Referring to the annexed illustrations it will be seen that the Fromentin self-acting feeder consists mainly of the two pear-shaped bottles, circular in cross section, and each capable of holding about 12 gallons of water, these two bottles being connected to the central disk by means of two sets of pipes. The pipes marked 2, 21, connected to the top of the bottles, are those through which steam finds its way alternately into the two bottles each time the apparatus moves or makes a stroke, this taking place whenever the water level in the boiler is lower than it should be, or than the bottom end of the plunge, or steam supply pipe inside the boiler. This steam supply pipe finds an inlet to the apparatus at the top flange 11, Fig. 2; the outlet for the non-condensed steam is at 14, this steam by means of a wipe being led back into the water supply tank and thus assisting in heating the cold supply water before it goes into the bottles. The water supply inlet to the apparatus is at 13, and the outlet or delivery to boiler at 12, the water passing into the boiler through an ordinary check or back pressure valve mounted close up to the boiler in the usual manner; the arrows shown at each of these passages in Fig. 2 indicate the direction taken by both steam and water.

The two disks on which the apparatus turns are represented in Figs. 3 and 4, that shown by Fig 3 being stationary and bolted down to the foundation plate, while that represented by Fig. 4 is movable, the latter being that disk to which the two bottles are connected by means of the pipes before mentioned. In the fixed disk Fig. 3, and which receives at the back all the flanges and connections, including both the water and steam supply as well as the delivery to the boiler, there are, as is seen, two distinct sets of ports, the top set being for steam and those at the bottom for water; the movement given to the apparatus is just sufficient to open and close these ports.

The two cylinders, 18, 18, Fig. 1, contain water, and the descent of the pistons in them is met with just sufficient resistance to allow the loaded bottles to come down noiselessly and and without knock ; the stroke is about 10 in., and is adjusted by means of the pistons in these cataract cylinders. The apparatus moves or makes one stroke on the average about every three or four minutes, but its action being purely automatic and its function to maintain a constant level, the number of strokes in a given time must necessarily depend upon the rate of evaporation.

The general action of the apparatus may be summed up thus: for instance, in the above illustration we will suppose the feeder has just moved or made a stroke in consequence of the now lower bottle 1, Fig. 1, having while uppermost been filled (and thus become the heavier of the two) with water from a small supply tank or from the town water service pipes, while at the same time the opposite bottle 1, Fig 1, while lowest has been emptying a portion of its contents into the boiler; this state of things has, however, been now reversed, and, as seen in Fig. 1, the bottle 1 is open to the boiler, and the water level in the latter being slightly lowered by evaporation, steam passes at once into the now full bottle up the pipe 2, and presses on the surface of the water with a force due to the boiler pressure, the water gradually passing out of the bottle by way of the pipe attached to the bottom of the same into the boiler through the delivery pipe and check valve, the flow of the water from the apparatus boilerwards being simply due to gravity or to the elevation of the apparatus above the level of the water line in the boiler-an elevation which need not in any case exceed three feet.

It may also be remarked that when the water level in the boiler is at its maximum, or say when the lower end of the plunge steam pipe is sealed, steam is then of course no longer able to pass up the pipe into the bottles, this state of affairs continuing until by evaporation the water level has again be-come lowered sufficiently to unseal the pipe. It is while the water is at the maximum level that certain returns of water from the boiler take place back into that bottle then in communication with the boiler through either one or other of the two steam pipes, 2, 2, attached to the bottles, the steam which had previously found its way into the bottle having condensed and left the latter partially empty, but the vacuous space being soon filled up again by these rapid returns of water from the boiler. This reversal of current through the pipes and the intermixture inside the bottle of the water of a higher temperatuce direct from the boiler, with that already remaining in the bottle is found by experience to be productive of the most beneficial results, as it not only keeps all the ports, pipes, bottles, etc., clean and free from all scale or deposit of any kind, but also lends material aid by way of preventing incrustation in the boiler, the solids contained in the water being precipitated in the bottles under the action of a higher temperature before admission to the boiler, and thus scaling or incrustation inside the boilers fitted with this apparatus being, it is claimed, greatly diminished.—Engineering.

## NEW ICE CUTTING MACHINE. (See page 220.)

The enormous and very general consumption of ice for manufacturing and domestic purposes has made ice harvesting one of our great industries. Important as the ice crop is, it is Important as the ice crop is, it is extremely precarious, being controlled not only by the variable forces of nature, but also by a great army of men, who cut, gather, and store the ice for distribution and use. The ice harvesters, like men employed in many other kinds of business, the are liable to disaffection, and it has at times occurred that the best ice of the season has been wasted in consequence of the want of a force of men necessary to secure it.

In view of the great amount of labor required in harvesting ice, and in view of the necessity for accomplishing it at the most favorable time, Mr. Chauncy A. Sager, of Valparaiso Ind., has devised a very ingenious and effective steam ice cutter, which makes a longitudinal cut while the machine is advan cing, and at the same time making transverse cuts, thus form ing cakes of suitable size for handling.

The machine propels itself forward slowly, the engine at the same time driving the saws. The saw making the longitudi nal cut is suspended on a long arm pivoted to the rear end of the machine on the avial line art. the machine on the axial line of the driving shaft, and ex-tending some little distance machine and extending some little distance rearward, and is driven by a cord or belt from the sheave on the distance rearward, and is driven by a cord or belt from the sheave on the driving shift.

At the side of the main frame of the machine there is a swinging frame supported from a countershaft journaled in an overhanging frame. The swinging frame carries at its lower and free end a saw shaft, on which is secured the cross-cutting aw, and which is partial at the secure of the cross-cutting saw, and which is provided with a key way, receiving the spline of the driving pulley, the shaft being free to move end of wise while the nulley remains in the shaft being free to move end of wise while the pulley remains in one position. On the end the the saw shaft is a sharp edged curved shoe, which engages and is standied by a set of the ice, and is steadied by a rod extending from the forward end of the swinging frame. Motion is communicated to the countershaft of the cross-cutting saw by means of miter gearing and a shaft running lengthwise of the main from the the mark and a shaft running lengthwise of the main frame of the main chine. On the formation of the main frame of the main frame of the main chine. chine. On the forward end of the shaft geared to the long-tudinal shaft there is a crank, which gives lateral motion to the swinoing frame and access the the swinging frame, and causes the saw to make the crosswise cut. cut.

The motion of the saws is controlled by levers at the forward end of the machine. The driving wheels are provided with spikes to give them a firm hold on the spikes to give them a firm hold on the ice, and the forward axle of the machine is more black. axle of the machine is movable on a king bolt to permit of steering. steering.

The two saws with their supporting frames are capable of being folded over on the machine when they are not in use, of when the outton is to be used in the sector of the sector is to be used in the s when the cutter is to be moved from one place to another.

In operation the machine is propelled forward by the action the engine the server the se of the engine, the saw at the rear is revolved, cutting the is longitudinally, at the same time the cross-cut saw is engaged in the ice and the swinging frame action is engaged in the ice and the swinging frame receives lateral motion through its crank connection. When the cross-cut saw enters the ice the sharp edged shoe concerns the the ice the sharp edged shoe engages the ice and prevents as rate from and prevents as rate from and prevents as the ice as t cross-cutting saw raft from end motion while the saw mall its cut. While this is being done the machine gradually moves forward, causing the saw at the same time to make the longitudinal cut which separates the incident longitudinal cut which separates the ice into blocks as has transverse cuts are passed. When the cross-cutting saw hich completed its excursion it has also compressed a spring which carries the shaft and saw back to the print of a spring which carries the shaft and saw back to the point of starting as ine is saw is released from the ice either by saw is released from the ice either by running out or by being raised by cams provided for that purpose. The cross-cutting saw is now ready for another cut, and the operation just scribed is repeated.

For gauging the distances between the longitudinal cuts in e ice and for facilitating the making the making the second se the ice and for facilitating the making of parallel cuts the and chine is provided with a making of parallel cuts the and chine is provided with a graduating gauge which extends downward from the under surface of the main frame. This machine is capable of very provided with

This machine is capable of very rapid operation, and abo publess be appreciated by ice berty rapid operation, and abo doubtless be appreciated by ice harvesters and dealers know the value of time in ice harvesting seasons.

Further information in regard to this useful invention may be obtained by addressing the inventor as above.