THE STUDY OF BODY MOTION IN VISCOUS MEDIUM

R. Mayer, *Department of Physics, Glazov State Pedagogical Institute (Russia)*

The suggested experimental installation (Fig. 1) consists of a graduate glass 1 with two marks 2 filled with liquid and a body 3 immersed into it [3, pp.30-32]. A thread is tied down to it which is put over a motionless block 4, another end of the former being attached to a pan with weighs. The body is shaped as a cylinder or disk with a weigh and its diameter is less than the graduate glass inner diameter by 2 mm approximately. Measuring of the time it takes the body to pass the distance between marks is performed by means of a stopwatch 6. Water or transformer oil can be used as the liquid.

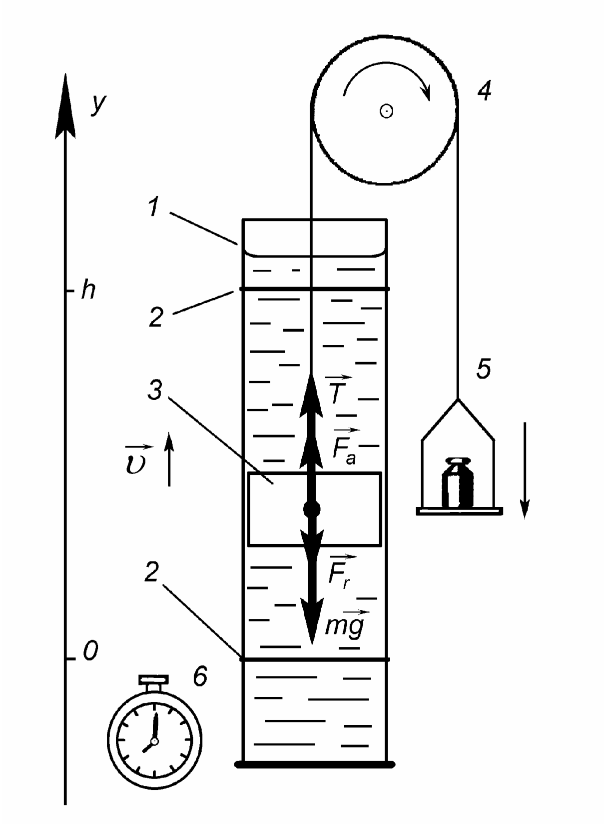

FIGURE 1. Experimental installation.

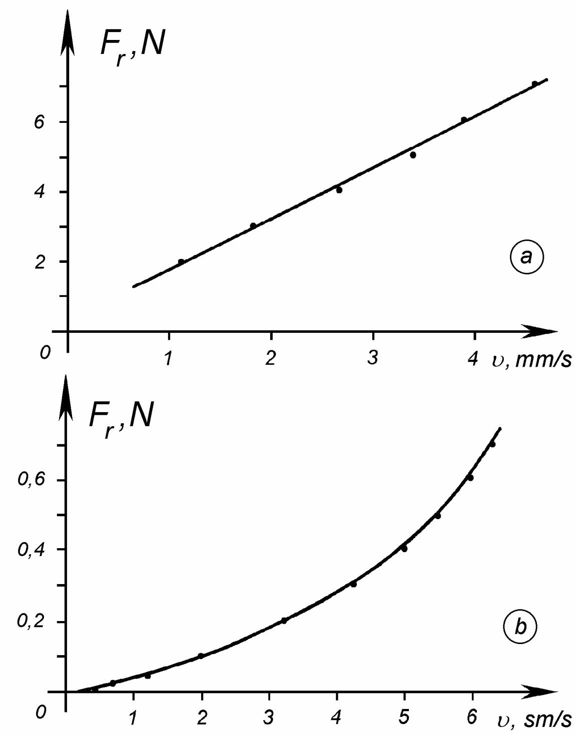

FIGURE 2. Experimental results.

To demonstrate the force of resistance affecting the body moving in viscous medium the pan with weighs is detached from the loose end of the thread and the end is tied down to dynamometer and then the spring distension is shown by uniform moving the dynamometer down.

The described experiment is performed twice, the dynamometer being moved down first slowly and then quickly and each time its spring's lengthening is measured which is proportional to the force of resistance. Students observe that the higher is the velocity of the body in viscous medium the greater is the force of resistance.

To study this phenomenon quantitatively the scales pan is balanced with the body immersed into the liquid by loading it until the body starts moving up. Then it is put down on the bottom of the graduate glass, the weigh of 1 to 5 g is put onto the pan and after setting the system free the time is measured of the body's passing the distance from the lower mark to the upper mark. Assuming that the motion of the weigh between rings is uniform one defines its velocity. The force of resistance is found as the force of gravity affecting the additional weigh which is put into the pan after balancing the system. 10 to 20 measurements are performed, each time the pan weight is increased by 1 to 5 g, the velocity υ and the force of resistance $F_r(\upsilon)$ being measured. On the basis of the obtained results the graph of the function $F_r = F_r(\upsilon)$ is plotted to make sure that it is a monotonically increasing curve. Figure 2 illustrates experimental graphs $F_r = F_r(\upsilon)$ in experiments with transformer oil (a) and water (b). In the experiments with water when the body is moving slowly the force of resistance is directly proportional to its velocity. At greater velocities the function curve raises sharper.

REFERENCES

1. Демонстрационный эксперимент по физике / Под ред. А.А.Покровского. – М.: Просвещение, 1971. – 366 с.
2. Хорошавин С.А. Демонстрационный эксперимент по физике в школах и классах с углубленным изучением предмета. – М.: Просвещение, 1994. – 368 с.
3. Майер Р.В., Данилов О.Е. Механика. Лабораторный практикум: Учебное пособие / Под ред. В.В.Майера. – Глазов: ГГПИ, 1996. – 120 с.