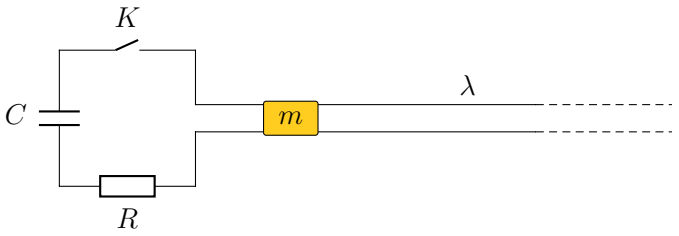
Railgun

As part of the US President R. Reagan Strategic Defense Initiative (SDI — Strategic Defense Initiative), also known as "Star Wars," electromagnetic rail accelerators (railguns) capable of accelerating a conductive projectile to high speeds were considered as an effective means of hitting warheads.

The projectile, which is a conducting body with a mass of $m = 100$ g, is accelerated in an electromagnetic gun, the scheme of which is shown in the figure. A capacitor bank with a total capacity of $C = 0.5$ F is charged to a voltage of $U_0 = 5 \cdot 10^3$ V and closes to two fairly long conductors.

The inductance per unit length of the entire system is $\lambda = 3 \cdot 10^{-5}$ H/m. Total loop resistance $R = 0.5$ Ohm. Neglect ohmic losses in the projectile and long conductors. The projectile is not a ferromagnet.

The frictional forces, ohmic losses in the projectile and long and hard conductors can be neglected. Electrical breakdown and radiation of electromagnetic waves during the experiment does not occur.



Find the maximum velocity of the projectile. *(10 points)*

First hint — 27.04.2020 14:00 (MSK)
Second hint — 29.04.2020 14:00 (MSK)