



### MAGDEBURG HEMISPHERES

MGH001

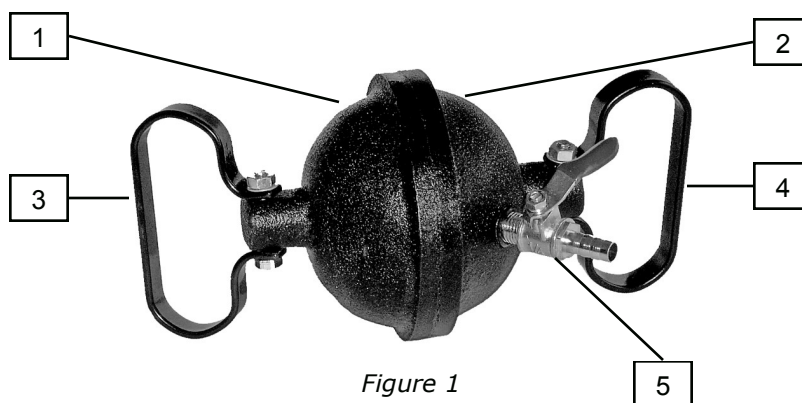


Figure 1

#### DESCRIPTION

The Magdeburg Hemispheres consist of a pair of matching cast iron hemispheres (1,2, *Figure 1*) with their mating surfaces ground flat to fit each other closely. Two handles (3,4) are attached to the hemispheres, and a valve (5) with a hose barb is fitted to one hemisphere.

When the hemispheres are fitted together, they form an airtight sphere. With an air pump attached to the hose barb, the air can be removed from the sphere. Air pressure from the outside then prevents the hemispheres from being pulled apart, even when a large force is applied. This demonstrates the forces that can be generated by air pressure.

#### HISTORICAL BACKGROUND

During the 17th century, many scientists became interested in the properties of air. An Italian investigator, *Evangelista Torricelli*, showed that the normal pressure of the air can only support a column of mercury about 76cm high. If the tube containing the mercury is longer than that, there is a vacuum above the mercury.

This work inspired the mayor of the German city of Magdeburg, *Otto von Guericke*, to design an air pump that could produce a vacuum in any container. It was ready in 1650, and now von Guericke needed a device to demonstrate the power of his pump. He designed a large pair of copper hemispheres (about 50 cm in diameter) that fitted together so that he could use his pump to create a vacuum inside. Then he would see if two teams of horses could pull the hemispheres apart.



Von Guericke's original hemispheres and pump. (Deutsches Museum, Munich)