

# Coursework example

[Science](#), [Physics](#)



WORK By Affiliation Heron's Fountain Heron of Alexandria is the inventor of the Heron's fountain which he developed in the First Century AD. Heron was regarded as a mathematician and physicist of the 1st Century AD whose blending of mathematical and physics' principles and concepts led to the invention of the Heron's Fountain. Through the reliance on air pressure and steam, Heron was able to construct items which were mostly appreciated as toys as they did not have industrial or commercial use at the time of invention. However, some of the toys that Heron made include the fountain which makes use of hydraulics' and pneumatics' principles.

#### Functioning of the Heron's Fountain

Illustration 1 above shows a Heron's Fountain schematic drawing. Three major parts of the Heron's fountain facilitate the functioning of the fountain. In the schematic diagram, there are three components referred as Basins A to C. Joining the basins together are vessels that allow air and fluid pressure to be transferred through. The connection of the parts as shown in illustration 1 show that the apparatus should make use of supporting mechanism in order to hold each component or part to the respective position.

With respect to Basin B, the top of the component should be sealed off and then water is poured into the basin. Basin C is left empty and connection hose is hooked to join the two basins/vessels as illustrated in the figure above (illustration 1). Additionally, Basin A is placed above Basin B and a joining hose to Basin B is fitted connecting the two. Basin A and Basin C are connected as well using another hose as shown in the figure above.

When water is poured into Basin A, it flows through the hose connecting

Basin A with Basin C and collects in Basin C. When the water flows into C, air in C is replaced and hydrostatic pressure results ( $P_2 = \rho gh_2$ ) adding to the primary atmospheric pressure ( $P_{atm}$ ) of C's air volume. Following the flow of air from C as result of the Pascal's principle and forces the water in vessel or Basin B to move up the hose connecting B with A. There is action and reaction between pressure exerted by the air and the primary atmospheric pressure leading to hydrostatic pressure ( $P_1 = \rho gh_1$ ). Air in basin B and C is compressed and drives the water to shoot from the upper basin thus resulting in a continuous movement of water to run the fountain (Brown, 2010).

#### Change in Measurements

Heron's Fountain considered various principles and concepts of physics. Among the most applicable are Pascal's and Bernoulli's principles. While Pascal's principle explains the pressure changes as a result of the water replacement of air, Bernoulli's principle on the other hand showcases the effect of measurement adjustment. For instance, in order to change the speed at which the water is shot out of the nozzle, the distance between A and B can be lengthened (Thomas, 1982). Additionally, based on the diameter of the hoses, it is likely that smaller diameters will result in differing speeds of the water. For instance, the increase in the diameter of the hose connecting A and C, it means that the flow of water from A to C would be rapid and replacing the air in C quicker. By maintaining the diameter of the hose connecting A and B would result in a higher speed of the water flowing from the hose. The application of Bernoulli's equation (See below) provides room for the calculation height, atmospheric pressure, air pressure, and

velocity of the water from the hose emerging in Basin A.

$$P_{\text{atm}} + \rho gh_1 + \rho v^2 = P_{\text{atm}} + \rho gh_2 \quad (1)$$

Solving equation (1) for  $v$ , we find (2)

$$v = \sqrt{2g(h_2 - h_1)}$$

#### References

Brown, H. (2010). 507 Mechanical Movements; Mechanisms and Devices, 19th edition. Oregon: Watchmaker Publishing. p. 111.

Thomas G. (1982). "Nineteenth Century Textbook Illustrations, XLI. Heros Fountain", Phys. Teach. 20; 169-170