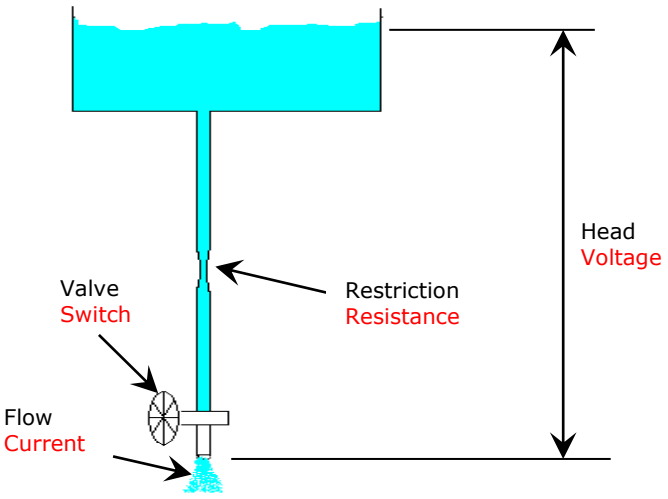
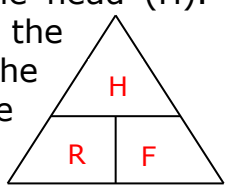
Mechanical Analogy of Volts (U), Current (I) & Resistance (R)

Consider the system shown below. The **vertical** distance between the top of the water in the tank and the point of use at the bottom of the delivery pipe is known as the *Head*. The greater the head, the greater the pressure will be at the point of use. The head is the driving force that will cause flow if the valve is opened. In electrical terms this would equate to the *Voltage.*

The restriction in the pipe will cause a resistance to flow and the greater this restriction the greater the resistance to flow will be and the less water will arrive at the point of use for the same head. Not only will the restriction itself cause resistance but so will the pipe. Narrow pipes cause greater restriction than wide pipes. In electrical terms these restrictions are the *Resistance* and this resistance is a sum of the primary resistance itself plus the resistance of the associated wiring.



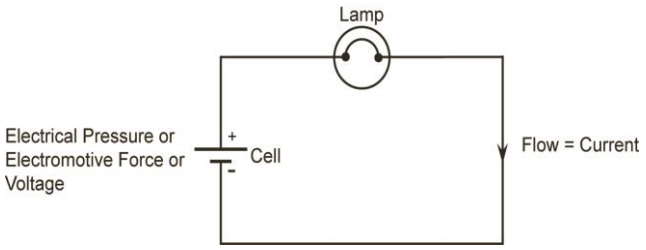
The amount of flow (F) from the valve is determined by both the restrictions (R) in the system and the head (H). The less restriction then the greater the flow and the more head then the greater the flow. The triangle shown



illustrates the relationship of the three quantities. In Electrical terms H, R and F are replaced by U, R and I and this forms the basis of Ohms Law. The second triangle illustrates the relationship of these electrical quantities. The analogy is identical in that a large current is possible if the Voltage is large and the resistance is small.

The diagram below shows a simple electric circuit where the electromotive force (Voltage) causes a current to flow. The circuit, consisting of a lamp and its associated wiring has a combined resistance that results in a particular value of current flow.

Smaller cross sectional areas in both pipe and wire will cause less



flow/current in the systems. This is due mechanical friction in one system and electrical friction in the other. Conductor materials in both analogy's may reduce frictional losses for example; qualplex versus gunbarrel in the mechanical system or copper versus aluminium in the electrical system.

Valves need to be properly rated for maximum flow possibility in the mechanical system as do switches for maximum current rating in the electrical system.