

2. The cost of sinking a shaft to the depth of 400 ft. in wet ground was £4,600 12s. 6d. ; the wages came to three-eighths of that amount ; the pumping came to one-and-an-eighth times as much as the wages ; and the material came to one-quarter the cost of pumping : how much did each cost ?

3. If 24 men and 7 boys got out 50 tons of ore in 8 hours, how much ore would 7 men and 3 boys get out in the same time, allowing that each boy did five-eighths of the work of each man ?

4. Sixty miners were employed at the rate of 9s. per day of seven and a half hours, 14 truckers at the rate of 8s. a day of the same length, and 16 surfacemen at the rate of 8s. 6d. a day of 8 hours ; the miners worked  $140\frac{1}{2}$  hours, the truckers 145 hours, the surfacemen worked  $160\frac{1}{2}$  hours : make up a wages-sheet showing the amount due to each.

5. Extract the cube root of 0.00006357, and square the quotient.

QUESTIONS USED IN EXAMINATION OF MINING MANAGERS FOR FIRST-CLASS CERTIFICATES.

SUBJECT G.—*A Knowledge of Part V of "The Mining Act, 1905."*

Oral.

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

1. What is the simplest method of raising water from a shaft 1,200 ft. in depth, and making 1,000 gallons an hour ?

2. What is meant by "direct-driven reciprocating pumps," and what motive powers are applicable ?

3. Has compressed air any advantage over direct steam for driving underground pumps ? If so, give your reasons fully.

4. In applying hydraulic pressure to underground pumping-engines, give three ways of doing the work, and describe each way.

5. Under what conditions is it desirable to use centrifugal pumps ? What is the usual lift for this style of pump ? What effect would the compounding of ordinary centrifugal pumps have ? and to what head would they work efficiently ?

6. Give a sketch of a Cornish plunger pump in position, and describe the working-parts.

7. What do you consider the best system of pumping machinery for very heavy work from a deep shaft ?

8. What advantage has the Bull system over the Cornish ? State fully, and give disadvantages (if any).

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

1. If 30 tons per hour had to be lifted from a perpendicular shaft 1,000 ft. in depth, with double cages, what effective horse-power would be required when weight of cage =  $\frac{1}{2}$  a ton, and truck = 5 cwt. ? Give number of trips ; circumference, weight, and description of rope that you would use ; and the time occupied in hauling, each trip. Show by calculation how you arrive at results.

2. What is the breaking-strain and safe working-load on a 3-in.-circumference patent plough-steel wire crane-rope (plain) ? And give the breaking-strain of a galvanised improved steel-wire crane-rope of the same circumference.

3. Give the rule for finding the breaking-strain on the best crane-chains, and the factor of safety.

4. Give a sketch of the best safety catch for a cage. How often would you test it, and how would you do it ?

5. What precautions would you take to insure the safety of the men in a case of overwinding ?

6. How does the engine-driver determine the position of the cages in the shaft ?

7. How often would you test the hauling-ropes, and how would you do it ?

8. If you wanted to be taken from No. 6 to No. 3 level, what knocks would you give ?

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 sketches of heaves, throws, and slides that have come under your own observation, and state the names of the mines.

2. Suppose you were driving a level on a lode 12 ft. in width, and the quartz suddenly cut off against a slide, what steps would you take to recover the lost lode ? Give sketches showing how you would proceed if you used the rule laid down by Schmidt and Zimmerman, and explain fully.

3. What is meant by the term "a horse of mullock" ?