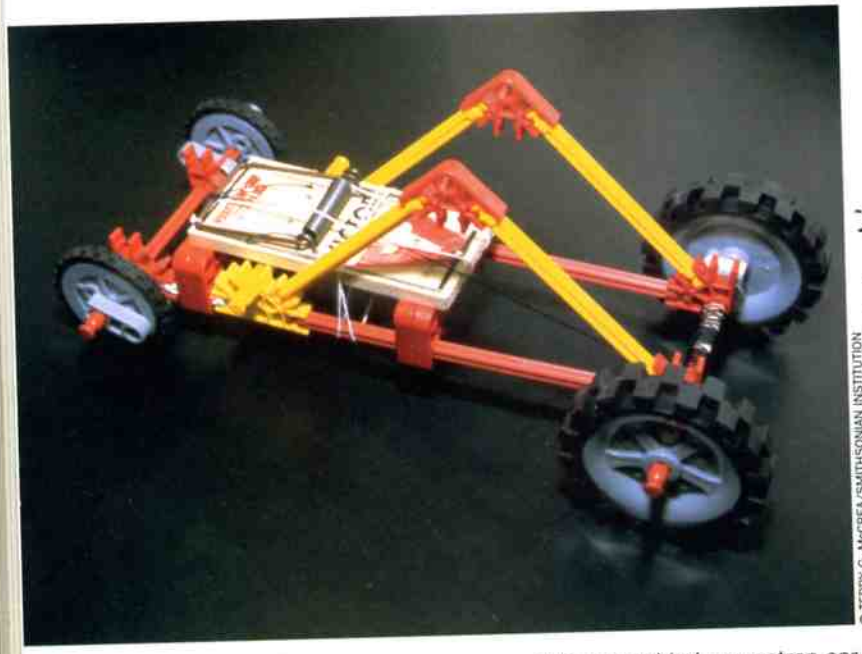
LESSON **19**

Motion of a Mousetrap Car



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The assembled mousetrap car

INTRODUCTION

In Lesson 18, you built a fan car and measured its speed. In this lesson, you will build a "mousetrap car" and investigate its motion. You will design an experiment that will enable you to measure the speed of the car as it moves after the trap is released. You will also identify the forces acting on the car and describe how these forces affect the car's motion. You will then compare the motions of the fan car with those of the mousetrap car.

OBJECTIVES FOR THIS LESSON

- Identify and describe the forces acting on the mousetrap car.
- Observe and measure the speed of the mousetrap car as it moves.
- Describe how forces affect the motion of the mousetrap car.
- Describe the energy changes in the mousetrap car as it moves across the floor.
- Compare the motion of the fan car with the motion of the mousetrap car.

Getting Started

1. Assemble the mousetrap car as shown in Figure 19.1; the exploded diagram shows all the parts needed to assemble the car and how they connect. Figure 19.2 shows the car with the pieces properly connected. (The photo at the beginning of this lesson also shows the assembled mousetrap car.) It is important that you use a long piece of string so that the axle will keep rotating after the trap has been released. If the string is too short, it will unwind and then begin winding the opposite way.

MATERIALS FOR LESSON 19

For your group

- 1 stopwatch
- 1 meterstick
- 1 0- to 10-N spring scale
- 1 piece of adding-machine tape
- K'NEX™ parts for the mousetrap car (see Appendix A: Directory of K'NEX™ Parts):
  - 6 white rods (R2)
  - 5 yellow rods (R4)
  - 4 red rods (R6)
  - 6 gray connectors (C1)
  - 2 tan connectors (C2)
  - 14 red connectors (C4)
  - 2 yellow connectors (C10)
  - 2 small wheels (W1)
  - 2 large wheels (W2)
  - 2 small tires (T1)
  - 2 large tires (T2)
- 1 mousetrap
- 1 small washers
- 1 piece of string
- 1 piece of nylon line
- 1 piece of masking tape

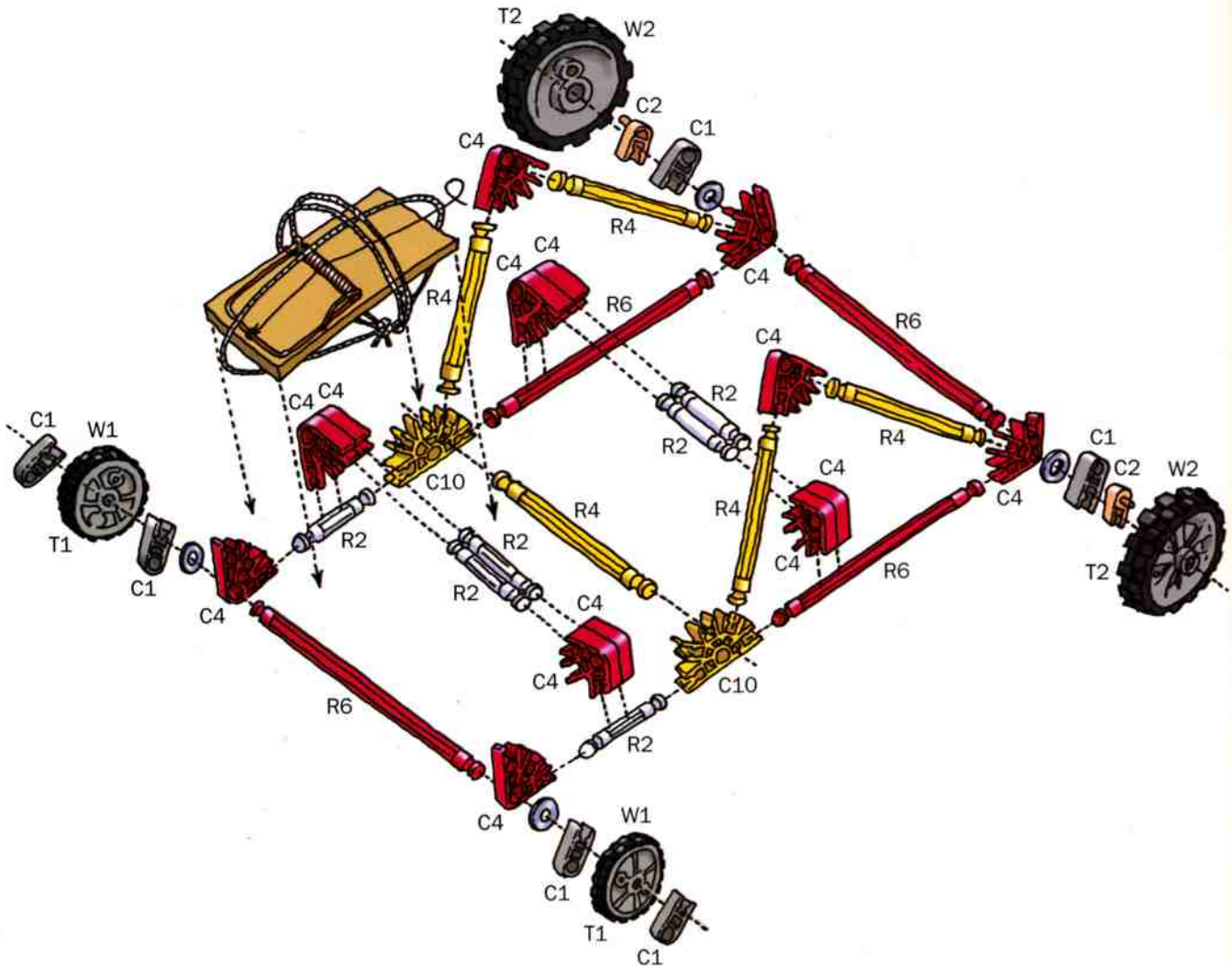

Figure 19.1 *Exploded view of the mousetrap car*

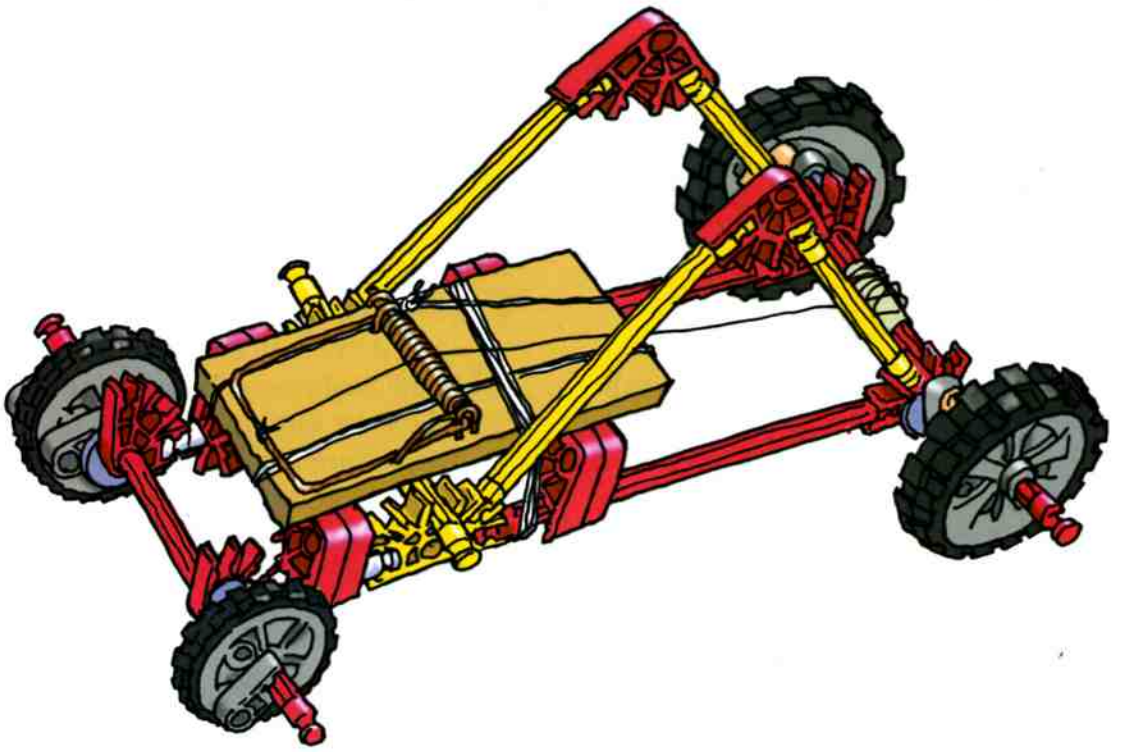

Figure 19.2 *Assembled mousetrap car. The mousetrap in this illustration has been sprung. The string is attached to the jaws of the trap and to the rear axle. By turning the wheels, you can wind the thread around the axle and pull the jaws of the trap open.*

2. Double-check your vehicle to be sure that the trap is securely attached to the car and that the jaws of the mousetrap will open and close properly.

3. How can you put energy into the mousetrap car? Discuss this question with the class.

SAFETY TIP

Do not put your fingers in the clamping device of the mousetrap.

Inquiry 19.2 Measuring the Speed of the Mousetrap Car

PROCEDURE

1. Share with the class what you wrote about the motion of your mousetrap car.

2. With the class, discuss the following questions:

   A. Is the speed of the car constant as it moves across the floor?

   B. How could you calculate the average speed of your car?

   C. How could you design an experiment to measure the speed of the mousetrap car as it travels along the floor?

3. With your group, develop a plan to measure the motion. Design an experiment to determine the mousetrap car's speed at different positions along its path. Write your plan in your science notebook. Design a data table on which to record your measurements and any calculations.

4. Carry out your plan.

5. When you are done, summarize the conclusions you can draw from your data.

REFLECTING ON WHAT YOU'VE DONE

Answer the following questions in your science notebook. Be prepared to share your answers with the class.

A. Summarize what you found out about the motion of the car. Give evidence from your data for your conclusions.

B. Explain the changes in the mousetrap car's speed in terms of the forces acting on the car.

C. When you set the mousetrap, do you do work on it? If so, why?

D. Write a paragraph describing the energy changes that took place when you set the trap and released the car.

E. How does the motion of the mousetrap car compare with the motion of the fan car? Identify similarities and differences. What forces acted each time?