

workings? How would you proceed to overcome the difficulties or defects? Explain fully. (10)

5. A rectangular airway is 6 feet high, 12 feet wide, and 2,500 feet long; what is the rubbing surface in square feet? (10)

6. Which is the more effective, the exhaust or forcing fan? Give your reasons. (5)

7. In a gangway having a 7-foot collar, 12-foot spread, and 7 feet high, what is the area and what quantity of air is passing when the velocity is 375 feet per minute? (10)

8. The velocity of the air passing in a circular shaft 8 feet in diameter is 300 feet per minute; what is the quantity of air passing per minute? (10)

9. The water gauge is 1.5 inches, the quantity of air in circulation is 85,000 cubic feet per minute; find the horse-power in the air. (10)

10. Explain the principle discovered by Sir Humphrey Davy and embodied in the safety lamp. What is the standard size of wire gauze used in the Davy lamp? (5)

11. What instructions would you give in reference to the care and preparation of safety lamps before giving them out to the workmen and how would you instruct the workmen as to their use? (10)

Pit Boss Examination.

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

The value attached to each question is given in parenthesis. Candidates must obtain 50 per cent. of the allotted marks to pass.

PRACTICAL WORK.

1. When would you consider that the coal in a seam is properly mined where blasting the coal is necessary? State your views fully. (10)

2. When the fire boss reports in the record book certain dangers that he has discovered during his examination, what would be your duty as pit boss? (5)

3. Assuming that falls of roof, slate, coal and sides are the cause of the greatest number of accidents in mines, what precautionary measures would you adopt as a pit boss to reduce their number? (10)

4. An entry is rising at the rate of 7 feet in 100 feet and the ventilating current of air is flowing up the grade where you are compelled to place a door on the pitch of said entry near its entrance, and the height of the door is equal to the height of the entry; explain how you would prepare the place so the door would close by gravity and show by sketch how door is placed. (10)

5. Make a sketch of an overcast. (10)

6. Show by sketch how you would timber a roadway having a bad roof and sides, also soft fireclay bottom that heaves. (10)

7. What method is the safest for using dynamite in sinking a shaft and what will give the least danger to life or limb? Explain fully. (5)

8. Describe a creep, its effect, and the precautions necessary to prevent and check it. (10)

9. A dam in a tunnel supports a vertical head of 80 feet of water; the sectional area of the tunnel is 70 square feet. Find the total pressure on the dam. (5)

10. Do you consider coal dust an element of danger in a non-gaseous mine? If you found much dust in the mine what precautions would you adopt to prevent any danger to life and destruction of property that might occur from its presence while mining operations were being carried on? (10)

11. What are the causes that lead to mine fires, not taking into consideration spontaneous combustion, and how would you guard against them? In dealing with mine fires what dangers are likely to arise to life pro-

vided care is not exercised by the persons dealing with them, and what precautionary measures should be adopted to insure safety? (5)

12. Explain in detail the causes of accumulations of fire damp, and the probable effects of allowing such accumulations to exist in a mine. What precautions should be taken to avoid such accumulations of gas? (10)

Pit Boss Examination.

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

The value attached to each question is given in parenthesis. Candidates must obtain 50 per cent. of the allotted marks to pass.

MACHINERY.

1. What is the principle of the siphon and to what height can it be applied to raise water? How would you start the flow in a siphon? (10)

2. What is it that causes a pump to raise water through a suction pipe 20 or 25 feet? (10)

3. For what purpose are bearings bushed? What metals are generally used and why? (5)

4. What is a unit of work and how many are there in a horse-power? (10)

5. What is the horse-power of an engine with cylinder 20 inches in diameter, length of stroke 30 inches, making 50 revolutions per minute, with an average steam pressure of 30 pounds per square inch? (10)

6. State the method you would employ in making an examination of the rope, cage, and safety catches in use at a coal mine. (10)

7. In laying out a siding or main parting where mechanical haulage is in use, what are the chief points to be considered with reference to safety, economy, and the speedy handling of the coal? (10)

8. Give a sketch showing various forms of rope capping. Which form would you prefer and why? (10)

9. Name the different kinds of safety valves and give the characteristics of each. (5)

10. If the diameter of the water cylinder of a pump is 10 inches and the discharge column is 150 feet in height, what would be the total pressure in pounds on the piston, disregarding friction? (10)

11. A pipe running full of water is one foot in diameter and is leading from the mine to a surface opening that is draining said mine of its water; the velocity of the water in the pipe is 4 feet per second, how many gallons of water would be discharged therefrom in one minute? (10)

Pit Boss Examination.

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

The value attached to each question is given in parenthesis. Candidates must obtain 50 per cent. of the allotted marks to pass.

SURVEYING.

1. Give the order of the letters on the face of a compass and the reason for such arrangement. (15)

2. What is meant by the declination of the needle? (10)

3. What is the most suitable and accurate instrument for measuring distances? (10)

4. Where are stations in mine surveying generally placed and why are they so placed? (10)

5. In setting up a compass, how do you determine the exact place to set the instrument when the station is placed in the roof? (15)

6. Plot the following compass survey to a scale of 100 feet to the inch:

Stations 1-2 N. 15 degrees, E. 220 feet.

Stations 2-3 N. 40 degrees, E. 160 feet.