## Chapter Seven Engineering with Electricity

"All right, Pete," I said, rushing into his shed. "I'm ready to tear open a radio and get this alarm set up!"

"Easy there, jillaroo," Pete said. "Before we start tearing things apart, I think we need to come up with a plan. And get some biscuits. Here, Sarah made a batch just for your visit."

I took a bite of biscuit and chewed for a few moments. "Why do we need a plan?" I asked. "Can't we just figure things out as we go along?"

"Sometimes you can," Pete said. "But when I was working as an engineer, there were steps that we would follow whenever we were trying to solve a problem. We call the steps the engineering design process. And since you're

about to work on your very first electrical engineering problem, it might be a good idea for us to try using the process. Come take a seat over here and give me a better idea of what we're trying to design."

I sat down next to Pete by his workbench.

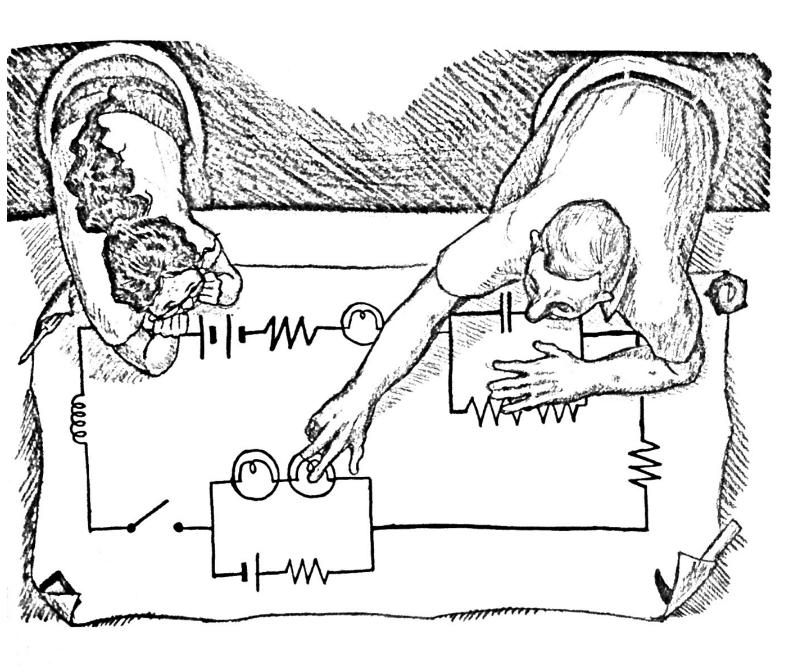
"The first step of the engineering design process is asking some good questions," said Pete. "Do you want this alarm to go off at a certain time of day, or just when the sheep's water trough is getting low?"

"Hmm," I said. "I guess I just want it to let me know when the water is low. If I'm out riding and I'm practicing a new jump, I don't want to have to stop just because it's a certain time. I'd rather wait till I really need to go to the shed."

"Sounds good to me," said Pete. "Do you know where you want the light and the buzzer to go?"

I pictured the way the shed looked from the stables. "Um, maybe the light could go on the top of the shed, and the buzzer could go on the back of the shed, facing away from the house. That way it won't be too loud for the sheep—or for Andrew."

We went on like that for almost the whole morning. Pete had me imagine a few different setups, or designs, for the alarm system. Then he had me draw a plan.



"Let me show you the plan that I did for my alarm system," Pete said. "Electrical engineers call plans like these schematic diagrams." He rummaged through a cabinet next to his workbench and pulled out a piece of paper with some lines and pictures on it.

"How could this be your plan—I mean schematic

diagram?" I asked. "I don't see the light or the buzzer on it."

"Ahh, but they are here. I just used symbols," Pete explained. "You see, electrical engineers and other people who work with electricity know that the symbol for a light looks like a circle with a swirl through it. The wires that connect everything are the lines in between the pictures. And the space here that looks like a door swinging open, that's the switch that closes the loop and makes the light and buzzer go off. It completes the system—or what we call the circuit. Using these symbols is kind of like speaking a language. The symbols allow us to communicate easily with one another."

"So altogether, everything that you've drawn here symbolizes a circuit?" I asked.

"Exactly!" Pete said. "Now why don't you try making a schematic diagram of your own. Then, once we have that all set, we can move on to the next step of the engineering design process: creating!"

