



## Displacement of center of mass causes rotation of torsional device

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### Abstract

It is experimentally shown the twisting of the suspension thread when the weight of the working medium changes.

It is proposed to carry out experiments 2, 3, 4 with variable dimensions of the working medium.

**Keywords:** center of mass, suspension thread, rotation.

A beam of length  $2n$  and mass  $2m$  is suspended on the yarn  $L$ , Figure 1a.

Point  $O$  is the center of the beam mass.  $O_1, O_2$  - centers of mass of left and right equal parts of beam.

There are two options to shift the center of mass of the beam: 1) change the mass of one of the parts of the beam, 2) change the geometry of the beam, for example, by heating one of the parts of the beam, Figure 1b.

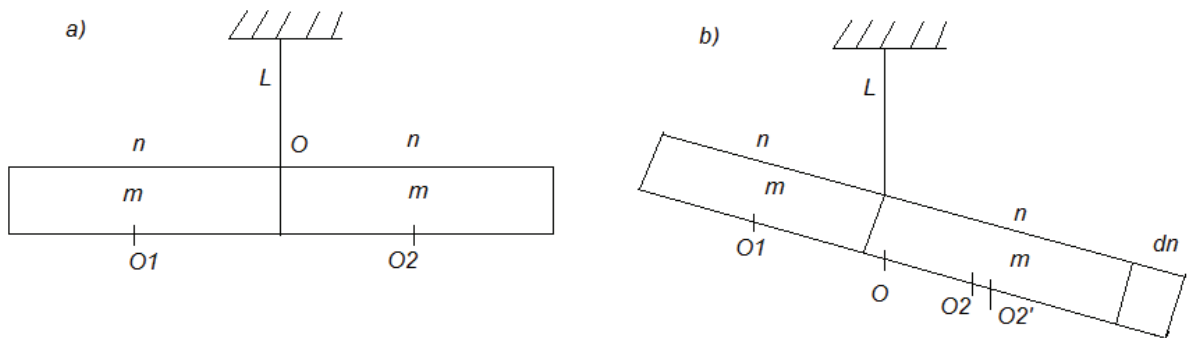


Figure 1

The suspension thread  $L$  remains stationary, Figure 1b.

Let's replace the beam with a 4-chamber parallelepiped, Figure 2a.

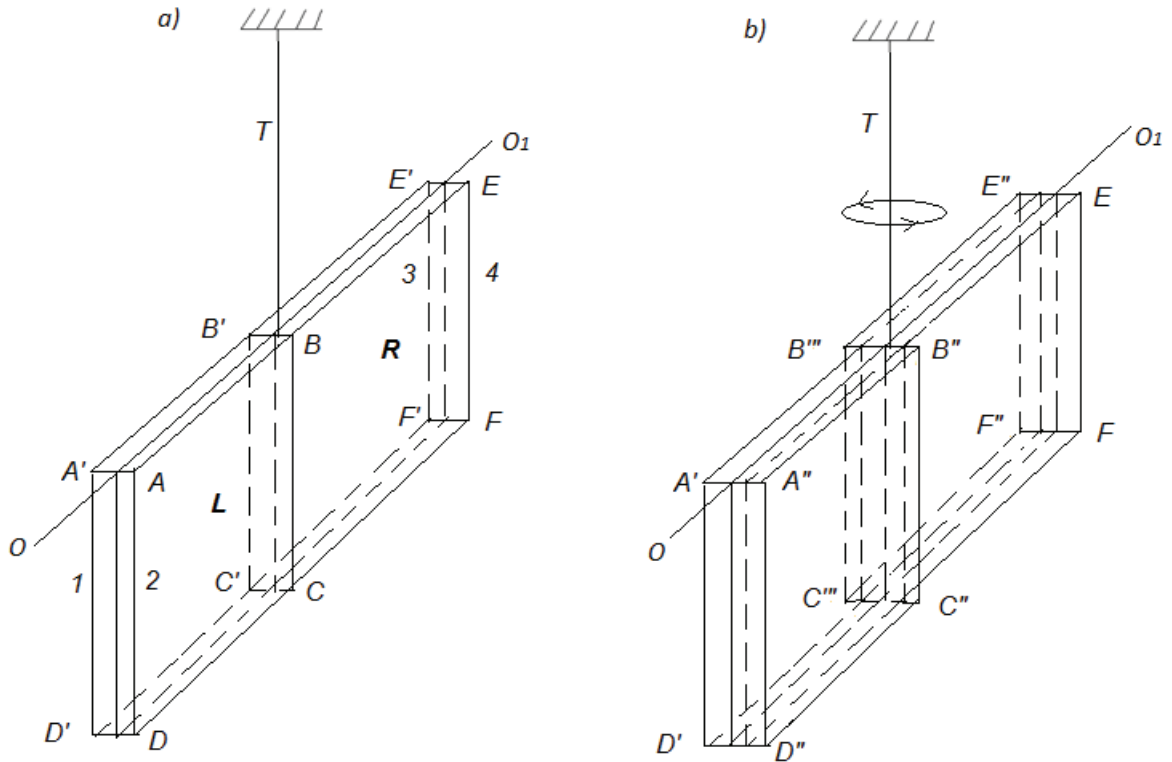


Figure 2

If you change the center of mass of the left *L* and right *R* parts equally, Figure 2b, then ideally the parallelepiped will have a bend along the  $OO_1$  axis. Suspension thread *T* must not twist.

### Experiment 1

Let's carry out an experiment according to option 1. We will change the mass of part *L* from the front side, part *R* from the rear side.

The parallelepiped is represented by figure 3. Make holes in the containers *L2*, *R3*, figure 4. Let's fill it with water, figure 5. Raise the containers above the water, figure 6. Water will start flowing out of the openings of the containers *L2* and *R3*.

In videos [1, 2], we see the rotation of the containers around the suspension thread *T*.

In the video there is a [3] control container without holes. There is no rotation.



Figure 3



Figure 4



Figure 5



Figure 6

## Wishes

Perform additional experiments.

In Experiment 1, replace liquid outflow with evaporation. All containers without holes. Fill the containers with rapidly evaporating liquid. Containers 1, 4 are closed.

According to version 2, with change of geometrical dimensions of working medium, two experiments are proposed:

### Experiment 3

Working body ice, Figures 7, 8.

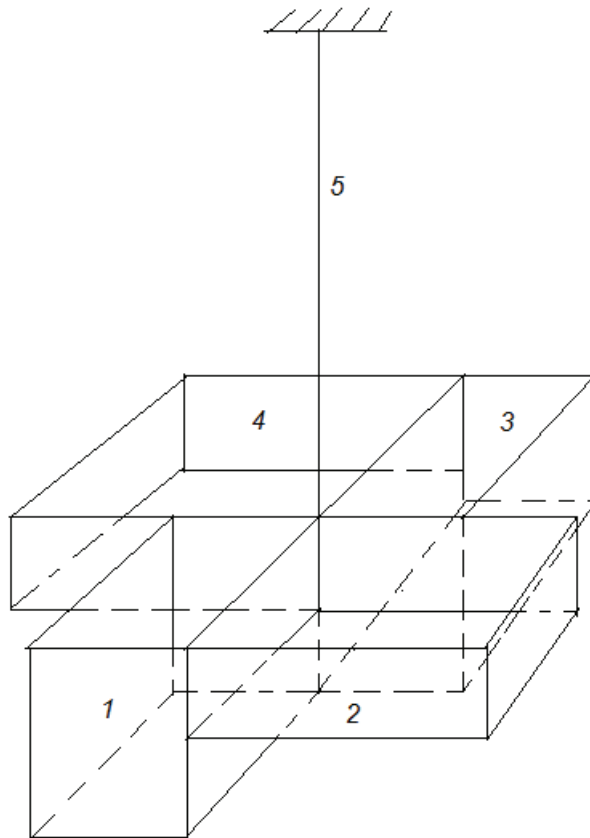


Figure 7

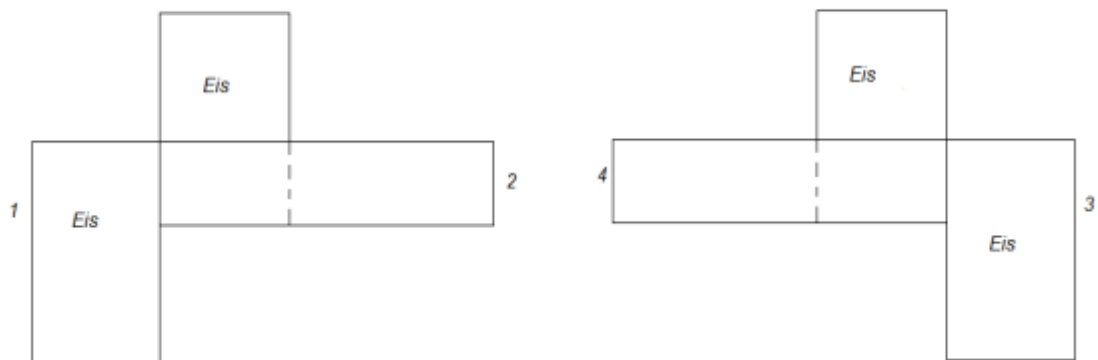
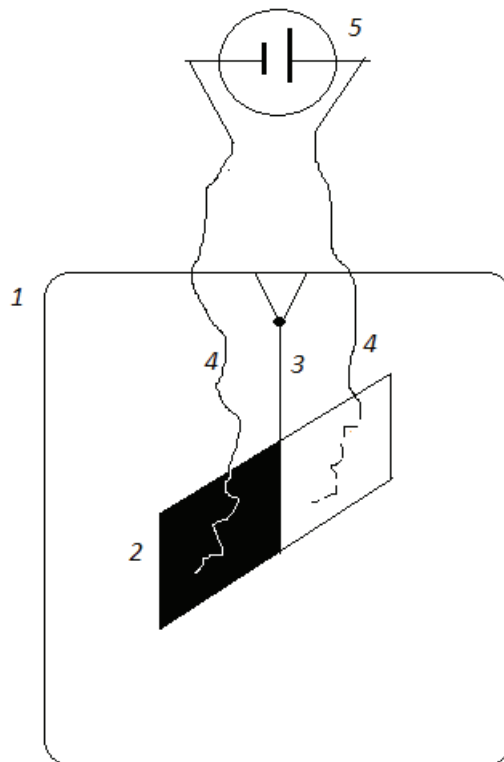


Figure 8

### Experiment 4

The device is similar to the device in the light pressure experiment. The resizing is done by heating the black planes, Figure 9.



1 - vacuum chamber, 2 - impeller, 3 - suspension thread, 4 - wires, 5 - power supply

Figure 9

## Conclusions

If in experiments 2 and 3 the effect of twisting the suspension thread appears, then in experiments with torsional instruments it is necessary to take this effect into account.

## Links

1. <https://drive.google.com/file/d/12ZCo6JbCFpn-o9sMZsxy9OgUzscEafEP/view?usp=sharing>
2. [https://drive.google.com/file/d/1c6GPdof\\_wGG2fDKNl7qBYCgze5x7iA9w/view?usp=sharing](https://drive.google.com/file/d/1c6GPdof_wGG2fDKNl7qBYCgze5x7iA9w/view?usp=sharing)
3. [https://drive.google.com/file/d/1JVccOLug734z8uSj9hPj\\_Owg2ETtNDXb/view?usp=sharing](https://drive.google.com/file/d/1JVccOLug734z8uSj9hPj_Owg2ETtNDXb/view?usp=sharing)