4. What is the horse-power of a pumping-engine capable of raising 2,000 gallons per minute from a depth of 300 ft. ? Give the diameter of the working barrel.

5. What size of engine would you erect underground to raise 120,000 gallons of water per hour from a depth of 300 ft. ? Assume the piston and pump are double-acting, and the speed 250 ft. per minute, with 30 lb. effective steam-pressure per square inch.

SUBJECT I. — *The Haulage in Shafts and on Underground Planes; also the Strength of Haulage Ropes and Chains.*

1. What kind of engine would you recommend to raise 400 tons in 8 hours from a depth of 300 ft. ? State the size of rope, diameter of drum, pressure of steam, and theoretical horse-power of the engine.

2. With 60-ft.-high pulley-frames (poppet-legs), what should be the minimum length between the centres of the winding-drum and of the shaft ?

3. Explain the working of the winding-engine; carefully illustrate by sketch its chief parts, especially the valve, and give the names of the chief parts.

4. Under ordinary conditions what would be the friction per ton on a level underground tram-way, and how would it vary in relation to the sizes of the wheels and axles employed ?

SUBJECT J.—*The Effect that Faults, Slides, and Mullock-bars have on Lodes, and how to ascertain the Direction of Slides and Heavals.*

1. Describe (a) a heave, (b) a throw, (c) a slide; and give sketches of each.

2. If you were driving a level on the lode at 100 ft. from your boundary, and the lode tapered off and cut out—(a) the walls are still clearly defined with a little pug between; (b) the walls have merged into the country rock : what would you do in each case ?

3. You find your lode suddenly cut off by a slide : what evidence would you look for to enable you to determine whether the lode had been carried away to a long or a short distance ?

4. Give a list of any heaves, throws, or slides known to yourself, and state in what mines they occurred.

5. Give the best rule known to you for picking up lost lodes.

6. Give sketches of (a) masses of ore, and (b) " reticulated masses." Give examples of where they occur, and how they may have been formed.

SUBJECT K.—*A Knowledge of Underground Surveying, and of making Plans of Underground Working showing the Dip or Inclination and Strike of Reefs or Lodes.*
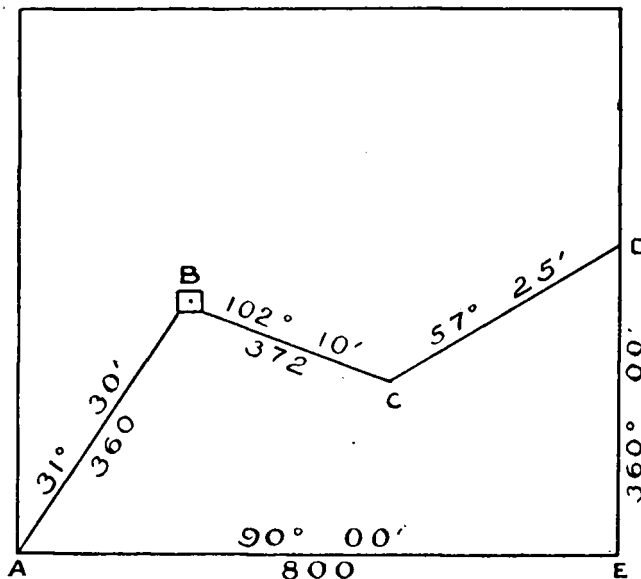
The above diagram represents a mining claim : B the position of a shaft 80 ft. deep, and BCD an underground drive from the shaft to the eastern boundary of the claim, having a fall of 4 ft. 10 in. Distances in links.

1. Compute the distances C to D, and D to E.

2. Compute the depth (in feet) below the surface of the end of the drive at D.

3. Compute the area of the figure ABCDE.

4. Describe the " dip " and " strike " of a reef, and give diagrams.

5. Describe in their proper order the complete adjustments of a Y theodolite.

6. Explain " parallax " in telescope, its effect, and how to correct it.