(*b.*) Draw a diagram showing how the underground traverses have been connected with the surface traverses, and describe in writing the method adopted for so doing, and describe the apparatus used.

(*c.*) Produce the original field-book of the work, and also the tabulations showing the closure of the traverses, and the calculation of the distances on meridian and perpendicular.

(*d.*) From the two points which are farthest apart in the underground survey, calculate the bearing and distance these two points are from one another, and show the calculations.

(*e.*) Describe the method of obtaining the meridian used in the bearings of both surface and underground survey.

(*f.*) Describe the method by which the survey has been made, name the instruments used to obtain measurements and angles, and say how the measurements have been reduced to the horizontal.

(*g.*) What means were taken to insure the accuracy of the measuring-tape, chain, or whatever else was used?

(*h.*) In a case where magnetic bearings have been used, describe how the differences between the surface and underground meridians are obtained.

(2 p.m. to 5 p.m.)

Subject 14 (continued):—

(*i.*) Describe the adjustments of a plane theodolite, and also describe a miner's dial, in writing. [The candidate will also be examined orally in the adjustments and use of these instruments.]

(*j.*) In a case where there are two adits, describe the method of obtaining the underground meridian, and its connection with the surface meridian.

(*k.*) Describe how the traverses on which the plan is based were plotted, and also the method by which the offsets were put in.

(*l.*) What is the area of a figure which is 1,040ft. long, 20ft. wide at one end and 280ft. at the other at right-angles to the line of 1,040ft.?

(*m.*) What is the area of a triangle 640ft. long in the base, and 400ft. long on the perpendicular?

(*n.*) Furnish a sketch of a coal-mine, showing faults (direction and throw), ventilation, and inclination of seam.

(*o.*) A seam dips at 1 in 8; 36 yards below this is another seam with the same inclination. It is required to connect these by means of a drive dipping 1 in 6. What length must it be?

FOURTH DAY (9 a.m. to 12 noon).

Subject 12.—The effect that faults produce in coal-seams, and how to ascertain the direction of a coal-seam when severed by a fault:—

(*a.*) In the main level of a 10ft. coal-seam having a south dip of 1 in 10, a fault is first met with on the dip side and lower corner of the face: how would you expect the "fault" to strike, and in which direction would the downthrow be, and how would you drive to recover the seam?

(*b.*) In sinking a square shaft in fairly steady measures dipping south, coal is first cut in the south-east corner of the shaft, but in continuing the sinking the seam is lost: how would you proceed to find the portion of the seam to the rise? explaining your reasons fully in the form of a report to employers.

Subject 13.—A knowledge of the composition and character of the different classes of coal, and also of the character of the rocks and formation of the country where coal is likely to be found:—

How do you distinguish the following kinds of coal: anthracite, cannel-coal, bituminous coal, pitch-coal, brown coal? giving the average composition and relative value for various purposes, giving New Zealand examples.

(2 p.m. to 5 p.m.)

*Subject 15.**—A knowledge of arithmetic, and the methods of keeping accounts:—

(*a.*) The diameter of a circle is 8ft.: what is its (1) circumference, (2) area?

(*b.*) Find the square root of 4651904.

(*c.*) Multiply 84·79 by 88090.

(*d.*) Find the cost of 13 score 14 tubs, each tub containing 8½cwt., 20 tubs to one score, at 13s. 4d. per score of 8 tons.

(*e.*) The tonnage price at a colliery was 5s.; subsequently 15 per cent. was given, then 15 per cent. reduction: what was the final rate? Afterwards it was agreed that in every ton 1cwt. should be deducted for slack, for which only 9d. per ton should be paid: what was the price per ton of the men's output?

(*f.*) What is the area of an airway measuring 4ft. 3in. by 3ft. 9in.?

(*g.*) Under what heads should a cost-sheet at a colliery be divided? Give an illustration.

Subject 16.—A knowledge of the provisions of "The Coal-mines Act, 1886."

* In all cases give the details of your calculations.

[*Approximate Cost of Paper.*—Preparation, nil; printing (1,200 copies), £4 5s.]

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