

SUBJECT 4.—*Dealing with Old Workings and other Sources of Danger.*

1. In working towards the rise in the direction of the old workings of an adjoining colliery containing a large volume of water, what check surveys or measurements would you take if doubtful as to accuracy of information obtained from old working-plans, and what other practical precautions would you insist upon?

2. If required to carry a main-haulage road through old workings much fallen, what special precautions would you adopt to insure the safety of men employed on the work? Show by sketches the system of timbering you would apply to fallen ground.

3. Under what conditions would you consider it necessary to withdraw miners from their working-places?

4. What special precautions would you take in reopening an old mine?

SUBJECT 5.—*Steam Boilers and Engines used about Mines.*

1. Say what type of boiler you consider best for colliery-work, and say where a boiler is most likely to give way from corrosion or other causes. How often should a boiler be cleaned and thoroughly examined?

2. If the safety-valve of a boiler is $4\frac{1}{2}$ in. diameter, the lever 35 in. long to the centre of the weight and $4\frac{1}{2}$ in. from the fulcrum to the centre of the valve, the weight being 78 lb., what is the pressure per square inch? Show calculation.

3. What is the object of applying a condenser to a steam-engine? What are the advantages, and what amount of vacuum would you usually expect to obtain?

SUBJECT 6.—*Mine Drainage and Haulage, and Appliances for Same.*

1. What are the relative advantages and disadvantages of pumping-engines fixed above and below ground? What plan would you adopt if required to raise 200 gallons of water per minute from each of two mines 100 yards and 200 yards deep respectively?

2. Describe the class of pump you would use for dealing with a large quantity of water in a sinking shaft, and show by sketches how you would fix them—the water being met with at a depth of 100 yards, and feeders likely to continue to a further depth of 100 yards.

3. Given an endless-rope haulage up a dip and operated by a friction-clutch, show by sketches the precautions you would adopt against accident from breakage of rope, breakage of clips, or from the friction-clutch being thrown out of gear.

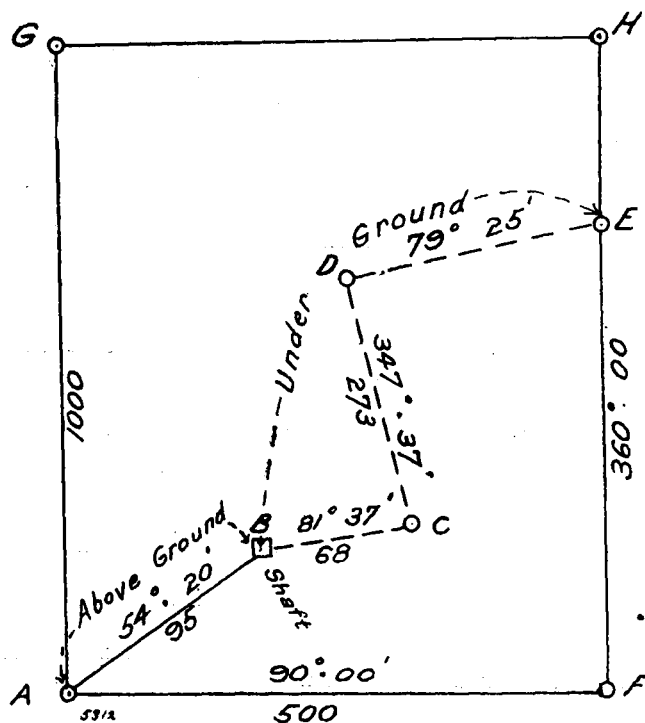
4. A pair of winding-engines having cylinders 30 in. diameter and 5 ft. stroke and working under a steam-pressure of 60 lb. per square inch, what is the greatest diameter the drum can be made in order that the engines may raise a load of 5 tons, allowing a margin of one-third for overcoming friction?

SUBJECT 7.—*Geology, Surveying, and making Plans.*

1. Describe as concisely as possible any coalfield in New Zealand with which you are acquainted. The following points should be given mention:—

- Nature and age of rocks forming the coal-bearing series or formation.
- Strike, dip, and general structure of coal-bearing rocks.
- Number of workable seams, their thickness, extent, and quality.
- Faults, rolls, washouts, &c.

2. In what way or ways do you consider coal to have been formed?



All figures on above sketch are in links.