523.

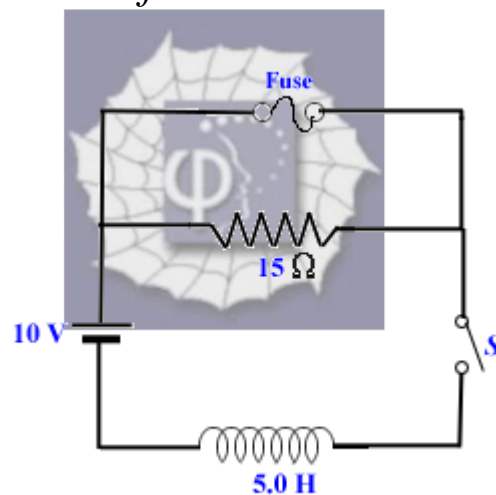## Problem 38.28 (RHK)

In the circuit shown in the figure the component in the upper branch is an ideal 3.0-A fuse. It has zero resistance as long as the current through it remains less than 3.0 A. If the current reaches 3.0 A, it "blows" and thereafter it has infinite resistance. Switch S is closed at time t = 0. We have to find the time when the fuse blows.

Solution:

Until the fuse blows the flow of current in the circuit is determined by the equation

$$L\frac{di}{dt} = E..$$.

As E and L have constant values, variation of current as a function of time will be given by

$$i = \frac{E}{L}t = \frac{10}{5.0}t = 2t,$$

where we have used the boundary condition that at $t = 0$,

$i = 0$.

We note that the current through the circuit that also flows through the fuse will increase to 3 A at $t = 1.5$ s.