

7. Explain the proper method of thawing dynamite cartridges. (10)

8. What are the dangers arising from the use of powder in dry and dusty mines, and how would you guard against them? (10)

9. Do you think coal dust will explode without the presence of inflammable gas; if so, what would you do to prevent such an explosion? (10)

Mine Manager Examination.

Paper No. 3. Time allowed, three and one-half hours.

The value attached to each question is given in parenthesis. Candidates must obtain 70 per cent. of the allotted marks to pass.

VENTILATION.

Coefficient of Friction, .00000002.

1. Define the terms motive column, regulator, coefficient of friction, ventilating pressure. (10)

2. Explain the principal features to be considered when contemplating the erection of a ventilating fan? (10)

3. What are the advantages of frequent splitting of the air current, and when is the limit in the number of separate ventilating sections reached? (10)

4. Find the rubbing surfaces of three airways each 6,000 feet long and all of the same sectional area, namely, 75 square feet. The forms of the three sections are as follows: The first, A, is rectangular, and is 5 feet high and 15 feet wide; the second, B, is square; and the third, C, is circular. (15)

5. (a) Determine the length of the motive column when the temperature of the downcast is 50 deg. F., and that of the upcast 130 deg. F., the depth of each shaft being 300 feet. (b) If the barometer reading in each is 29 inches, what is the pressure producing ventilation? (10)

6. If, with a water gauge of 1 inch, 40,000 cubic feet of air are obtained in an airway 10,000 feet long, what should be the water gauge when the length of the airway is extended to 20,000 feet, all other things being the same? (10)

7. If it is necessary to double the amount of air in a mine, how should the pressure and power be increased, respectively? (10)

8. What power will be required to give a current of 60,000 cubic feet of air per minute in a mine having four equal splits, the airway in each split being 6 feet by 8 feet by 5,000 feet? (10)

9. To find the percentage of mine gases given off by a mine the air at the inlet was measured and found to be 137,500 cubic feet per minute at a temperature of 61 deg. F., the air at the outlet measured 150,200 cubic feet per minute at a temperature of 76 deg. F., what is the percentage of mine gases present in the air leaving the mine? (15)

Mine Manager Examination.

Paper No. 4. Time allowed, three and one-half hours.

The value attached to each question is given in parenthesis. Candidates must obtain 60 per cent. of the allotted marks to pass.

PRACTICAL WORK.

1. If you had a number of men in a certain district and fire was to take place in an intake airway, state how you would proceed to rescue the men. (10)

2. If you were in charge of a gaseous mine and an explosion should occur during working hours: (a) What would be your first action? (b) Describe in detail how you would proceed into the mine to recover dead bodies or rescue persons still living. (10)

3. Make a sketch showing how you would construct an overcast. (10)

4. What useful purpose do overcasts and undercasts serve in mine ventilation, and which kind would you approve of and why? (10)

5. Show by sketch how you would divide a shaft you were sinking into the various necessary compartments, one compartment to be used for water, air pipes, and ventilation until connection with the escapement shaft is made. Answer fully. (10)

6. In developing a flat seam of coal, opened up by a shaft, and which is giving off a large quantity of explosive gas, how should the mine be planned in regard to ventilation and haulage so as to insure the greatest degree of safety to the employees? (15)

7. How do mine fires originate, and what precautions are necessary to prevent them? (10)

8. Give your reasons why different methods of mining are used and why one method will not answer for all mines. (10)

9. Describe by sketch some of the methods used in working incline seams. (15)

Mine Manager Examination.

Paper No. 5. Time allowed, three and one-half hours.

The value attached to each question is given in parenthesis. Candidates must obtain 60 per cent. of the allotted marks to pass.

MACHINERY.

1. What is a unit of work and how many are there in a horse-power? (5)

2. What care should be taken of steam boilers to secure the best results from their use? (10)

3. How may radiation from boiler pipes and engine cylinders be prevented? (10)

4. What is mean effective pressure? (5)

5. The diameter of the piston of an engine is 10 inches and the length of stroke is 15 inches. The engine makes 250 revolutions per minute with a mean effective pressure of 40 pounds per square inch. What is the horse-power of the engine? (10)

6. At a shaft 200 feet deep, there is a sump 250 feet long, 20 feet wide and 6 feet deep. If this sump fills in three hours' time, find the horse-power of the pump that should be installed to handle the water. (10)

7. A 300 horse-power engine has a cylinder 22 inches in diameter, and a stroke of 18 inches. When making 200 revolutions per minute, what must be the mean effective pressure (M.E.P.)? (10)

8. What weight will a double cylinder engine of the following dimensions lift (allowing one cylinder to overcome friction): Diameter of cylinder, 10 inches; length of stroke, 15 inches; average steam pressure on pistons, 40 pounds per square inch; engine shaft geared 5 to 1 on drum; diameter of drum, 5 feet? (10)

9. To what use is electricity applied in a coal mine? What are the names of the four electrical units in common use and explain their meaning? (10)

10. What in your opinion constitutes an efficient and safe hoisting appliance for a coal mine? Describe in detail from the foundation of the engine to the delivery of the carriage at the tippie. (10)

11. What classes of air compressors are best adapted to operate haulage locomotives? Give reasons. (5)

12. Using compressed air of 60 pounds gauge pressure, if there is required 1,100 cubic feet of free air for the operation of twenty-five 2-inch drills at sea level what quantity of free air would be required for the same work at an elevation of 5,000 feet above sea level where the barometer reads 25 inches? (5)