## 150 HYDRAULIC LIFT LOCK ON THE TRENT CANAL.

or outside cylinder of steel castings. In the type of accumulator invented by Lord Armstrong, the ballast-box, whereby the weight is applied to the top of the ram, is in the form of a ring encircling the press. But this appears to be undesirable, because when the ram is at the top of its stroke there is practically a pivot joint in the middle of the column, the height of which is twice the length of the This accumulator is now built with the ballast-box directly ram. on the top of the ram, and the top of the press is stayed to the walls of the concrete, where it is installed. It is expected that a much steadier motion will be obtained in the machine by this method. The accumulator is installed in a void in the eastern side tower, and a cylindrical well has been carried down to about the level of the top of the large presses in order to contain the press. The stroke of the ram will be accommodated in the height of the tower. The diameter of the ram is 20 inches and its stroke is 30 feet 6 inches. This will give, without further supply from the pumps, a sufficient quantity of water to raise one of the large rams one foot high.

As it was necessary that the accumulator and pump should be installed, it was thought desirable that the gates and the capstans for towing vessels in and out of the chambers might also be operated to advantage from this power, so it was decided to use Brotherhood three-cylinder hydraulic engines to operate the gates, one for each pair of gates upstream and another for each pair of gates downstream, the gearing being so arranged that only one pair of gates can be worked at a time. The hydraulic capstans are practically of the same form as these engines and are operated by the same power. The engines and the capstans are being constructed by the Hydraulic Engineering Co. of Chester, England.

## THE PUMPS.

The accumulator receives its supply of water from two high pressure hydraulic pumps located in the pump-room. Each of the pumps has a capacity sufficient to operate the accumulator, the two being provided in order to form a duplicate plant. The pumps are built in the most substantial manner, having bronze pistons and piston rods, and bronze-lined cylinders. They are directly connected to the turbines by which they are driven, and are so arranged that in case of accident both can be connected to pump up the lock-chambers singly so as not to completely stop the traffic on the canal.