***4-6.** A timber of uniform cross section with a mass of 90 kg is hinged at its lower end and held at an angle of 60° with the horizontal by a rod attached as shown in Fig. Prob. 4-6. A cylinder which has a mass of 30 kg is placed between the timber and the wall. What are the horizontal and vertical components of the reaction at A? What is the force between the cylinder and the timber?

4-7. A cherry-picker has a bucket at the end of the boom which is hinged to the boom as shown in Fig. Prob. 4-7. The diameter of the bucket is 3 ft; its depth is 3 ft; and its weight is 300 lb. A man weighing 180 lb is standing in the bucket. What will be the reactions at the hinges?

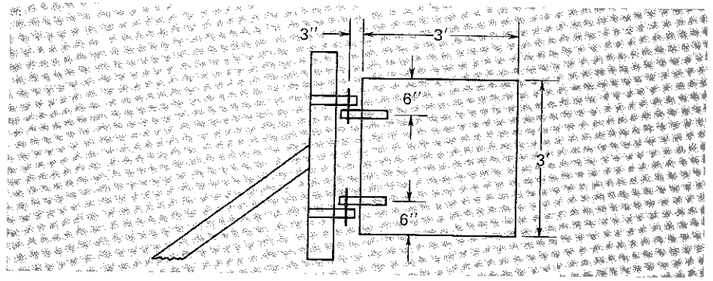

FIGURE PROBLEM 4-7

4-8. In an irrigation project it was found necessary to cross low ground or else swing the canal to the left by cutting into solid rock. It was decided to run the canal as a flume and support it on a number of frames, as shown in Fig. Prob. 4-8. The two members rest in sockets in solid rock

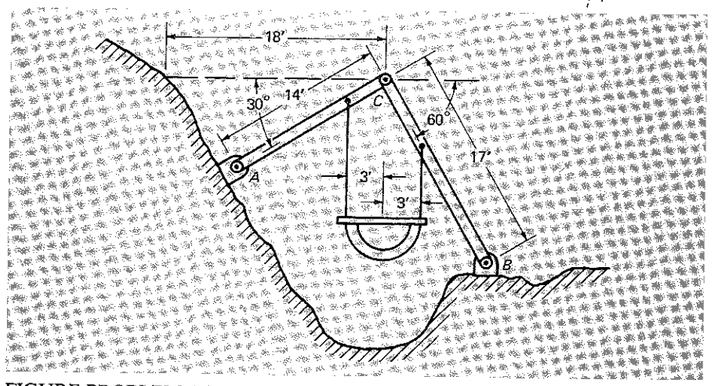

FIGURE PROBLEM 4-8

at points A and B. The sockets can be considered as hinges. What will be the vertical and horizontal components of the reactions at A and B? The weight of the water in the flume supported by each frame is estimated as 18 200 lb.

4-9. The A-frame in Fig. 4-13 has an additional load of 1200 lb at the center of BD. All members weigh 90 lb per foot of length. What are the pin reactions at B, C, and D?

4-10. Figure Problem 4-10 shows a wooden brace hinged to a floor at A and held by means of the rod BC. The weight of the brace is 300 lb and can be assumed to be applied as shown. What will be the horizontal and vertical components of the force at A? What is the force in BC?

4-11. In the crane shown in Fig. Prob. 4-11, the member BG weighs 600 lb, which is considered to act midway between B and F. If other weights of members are neglected, what will be the forces in the two tension rods? What will be the horizontal and vertical components of the reactions at A and B?

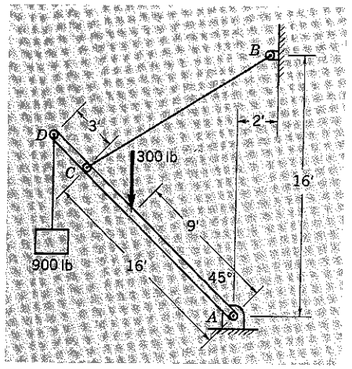

FIGURE PROBLEM 4-10

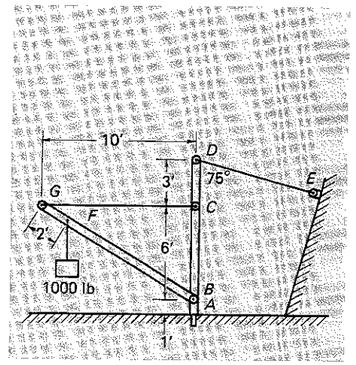

FIGURE PROBLEM 4-11

4-12. In a shipyard, a jib crane, shown in Fig. Prob. 4-12, was used to handle heavy machinery. With the moving load in the position shown, what will be the forces in members A, B, and C? What is the horizontal component of the reaction at the upper end of the vertical member?

4-13. For the Pratt truss shown in Fig. Prob. 4-13, find the magnitudes and types of forces in members AB, AH, BH, BC, HG, BG, and CG.

4-14. A cantilever truss, shown in Fig. Prob. 4-14, carries a load of 1200 lb. Find the reactions at A, B, C, and E.

4-15. Figure Problem 4-15 shows a truss that is supported at A and B and carries a load of 4000 lb. Find the external reactions and the forces in all the members, assuming that all joints are pin-connected.