

SUBJECT G.—*Blasting and the Use of Explosives.*

1. Give the names, and compositions, and relative strength of explosives commonly used in mines. From your experience in using explosives, what explosive used in blasting produces the least injurious effect on the workmen in mines? Give your reasons fully.
2. Give the maximum temperature that it is safe to store dynamite in. If frozen, how would you act? If combustion is not complete, can you point out the cause and effect?
3. In tamping explosives what materials would you use? How would you tamp the charge, and what appliance would you use? If a shot missed fire, give the precaution you would take to prevent an accident.
4. Calculate the number of ounces of dynamite that would be required for a bore 6 ft. deep, 1 in. diameter, and line of least resistance 4 ft.

THIRD DAY.—TIME: 9 A.M. TO 12 NOON.

SUBJECT I.—*A Knowledge of Underground Surveying, and the Making of Plans of Underground Workings.*

- (a.) State whether the compass can be relied on for underground surveys, and give your reasons for the answer. If you had a choice of a compass or a theodolite, which would you use?
- (b.) If you are obliged to make a magnetic underground survey, state what means you would use to check the correctness of the survey, and how you would know that the surface and underground survey are on the same meridian; or how you would reduce them to the same, supposing one to be magnetic and the other true.
- (c.) The position of a peg at the end of a drive is N. 24006 links, and E. 3611 links: what is the bearing and distance to a point situated on the boundary of the claim N. 24520 and E. 4910—both co-ordinated from the same point?
- (d.) Describe in writing, in the order named, the adjustments of a plane theodolite under the headings of "Horizontal level," "Vertical level," "Collimation," "Parallax"; and state what others are necessary. Also describe a miner's compass and its adjustments. (In both of these subjects the candidate will be examined by the Supervisor, who must furnish a separate report on each candidate's knowledge of the subject.)
- (e.) Describe the method of plotting the plan, and how the area of the claim was ascertained, and what drawing-instruments were used.
- (f.) What are the regulation marks that should define the boundaries of a claim under the Mines Act? And state sizes.
- (g.) State where you learnt surveying, and who taught you, and how long you have had practice at surveying.

THIRD DAY.—TIME: 2 P.M. TO 5 P.M.

SUBJECT C.—*Pumping Appliances and the Drainage of Mines.*

1. Show by sketch how you would arrange for two lifts of pumps in a shaft, and how they are connected with the motive-power.
2. If the plunger of a single-acting pump is travelling 100 ft. per minute, show by calculation its diameter necessary to lift 2,000 gallons of water per minute.
3. Describe different classes of pumps used in "mine-drainage," and name those with which you have had practical experience; and state under what conditions certain pumps are more advantageous to use than others.

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

1. What is the lowest grade a self-acting incline will work?
2. Assume the working-pressure on a boiler to be 70 lb. per square inch, the safety-valve of which is $3\frac{1}{2}$ in. diameter: give sketch showing length of lever, and weight required at end of same, to allow of steam blowing off at pressure named.
3. Show by calculation horse-power of engine required to haul 700 tons per shift of seven hours up an incline 1,500 ft. long against a grade 1 in 40, making allowance for friction; and give sketch showing general arrangement of such an engine, stating size rope to be used.
4. Show by sketch the general arrangement of setting for a Lancashire boiler; and also, by calculation, the safe working-pressure of such a boiler, whose diameter is 7 ft., and made of steel plates $\frac{5}{8}$ in. in thickness and double-riveted, the ends being stayed to correspond with the strength of the shell.

FOURTH DAY.—TIME: 9 A.M. TO 12 NOON.

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

1. How would you ascertain the cause that displaced a faulted lode, and how would you proceed to recover it again?
2. Show by sketches the difference between faults, slides, cross-courses, heaves, dykes, and horses.
3. What is the difference and rates between smaller and greater angles, and which would you follow to recover the lost lode?