

What provisions should be made in case (a) for breakdown, and in case (b) to prevent inundation of the pump and motor?

2. Describe, and illustrate by diagram, the action of a three-throw plunger pump. State (a) what is the usual piston-speed, (b) revolutions per minute. Is it a single- or double-acting pump?

3. What is meant by the brake horse-power of an engine? How is it ascertained, and by what formula calculated?

4. What would be approximately the loss of efficiency of a pumping plant for every additional set of multiplying or reduction gear wheels?

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

1. How would you test a safety cage?

2. When two coupled drums are employed to wind from two compartments, what provision would you make that the actual position of each cage should be known to the driver at all times?

3. Describe, and illustrate by sketch, the winding-engine you would recommend for raising 500 tons per day from a mine 1,200 ft. deep. What steam-pressure would you use, and what type of valve?

Briefly discuss the advantages, if any, of using in the above case—

(a) Compound engines,

(b) Expansion valves,

(c) Some form of "trip" gear in lieu of slide valves,

(d) Friction-clutches.

4. What size of plough-steel wire rope would you recommend to lift 6 tons from 400 yards (live load)?

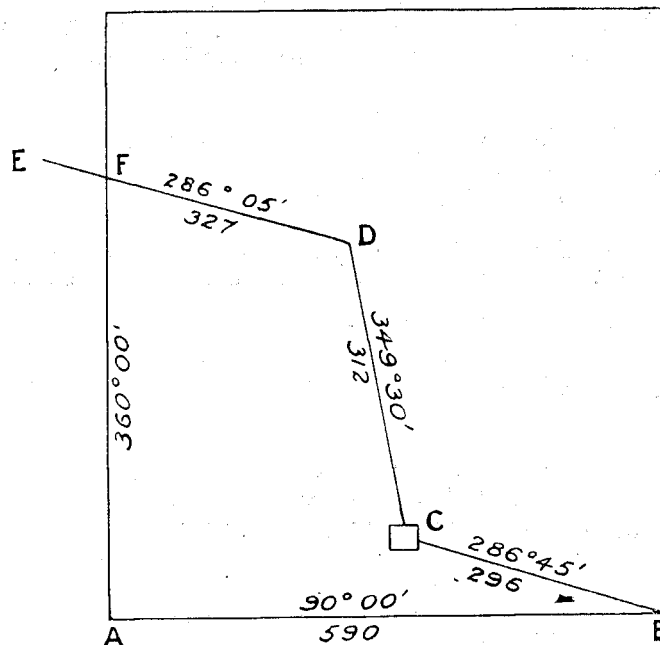
SUBJECT J.—*The Effect that Faults, Slides, and Mullock-bars have on Lodes, and how to ascertain the Direction of Slides and Heavals.*

1. Give diagrams illustrating the effect that is exercised on mineral lodes by faults, slides, and mullock-bars.

2. Describe fully (a) masses of ore, (b) stockworks, (c) pipes, and (d) churns, and give instances where they occur.

3. Suppose your lode was cut off by a heave or slide, what steps (if any) would you take to recover the lode again?

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: C the position of a shaft, and CDE an underground drive. Distances in links.

1. Compute the distance FE—i.e., the encroachment on the adjoining claim; the distance AF also required.

2. The rise in the drive from C to D was found to be $3^{\circ} 18'$, and from D to E $2^{\circ} 8'$; compute the difference of level, in feet, between the bottom of the shaft and the floor of the drive at F.