

8. Coal outcrops at intervals in two New Zealand valleys a mile apart; the overlying strata, sandstone and limestone, appear to be continuous between the two valleys; the outcrops seen are from 6 ft. to 20 ft. thick, with an average of, say, 12 ft.: would you be justified in assuming that workable coal extends through the ground between the valleys? Explain the reasons for your answer, and state what exploration you would undertake before advising a mining company to begin active development.

QUESTIONS FOR MANAGERS' SECOND-CLASS CERTIFICATES OF COMPETENCY.

SUBJECT 1.—*Mining: Opening out a Colliery; Working Coal; Timbering; Boring.*

1. Give sketch of a small section of longwall workings, and of bord-and-pillar workings, showing intake and return air in each.
2. Describe the various forms of timbering used in mines, giving sketches of suitable sets for—
  - (a.) Places with good roof and soft floor;
  - (b.) Floor hard, roof and sides weak;
  - (c.) Show how timber should be set in highly inclined seam.
3. If required to drive towards old workings known to contain water under pressure, describe and show by sketches how you would proceed, giving details of appliances to be used and requirements of the Coal-mines Act.
4. Sketch what in your opinion would be a convenient arrangement of shaft-bottom to deal with 600 tons daily output.
5. On what system would you work a seam of coal 15 ft. thick with tender roof? Explain fully the precautions you would adopt to safeguard the men.
6. What size pillars would you leave to support a shaft 200 yards deep with seam pitching at an angle of 15 degrees?
7. What are the precautions necessary to prevent blown-out shots, and what dangers are to be feared from such occurrences?
8. Do pillar workings demand more attention by mine officials than places advancing in the solid coal, and, if so, why?
9. Under what conditions would you consider coaldust dangerous in mines?

SUBJECT 2.—*Mechanics: Pumping-appliances and Mine-drainage; Tapping Water and Dam-construction in Mines; Winding in Shafts; Hauling on Underground Planes; Compressed-air and Steam-power Plants; Strength of Materials; Elementary Electricity.*

1. What system of haulage do you consider most efficient where large output of coal is required? Give reasons for your preference.
2. What power would be required to haul 500 tons daily over an incline plane 800 yards long with grade against the load of 1 in 6?
3. If required to raise 300 gallons of water per minute to a height of 500 ft., what horse-power would be required, allowing for 65 per cent. efficiency?
4. What are the terms applied to indicate (a) electric pressure, (b) electric quantity, (c) electric resistance? What do you understand is meant by "insulation" in connection with electric plants?
5. What terms are used to indicate the commercial unit of electrical energy?
6. Under what conditions would you consider the installation of electrical power in the underground workings of a coal-mine dangerous?
7. Give your experience in connection with the erection and working of pumping-appliances placed underground.
8. Give sketch of what you consider a useful form of drum for lowering coal on a self-acting incline 20 chains long. Assume suitable grade, and give your estimate of quantity which could be lowered by the arrangement per eight-hours shift.

SUBJECT 3.—*Ventilation: Ventilation of Mines and Knowledge of Mine-gases; Spontaneous Combustion of Coal, and Methods of Dealing with Underground Fires; Rescue Apparatus; Practical Knowledge of Gas-testing with a Safety-lamp.*

1. Indicate briefly the object aimed at in splitting the air in mines.
2. Describe the chemical composition and properties of the various gases met with in coal-mines.
3. What are the chief impediments to the passage of air in mines, and how they can best be removed? What parts of a mine-workings are most easily ventilated?
4. What experience have you had in dealing with mine-fires? Describe how you would deal with an outbreak of this kind, having special regard to the safety of employees.
5. What oil-burning safety-lamps do you consider the best, and state whether in your opinion the electric lamp for miners is in all essentials a safety-lamp?
6. Should the foreman report dangerous conditions owing to gas and dust in a portion of the mine, what precautions should be taken by the manager and underviewer to prevent accident to employees?
7. Why are permitted explosives safer than the usual blasting-powders?
8. Give your experience of the use of blasting-materials, and fully describe the working of the electric system of shot-firing.