*†3-6 For the trailer hitch of Problem 3-4, determine the horizontal force that will result on the ball from an impact between the ball and the tongue of the 2 000-kg trailer if the hitch deflects 2.8 mm dynamically on impact. The tractor weighs 1 000 kg. The velocity at impact is 0.3 m/sec.

*†3-7 The piston of an internal-combustion engine is connected to its connecting rod with a "wrist pin." Find the force on the wrist pin if the 0.5-kg piston has an acceleration of 2 500 *g*.

*†3-8 A cam-follower system similar to that shown in Figure 3-15 (p. 108) has a mass m = 1 kg, a spring constant k = 1 000 N/m, and a damping coefficient d = 19.4 N-s/m. Find the undamped and damped natural frequencies of this system.

†3-9 A ViseGrip® plier-wrench is drawn to scale in Figure P3-3. Scale the drawing for dimensions. Find the forces acting on each pin and member of the assembly for an assumed clamping force of P = 4 000 N in the position shown. What force F is required to keep it in the clamped position shown? *Note: A similar tool is probably available for inspection in your school's machine shop.*

*†3-10 An overhung diving board is shown in Figure P3-4*a*. Find the reaction forces and construct the shear and moment diagrams for this board with a 100-kg person standing at the free end. Determine the maximum shear force, maximum moment, and their locations.

*†3-11 Determine the impact force and dynamic deflection that will result when the 100-kg person in Problem 3-10 jumps up 25 cm and lands back on the board. Assume that the board weighs 29 kg and deflects 13.1 cm statically when the person stands on it. Find the reaction forces and construct the shear and moment diagrams for this dynamic loading. Determine the maximum shear force, maximum moment, and their locations along the length of the board.

†3-12 Repeat Problem 3-10 using the cantilevered diving board design in Figure P3-4*b*.

* Answers to these problems are provided in Appendix H.

† These problems are extended with similar problems in later chapters with the same –number, e.g., Problem 4-4 is based on Problem 3-4, etc.

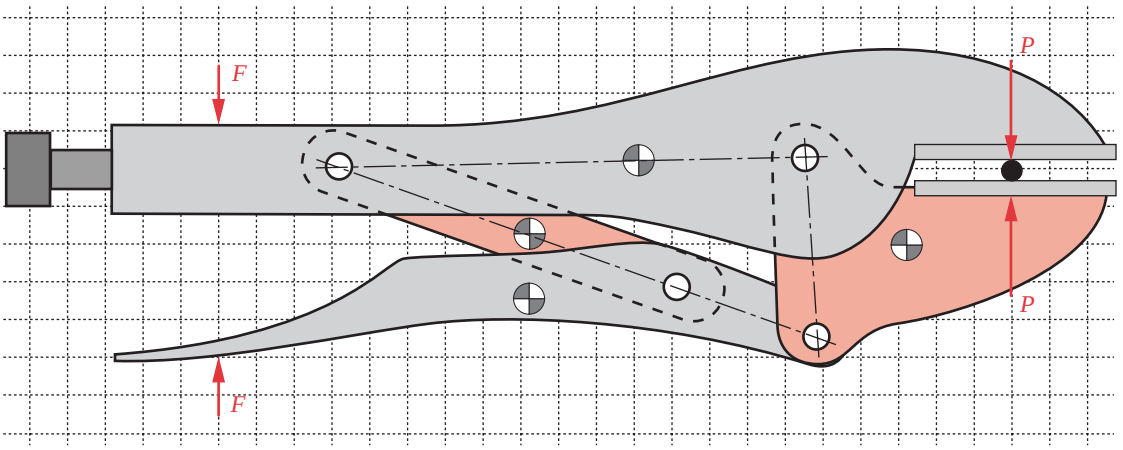

FIGURE P3-3

Problem 3-9