



SECTION VIII Nos. 113—128

Water handling and water power devices, propeller wheel and steering device.

### Section VIII

**113.** Old oaken bucket. This is the first known method of raising water from a well of no considerable depth. Use is made of a lever of the first type (See first model on No. 2). The rock or counter balance attached to the boom assists in lifting the bucket because it equals about one-half of the weight to be raised.

**114.** Double bucket well. Another method for raising water makes use of the common pulley (See No. 25). The empty bucket is pulled down in order to raise the full one.

**115.** Bailing or lifting scoop. This device is for raising water short distances. The scoop is connected by a rod to one end of the green elbow lever which has force applied at its other end.

**116.** Pendulum water lift. This device for raising water is operated by hand or other power. By following the arrows leading from each pick-up bucket to the overflow it is easy to trace the action, the whole device oscillating on the center represented by red disk.

**117.** Balance pump. This type of pump was an early form, operated by a man swaying from right to left over the center of the bridge. Slaves and criminals were commonly used and so worked out their sentences in labor. The two plungers represent valve pumps.

**118.** Hydraulic ram. This machine for raising water will furnish a supply of water at a high level. The alternate action of the two

valves operated by the force of the moving water, allows the water to enter the air chamber. The valve on the right is kept open by its own weight until sufficient water has entered the inlet and forced it shut. As stop valve closes, the small valve is forced open and water enters the air chamber rising to a certain level with pressure that equalizes the air pressure. When the small valve closes again, the right-hand one opens. A constant upward stream into tank is obtained by the compressed air in chamber acting on surface of water.

**119.** Fourneyron turbine water wheel. As the water enters the holes in the center, it flows against the fixed guides or shutes. These direct the water against the buckets of the outer wheel, causing it to revolve. The water then escapes through discharge.

**120.** Warren turbine water wheel. In this type of turbine water wheel the position of fixed guides and revolving wheel is opposite to that in No. 119. Water enters inlet at top and falling upon fixed guides on outside is directed upon center wheel, causing it to rotate. Water is discharged through holes at the center.

**121.** Undershot water wheel. The motion is caused by the water flowing under gate on left pushing against the wheel. The speed of the wheel is regulated by raising and lowering the gate valve, allowing more or less water to flow through.

**122.** Lift and force pump. This is the ordinary force pump having two valves. The

plunger is raised by the handle causing valve A to rise, drawing water from low level into the pump chamber. On the descent of plunger, valve A closes and water is forced through valve B into discharge pipe at higher level. As handle is again raised, water in discharge pipe closes valve B.

**123.** Current power water lift. This device is sometimes called a Persian wheel. It has a hollow shaft in the center and curved buckets, at the ends of which other forms of buckets are suspended. The motive power is supplied by the end buckets which turn as water strikes them and present a good driving surface. Their under surfaces offer no resistance because they travel in direction of water. This is one of a few instances where the motive force also carries a load. As the wheel rotates, all buckets pick up water. The small buckets discharge water at the top after being tilted by a stationary pin and the curved buckets discharge water through the hollow shaft in center.

**124.** Volute turbine water wheel. This type water motor is used for furnishing power. Water, entering at the inlet, flows around inside of gradually narrowing passage between vanes and outer shell, or casing, and causes vanes to rotate. Great pressure is exerted by the water seeking to escape. As the water escapes through the discharge at center, it is forced against the radial surfaces of the red propeller wheel and again exerts power on the drive shaft A.

**125.** Overshot water wheel. Motion is given to wheel by force of water striking against the

buckets at top of wheel, and also by the weight of the water in the buckets as they rotate downward.

**126.** Archimedes screw. This machine is said to have been introduced by Archimedes. The motive power is supplied by the stream, rotating the green wheel. As spiral pipe, represented by glass, is rotated by the wheel, water runs in lower end seeking its level on the lower side of turn in pipe. This lower level advances with the spiral shape of pipe and water is automatically raised to the top and discharged. Note travel of water as represented by balls in bottom of each turn of coils.

**127.** Vertical paddle propeller wheel. This is the most efficient type of paddle wheel. The green driver arms are the supports for the rotating paddles. The red arms are attached by crank arms to the green arms. The red driver is eccentric to the green driver. The rotating action of the two causes the paddles through the crank arm connections to be held always in a vertical position with their surfaces always meeting the water at right angles to their travel. This is the most efficient angle for driving.

**128.** Steering wheel and winch. Ordinary steering apparatus. On the shaft of the hand wheel is a barrel on which is wound a rope. The ends of the rope pass around guide pulleys and are attached to a lever or tiller on the top of the rudder. By turning the wheel in opposite directions, the rope will wind and unwind, pulling the lever in the direction the wheel is turned.