III IYNT 2015

Problem № 16
«Smoke ring cannon»

Team *«MG 12»*

Objective:

- Construct such a vortex ring cannon that would shoot with smoke rings on a distance sufficient to hit the chairperson of your Science Fight

Hypothesis

- If there is a viscous friction substance, it can be observed education toroidal vortex the sudden change in the flow rate.

Purpose

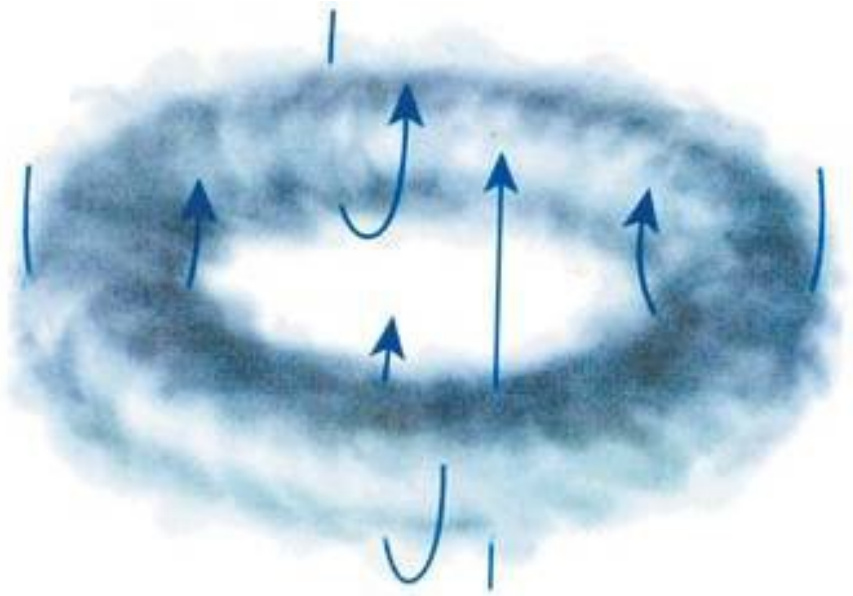
- Construct such a vortex ring cannon that would shoot with smoke rings on a distance sufficient to hit the chairperson of your Science Fight. Determine what does the range ring depend on.

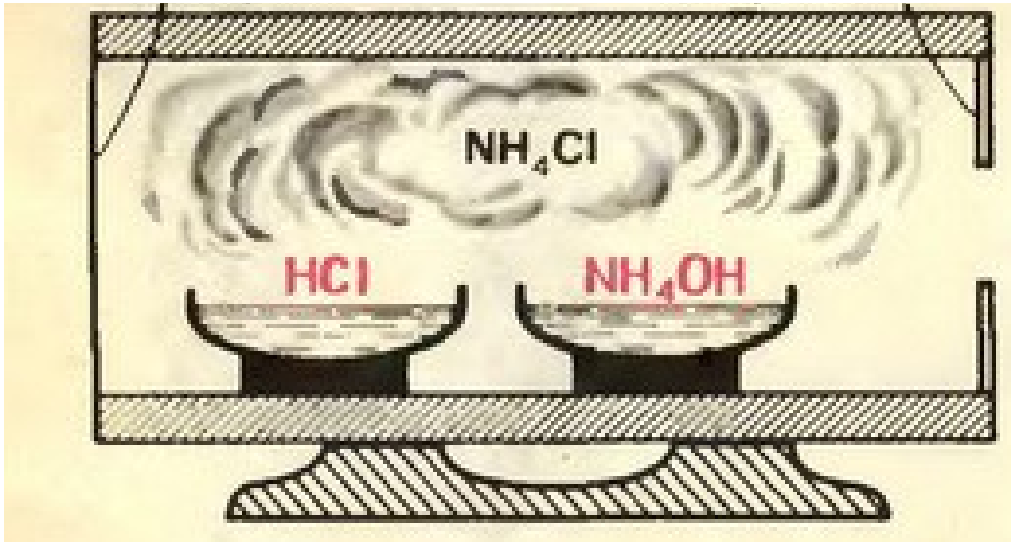
Tasks

- To study the literature on the research topic.
- To explain the observed phenomenon.
- To construct a vortex smoke gun with a maximum range of the toroidal ring.
- To consider the options that affect the physical characteristics of smoke.

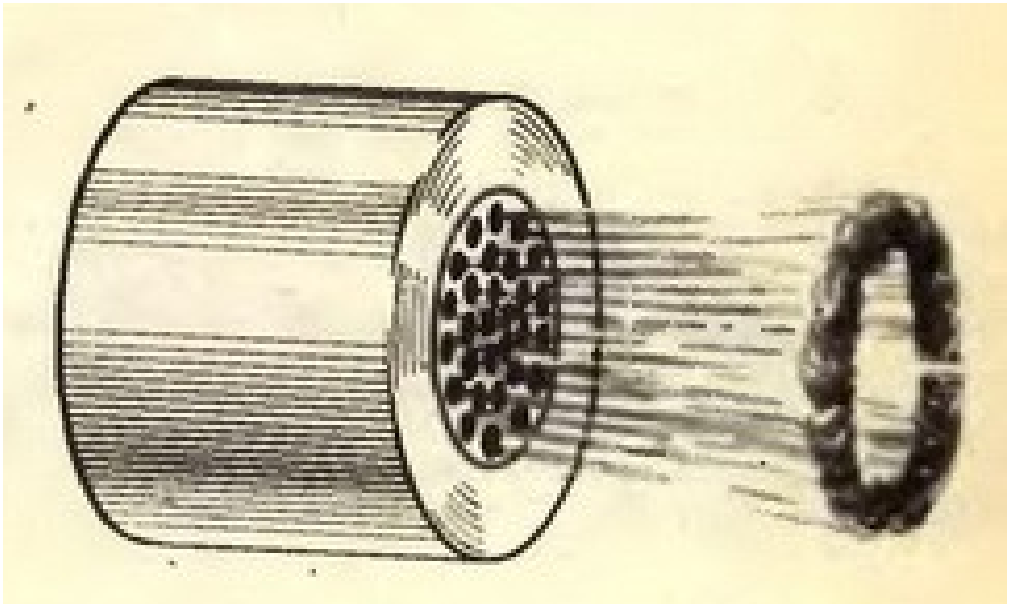
Theoretical substantiation of the formation mechanism of the ring

Vortex



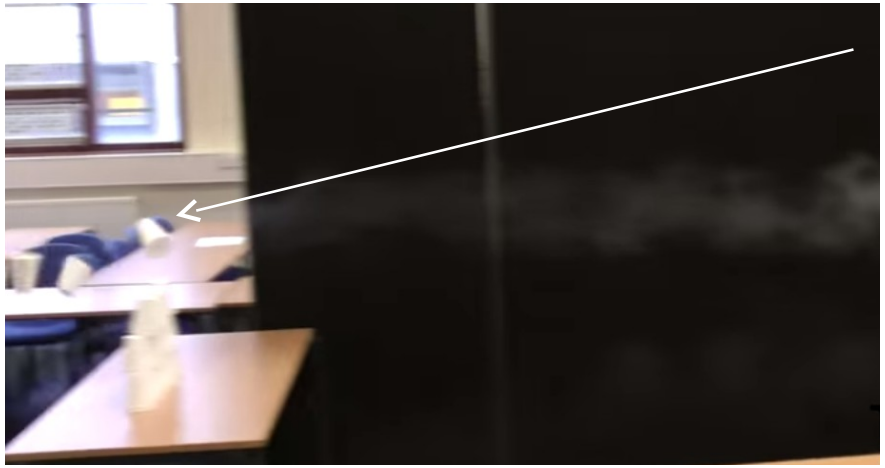


Pic 1. Tate device for vortex will repay in

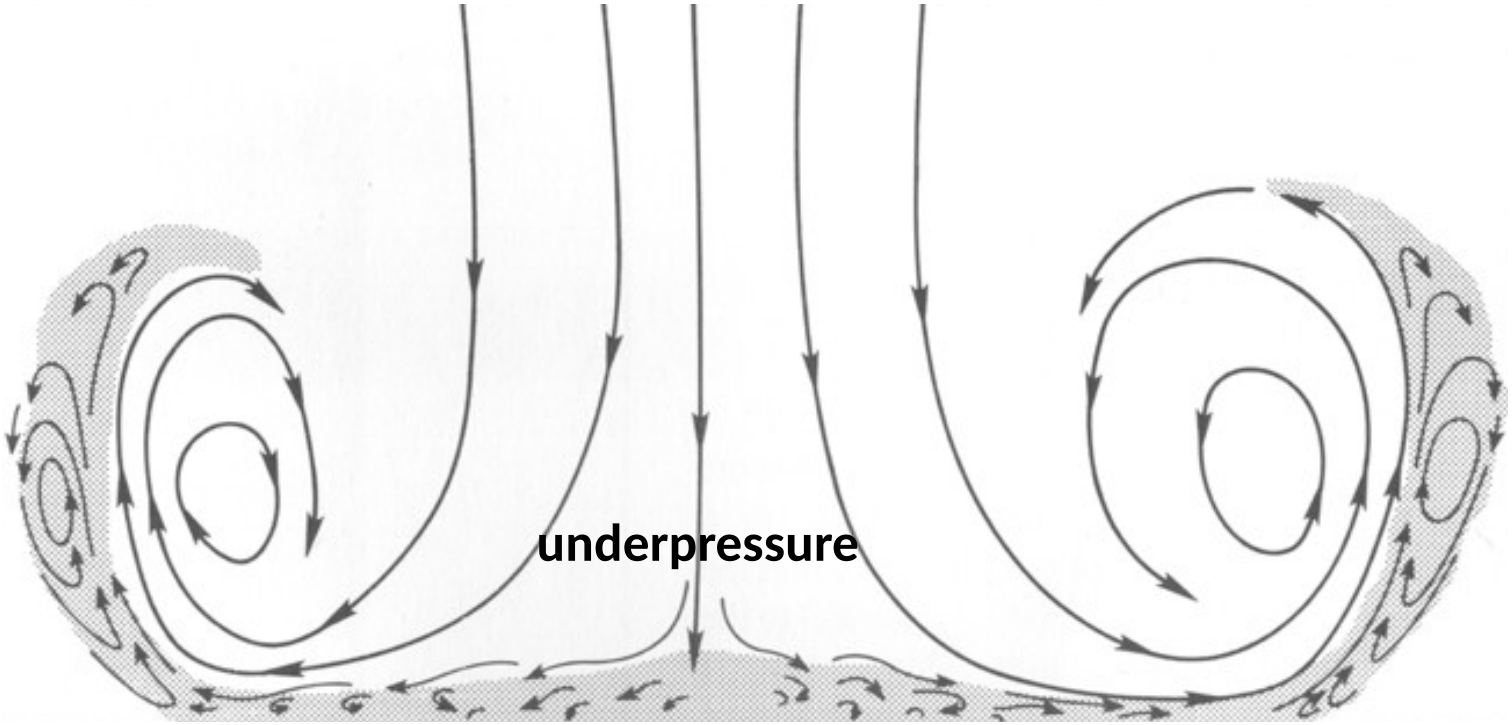


Pic 2. The formation of vortices using iris-sieve

Spherical Hill's vortex



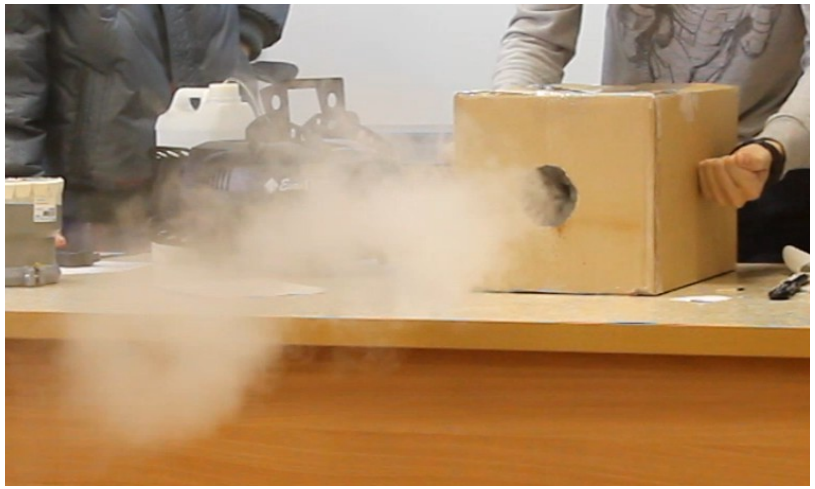
The viscosity of the medium



The experimental part of the study

Experiment 1

- Purpose: determine the dependence of the flight range of ring volume smoke chamber
- Equipment : smokebox different volumes, smoke machine



- Results: maximum range is achieved by using rings smoke chamber a larger volume

Experiment 2

- Purpose : determine the flight distance depending on the speed change ring volume smoke chamber.
- Equipment : Large-volume smokebox, smoke machine.

- Results: largest range rings is achieved at a faster rate of change of volume of the smoke chamber.

Experiment 3

- Purpose : determine the flight distance depending on the smoke concentration.
- Equipment Large-volume smokebox, smoke machine, clock.
- Results: largest range rings is achieved at an average concentration of smoke in the smokebox.

Experiment 4

- Purpose : determine the dependence of the flight distance of the ring from the natural origin of the smoke.
- Equipment : birch leaves, celluloid ball, lighter, paper, smoke machine.
- Results : maximum range is achieved with smoke rings created by the smoke machine

Experimental results

Ring’s flight distance is more when we have:

- Large-volume smokebox
- Faster rate of change of volume of the smokebox
- Average concentration of smoke in the smokebox.

Output

- In the course of solving the problem failed to create an installation that could shoot smoke ring at a distance of approximately 9 meters, as well as to determine the parameters influencing the range rings.

Sources of information

- The journal "Science and Life" № 12, 1968
- The journal "Science and Life" № 10, 1992
- G.Shlihting. The theory of the boundary layer, 1969
- S.Shabanov, V.Shubin. About vortex rings, 1987
- M.A.Lavrent'ev, B.V.Shabat, Problems of hydrodynamics and their mathematical models, 1973.