A *weir* is an obstruction in a channel flow which can be calibrated to measure the flow rate, as in Fig. P5.32. The volume flow Q varies with gravity g, weir width b into the paper, and upstream water height H above the weir crest. If it is known that Q is proportional to b, use the pi theorem to find a unique functional relationship $Q(g, b, H)$.

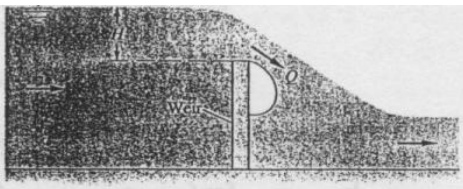

Fig. P5.32

Solution: Establish the variables and their dimensions:

Q	=	fcn(	g	,	b	,	H	)
$\{L^3/T\}$			$\{L/T^2\}$		$\{L\}$		$\{L\}$	

Then $n = 4$ and $j = 2$, hence we expect n-j = 4-2 = **2** Pi groups, capable of various arrangements and selected by myself, as follows:

$$\frac{Q}{g^{1/2}H^{5/2}} = \text{fcn}\left(\frac{b}{H}\right)\text{; but if } Q \propto b\text{, then we reduce to } \frac{Q}{bg^{1/2}H^{3/2}} = \textbf{constant } Ans.$$