6. The rise workings from a level are supposed to contain fire-damp: describe minutely how you would proceed to ascertain if such is the case. State how you would ascertain approximately percentages of gas present, and how you would take samples for more definite analysis. State also how you would determine approximately the amount of fire-damp in these rise workings.
7. Black-damp occurs in considerable percentage on the floor of a narrow crosscut to a depth of 18 in.; at the face of the crosscut rock drills are used; the crosscut is 7 ft. in height, near the top of which is a line of air-pipes of maximum dimensions connected to an exhaust fan; the air-current does not disperse the black-damp lying on the floor: describe how the gas may be easily shifted with the appliances at hand.
8. The following is an analysis of mine-air recently taken by the Examiner: $CH_4 = 48{\cdot}10$ per cent.; $CO = 0{\cdot}015$ per cent.; $CO_2 = 0{\cdot}35$; Oxygen = 10·10 per cent.; Nitrogen, 41·435 per cent. Describe how you would take two samples of this mixture with perfect safety; also what effect (if any) would 10 minutes' detention in this mixture have upon you; also would there be any colour, taste, or smell from the gaseous mixture?

Subject IV.—*Arithmetic, Law, and First Aid.*

Arithmetic.

1. If gold is worth £3 17s. 6d. an ounce and silver £2 14s. per pound, what is the value of a bar of silver of equal weight with a bar of gold worth £1,085?
2. Extract the square root of 900042600504 and the cube root of 1027243729000.
3. A pocket of lead-ore weighed 7 tons; one portion of it yielded lead 78 per cent. and silver 8 oz. per ton; the remaining portion yielded lead 75 per cent., and silver 7½ oz. per ton; the total yield of silver was 55 oz.: what average per cent. of lead did the whole pocket contain?
4. Work out the following pay-bill, adding an advance of 18 per cent.: 164 tons 5 cwt. at 2s. 3½d. per ton; 104 yards cutting at 4s. 5d. per yard; 6 sets of timber at 3s. 2¾d. per set; drawing 138 props at 3¼d. each.
5. There are four legs for the construction of poppet-heads, each 69 ft. long, 22 in. square at one end and 15 in. square at the other: the contract price being 18s. 7½d. per 100 ft. super., required the number of superficial feet in the legs and the total cost.

First Aid.

1. Name the different kinds of fractures, and describe the difference in the symptoms of a fracture and a dislocation.
2. If part of a limb has been torn off, but there was not much bleeding, how would you act?
3. Briefly describe Schafer's method of artificial respiration; and why it is usually preferred to other methods.
4. What are the signs and symptoms, and what would you do, in a case of carbolic-acid poisoning?

Law.

1. What are the duties of the workmen's inspectors?
2. What duties has the mine-manager to carry out when a serious accident happens in a mine of which he has charge?
3. Under what conditions are explosives used in a mine? Quote rules as to storage of explosives on the surface and underground.
4. What are the conditions under which ropes and chains may be used?

Subject V.—*Surveying.*

(First-class Candidates only).

1. A tunnel is driven from A to B, due west, a distance of 168 ft. A lode is found at B and worked to C in a general northerly direction, as shown by the following traverse: Bearing 347° 42′, distance 83 ft.; bearing 24° 53′, distance 74 ft.; bearing 353° 25′, distance 90 ft., where a fault occurs. A prospecting-drive is then run in an easterly direction from C to D, as follows: Bearing 85° 33′, distance 108 ft.; bearing 103° 45′, distance 132 ft., where the lode is again struck. Compute the direct bearing and distance from A to D.
2. Two drill-holes, one mile apart, are put down to a seam of coal; the depth of the first is 634 ft., and that of the second 850 ft.; the surface of the former is 25 ft. above the top of the latter: what is the inclination of the coal-seam between the two points, measured in inches per yard?
3. A line passing through plumb-lines A and B suspended down two shafts bears 110° 32′; from a station C underground a line CB measures 16 chains, and a line CA 18 chains; the angle ACB = 80°: compute the bearings of AC and CB, and the distance AB.