side of the gate chamber of a lock gate.

3.38 Guide

That portion of a gate frame which restricts the movement of a gate in the direction normal to the water thrust (*see* Fig. 38).

3.39 Guide Rollers

Rollers provided on the sides of a gate to restrict its lateral and/or transverse movements.

3.40 Guide Shoe

A device mounted on a gate to restrict its movement in a direction normal to the water thrust (*see* Fig. 38).

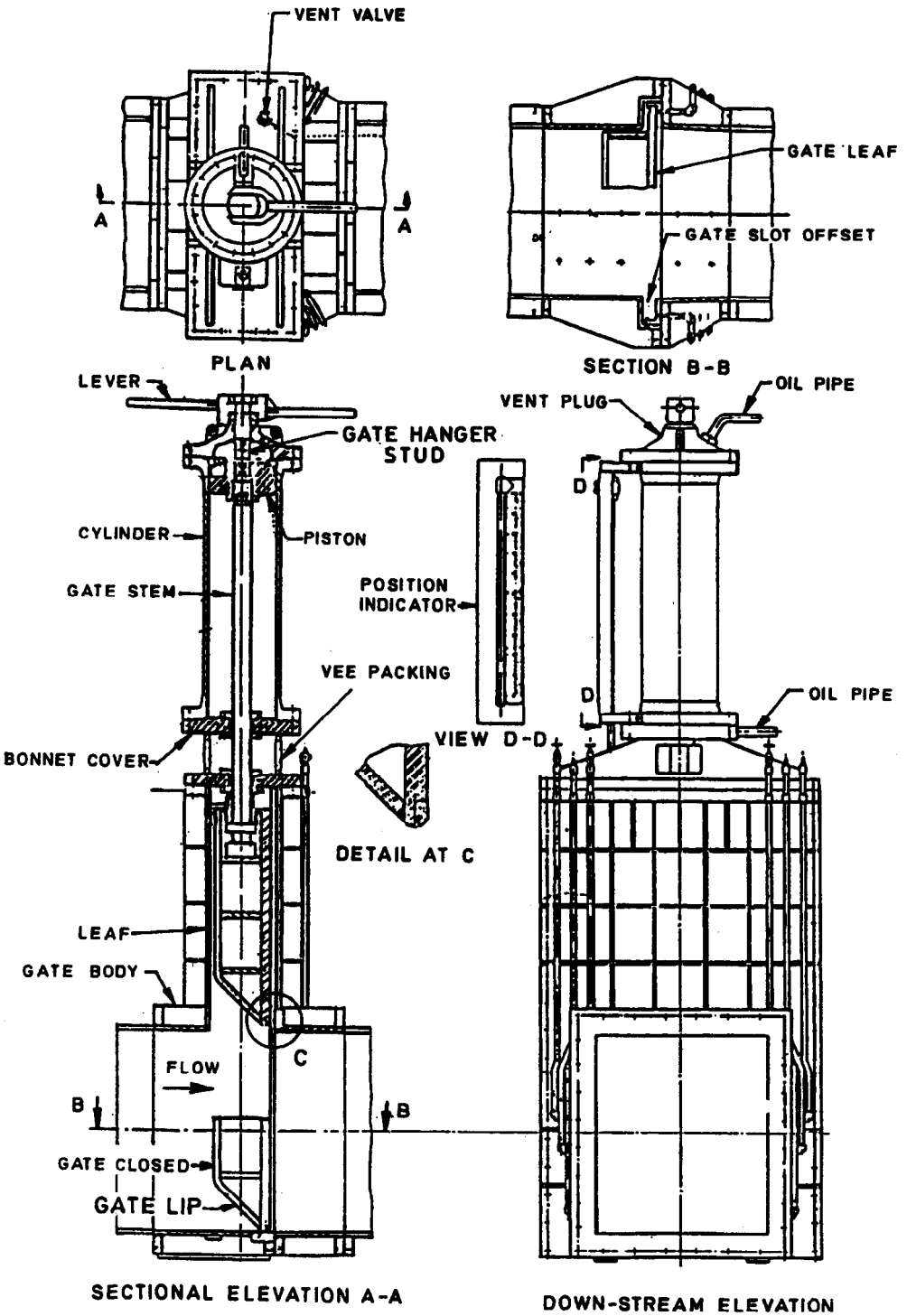


FIG. 39 SLIDE GATE WITH BONNET AND HANGER ARRANGEMENT FOR HYDRAULIC HOIST

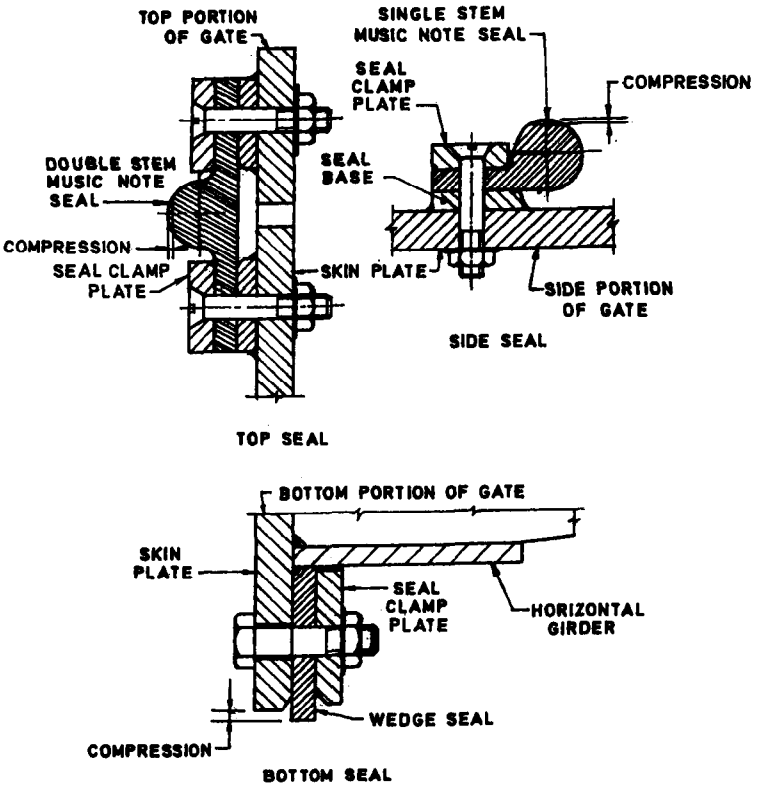


FIG. 40 SEAL FIXING ARRANGEMENTS WITH GATE

3.41 Heel Post or Quoin Post

A post to which a lock gate is hinged.

3.42 Hood

A plate fixed at the top of a gate to allow flood water to pass over the gate.

3.43 Hollow Quoin

Recessed masonry or concrete accomodating the heel post of a lock gate.

3.44 Horizontal Girders

The main structural members of a gate, spanning horizontally to transfer the water pressure from the skin plate and vertical stiffeners (if any) to the end girders or end arms of the gate.

3.45 Hydraulic Down Pull

A net force acting on a gate in vertically downward direction under hydrodynamic condition.

3.46 Hydraulic Shutter

An inclined shutter that is operated to maintain any desired inclination by means of a hydraulic ram connected to a plunger.

3.47 Hydraulic Uplift

A net force acting on a gate in vertically upward direction under hydrodynamic condition.

3.48 Inclined End Arms

The end arms of a radial gate which are inclined to the direction of flow (Inclined arms are used to reduce the maximum bending moment on the horizontal girders of a radial gate).

3.49 Lift of Gate

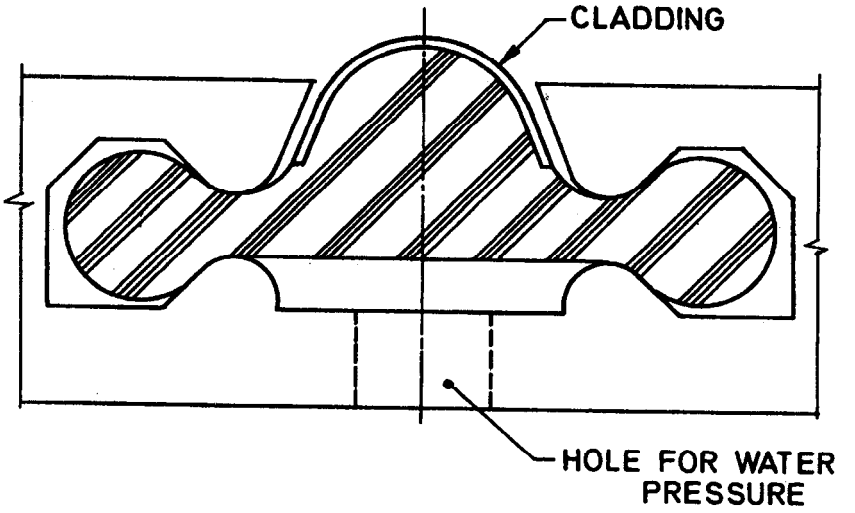
The maximum vertical travel of a gate above the gate sill.

3.50 Lifting Beam

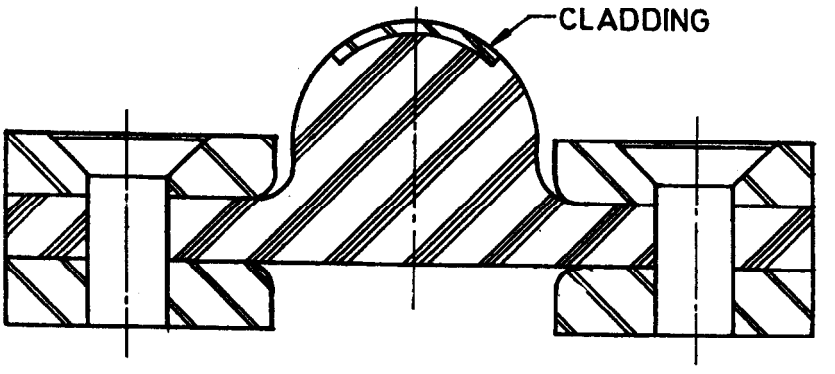
A beam (with a grappling mechanism) suspended from a gantry crane or a travelling hoist and moves vertically in a gate groove for lifting or lowering a gate or a stoplog.

3.51 Lifting Lugs

Structural members provided on a gate to facilitate handling of the gate during erection, installation or operation.



41 A Double Stem Seal with Brass/Fluro Carbon/Teflon Cladded Seal



41 B Double Stem Seal with Brass/Fluro Carbon/Teflon Cladded Seal with Flat Stem

FIG. 41 CLAD SEAL

3.52 Liner

Steel lining generally provided in the gate groove and its vicinity for a medium or high head installation.

3.53 Lock Gate Recess

A recess provided in the side walls of a lock in which a lock gate is supported when in the open position.

3.54 Lock Plate or Keeper Plate

A plate provided on a gate roller assembly to prevent rotation of the roller pin.

3.55 Metal Seal

A metallic gate seal used on slide gates (*see* Fig. 38).

3.56 Mitre Post

A vertical member at the free or swinging end of a mitre gate.

3.57 Music Note Seal or J-Seal or Single Stem Seal

A flexible seal made of natural rubber or synthetic rubber having a bulb and a tangential stem (*see* Fig. 43).

3.58 Parallel End Arms

The end arms of a radial gate which are parallel to the direction of flow.

3.59 Pintle

A structural member below a quoin post about which a mitre gate rotates.

3.60 Pneumatic Seal or Retractable 'Inflated Seal'

A rubber seal which comes into operation by means of air or water pressure after gate has been fully closed. The water pressure or the seal is released before the gate is lifted.

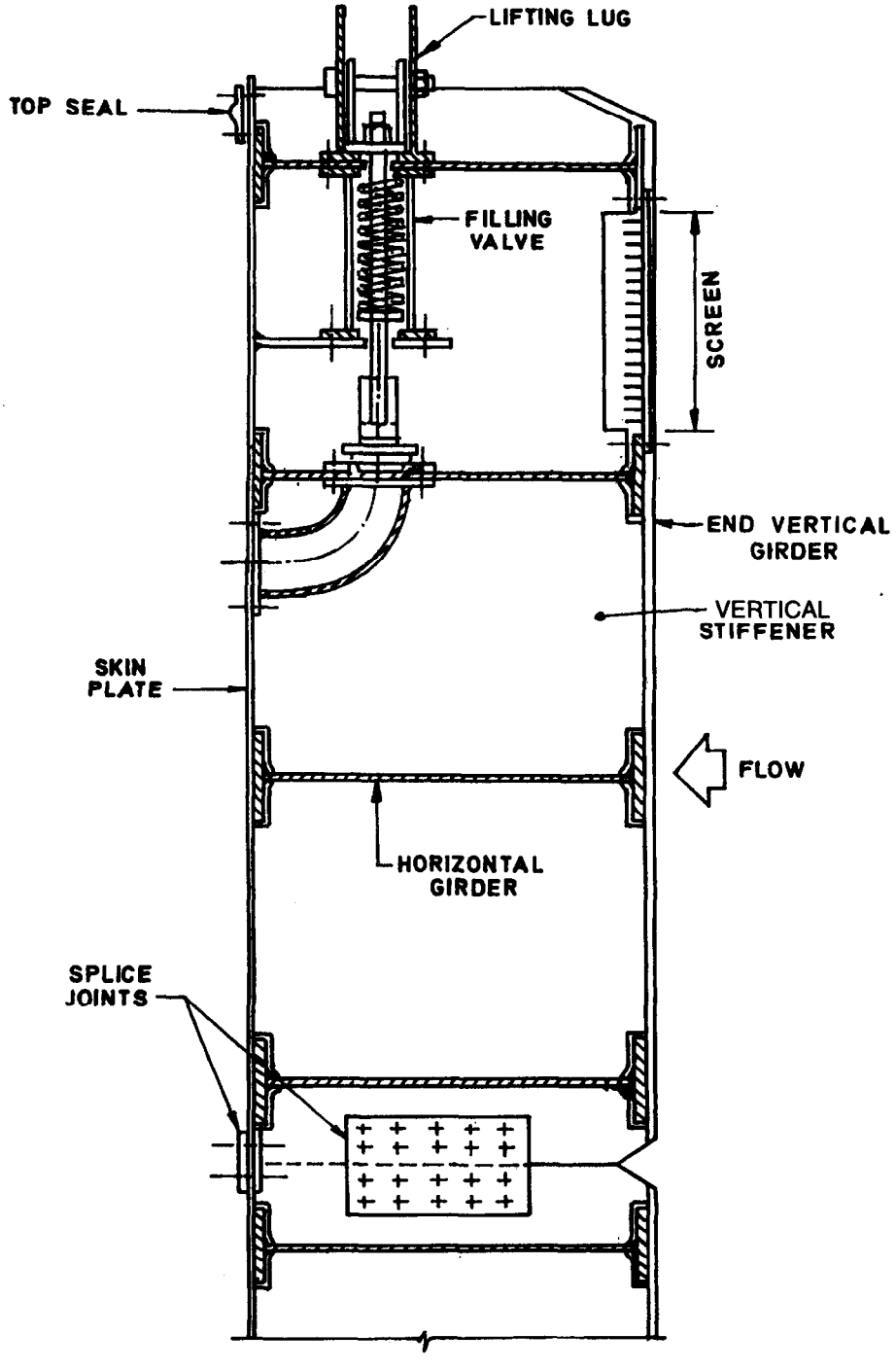


FIG. 42 FILLING VALVE

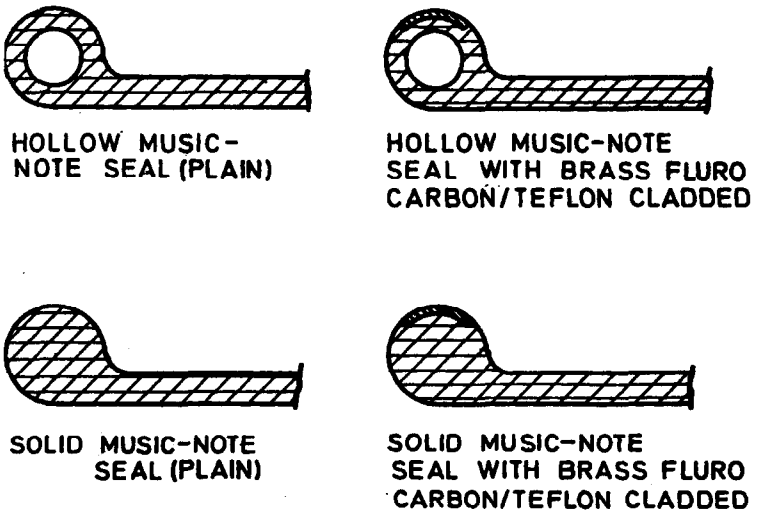


FIG. 43 MUSIC-NOTE SEAL OR J-SEAL OR SINGLE STEM SEAL (PLAIN/CLAD SEAL)

3.61 Radial Arms

Radially placed beams which connect the trunnion of a hinged radial gate to the leaf.

3.62 Rest Chair

A structural member which supports the dead load of the trunnion girder or yoke girder of a radial gate (*see* Fig. 44).

3.63 Roller Train

A series of cylindrical rollers whose pins are connected by a continuous chain or by a bar (*see* Fig. 45).

3.64 Seal

Same as Gate Seal.

3.65 Seal Assembly

An assembly consisting of rubber seal, seal base, clamp plate and fastening bolts and nuts (*see* Fig. 40).

3.66 Seal Base

A plate on which a gate seal is fixed (*see* Fig. 40).

3.67 Seal Friction

The frictional resistance due to the sliding of seal over the seal seat.

3.68 Seal Interference

As applied to hydraulic gate seal the extent by which the rubber seal bulb interferes with the seal seat (*see* Fig. 40).

3.69 Seal Plate or Seal Seat

A metal plate mounted on a gate leaf to transfer water pressure to the seat and to act as a seal (*see* Fig. 38).

3.70 Seal Seat

A plate fixed to the surrounding structure of a gate against which a gate seal bears (*see* Fig. 38).

3.71 Shield

A plate fixed on the two sides of a radial gate to protect the lifting ropes/end arms from water flowing over the gate.

3.72 Side Seals

Seals fixed to the vertical ends of gate leaf (*see* Fig. 38).

3.73 Skin Plate

A membrane which transfers the water load on a gate to the other components (*see* Fig. 40).

3.74 Splitter or Separator

A device provided on the hood of a gate to split the flow to avoid cavitation.

3.75 Spring Point

A point on a gate lip where the flowing water leaves contact with the gate.

3.76 Spring Loaded Guide

A guiding arrangement for gate which ensures relative position of gate and groove by using spring loaded guided device.

3.77 Teflon-Clad Seal

A seal in which the sealing surface is clad with fluoro carbon (Teflon) (*see* Fig. 41).

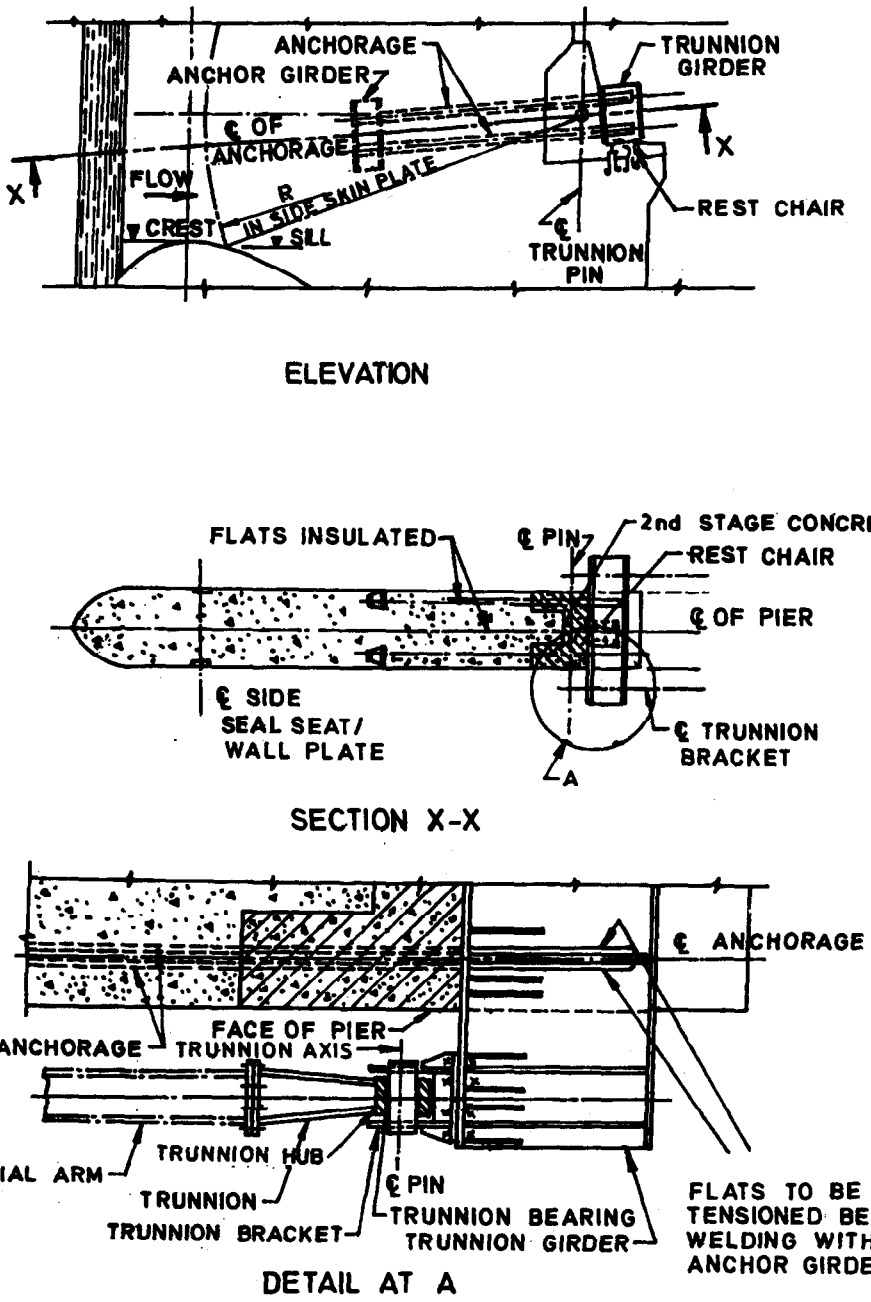


FIG. 44 ANCHORAGE SYSTEM FOR RADIAL GATES

3.78 Thrust Pad or Thrust Block

a) A structural member provided on a gate leaf to transfer water load from the gate to a bearing plate (*see* Fig. 46).

b) A structural member designed to transfer to the pier or abutment that component of water thrust on a radial gate, which is normal to the direction of flow (*see* Fig. 46).

3.79 Top Seal

A seal provided at the top of a gate leaf or gate frame (*see* Fig. 40).

3.80 Track Base

A structural member supporting a track on track plate (*see* Fig. 38).

3.81 Track Plate/Track

A structural member on which the wheels of a gate move (*see* Fig. 38).

3.82 Trunnion Assembly

An assembly consists of trunnion hub, trunnion bush or bearing, trunnion pin and trunnion bracket (*see* Fig. 44).

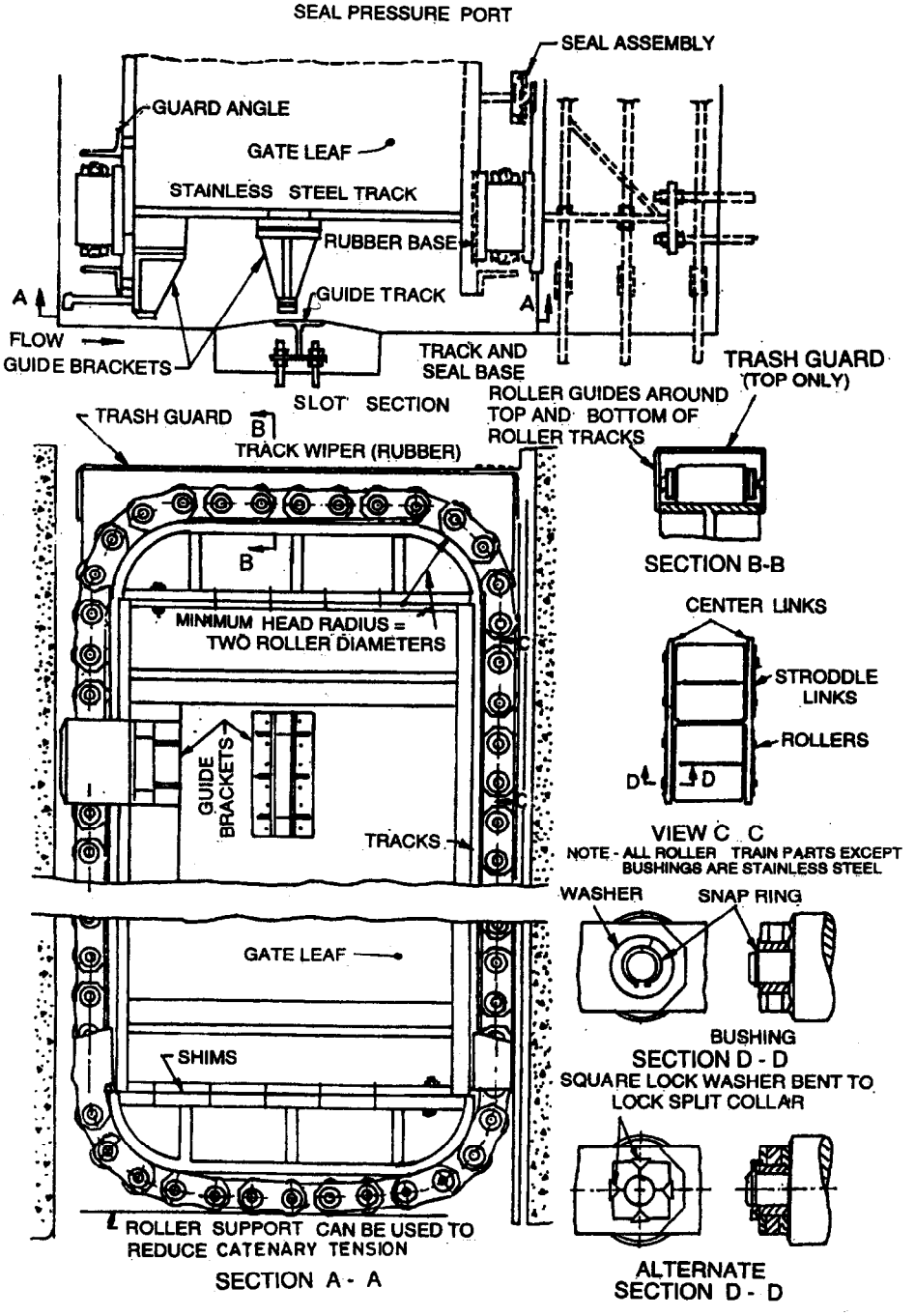


FIG. 45 ROLLER TRAIN

3.83 Trunnion Axis

The axis about which a radial gate rotates (*see* Fig. 44).

3.84 Trunnion Bracket

A bracket which supports the trunnion pin and is rigidly fixed to the trunnion girder (*see* Fig. 44).

3.85 Trunnion Bush/Bearing

A slide type bushing or roller-type bearing which transfers the load from the trunnion hub to a trunnion pin (*see* Fig. 44).

3.86 Trunnion Girders or Yoke Girders

Structural members supporting the trunnion bracket and held in place by load carrying anchors or tension bars embedded in piers/abutments (*see* Fig. 44).

3.87 Trunnion Hub

A hub to which the converging end arms of a radial

gate are rigidly connected. It houses the trunnion bushings/bearings and rotates about the trunnion pin (*see* Fig. 44).

3.88 Trunnion Pin

A horizontal axle about which the trunnion hub rotates (*see* Fig. 44).

3.89 Trunnion Tie

A structural tension member connecting two trunnion assemblies of a radial gate to cater to the effect of lateral force (normal to the direction of flow) (*see* Fig. 47).

3.90 Vertical Stiffeners or Vertical Girders

The structural members spanning vertically across horizontal girders to support the skin plate (*see* Fig. 38).

3.91 Wall Plate

A plate embedded flush in a pier/abutment to provide a track for the seal and guide rollers of a radial gate.

3.92 Wedge Seal

A flat natural or synthetic rubber seal fixed at the bottom of a gate (*see* Fig. 40).

3.93 Wheel Friction

The sum of the axle friction and rolling friction encountered during the movement of gate wheels.

3.94 Width of Groove

The dimension of a gate groove measured in the direction of flow.

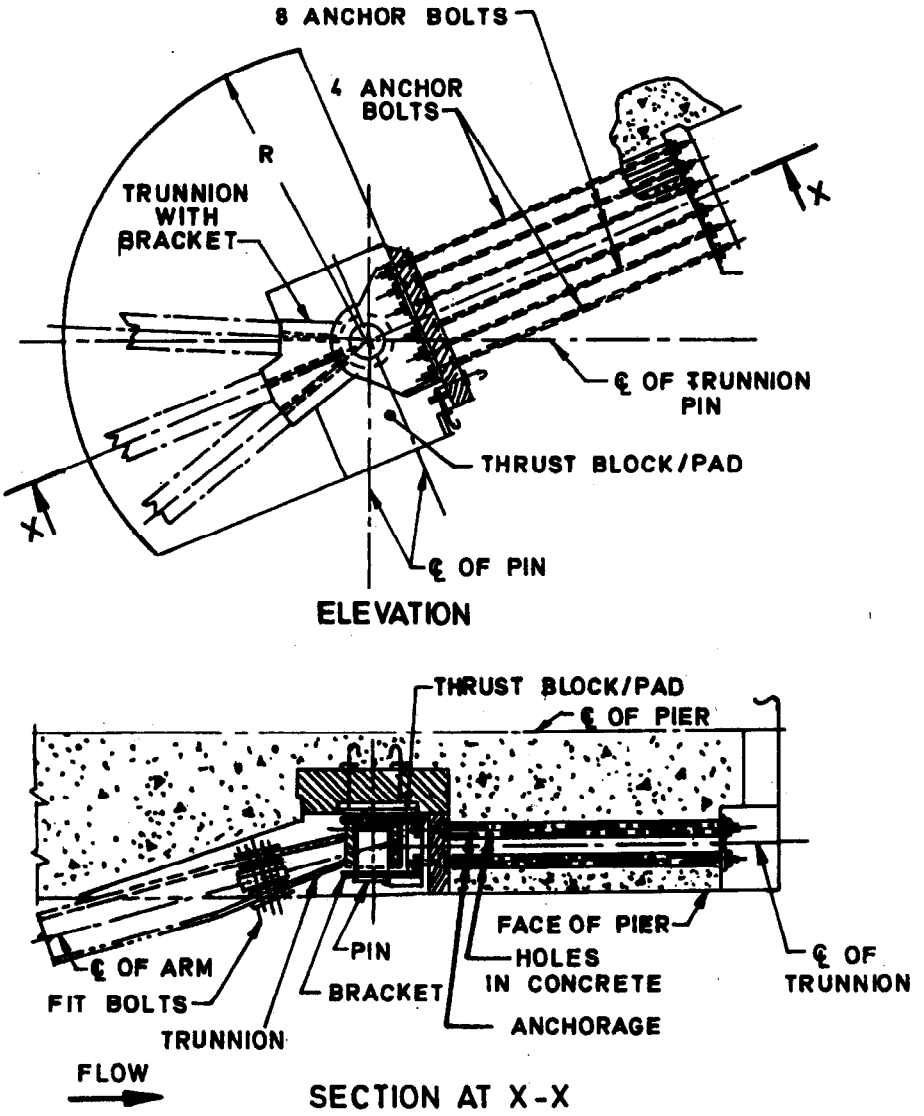


FIG. 46 LOAD TRANSFER THROUGH THRUST BLOCK/PAD AND R.C.C. ANCHORAGE

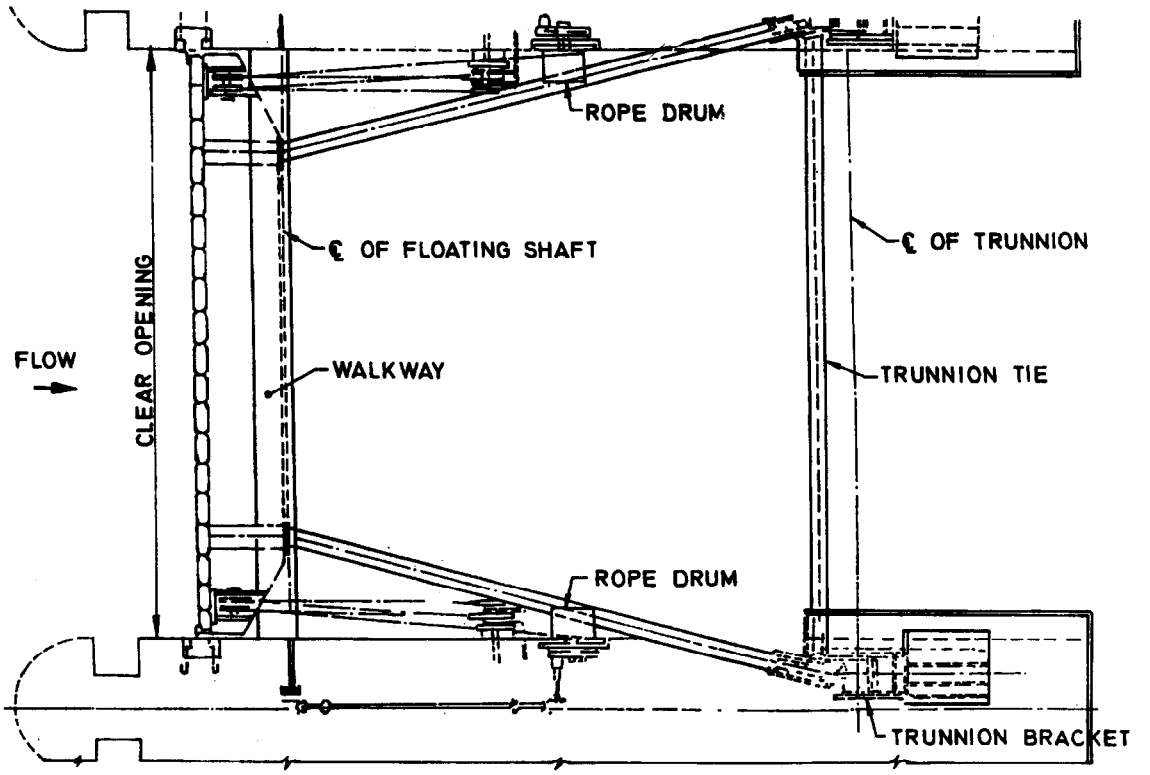


FIG. 47 TYPICAL SECTIONAL PLAN OF SPILLWAY RADIAL GATE D/S SUSPENSION WITH WALKWAY BRIDGE

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc : No. RVD 2 (206).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 323 01 31, 323 94 02, 323 33 75

Telegrams: Manaksanstha
(Common to all offices)

Regional Offices:	Telephone
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002	323 76 17, 323 38 41
Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola, CALCUTTA 700054	337 84 99, 337 85 61, 337 86 26, 337 86 62
Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022	60 38 43, 60 20 25
Southern : C. I. T. Campus, IV Cross Road, CHENNAI 600113	235 02 16, 235 04 42, 235 15 19, 235 23 15
Western : Manakalaya, E9 MIDC, Marol, Andheri (East), MUMBAI 400093	832 92 95, 832 78 58, 832 78 91, 832 78 92

Branches : AHMADABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. NAGPUR. PATNA. PUNE. THIRUVANANTHAPURAM.

Printed at New India Printing Press, Khurja, India