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COLLIERY OFFICIAL'S EXAMINATIONS 1904.

Answers to Manager's Questions by J. W. Marshall, Springhill

VENTILATON.

Ques. 1.—Give the names of the different gases met with in coal mines, and also their symbols and specific gravities?

Ans. 1.—(a) Light carburetted hydrogen, Proto carburetted hynrogen, Methyl hydride, Methane, Marsh gas, Firedamp, or simply "Gas." Symbol $C\text{-}H_4$. Sp : Gr. ·559

(b) Carbon-odi-xide, Carbonic acid gas, Carbonic anhydride, Stythe or so metimes Black-damp. Symbol $C\text{-}O_2$. Sp : Gr : 1·529.

(c) Carbon-mon-odide, Carbonic oxide, White-damp, or Sweat damp. Symbol C-O. Sp :Gr : ·969.

(d) Sulphurretted hydrogen, Hydrogen sulphide, or Stinkdamp. Symbol $S\text{-}H_2$. Sp : Gr. 1·129.

Ques. 2.—What height of cap will show on the light of a safety lamp, containing 1 part of gas to 18 of air, 1 part of gas to 20 of air, and 1 part of gas to 25 of air?

Ans. 2.—The following is for an ordinary cased Davy lamp burning a mixture of colza and petroleum, and with a ¼ inch flame.

(a) $\frac{100}{16} = \frac{5}{19}$ ∴ cap will be above 3 inches.

(b) $\frac{100}{21} = 4\frac{16}{21}$ ∴ cap will be about $1\frac{3}{4}$ inches.

(c) $\frac{100}{26} = 3\frac{11}{13}$ ∴ cap will be about 1 inch.

With a Clowes detecting lamp the oil flame being about 1-10th of an inch high the caps would be 2½ inches, 1½ inches, and 3-5 of an inch respectively.

Ques. 3.—How would you light a furnace fire in a mine where the temperature outside is 90° and the temperature inside is 60° the furnace being built at a point 100 ft. higher than the intake opening; explain fully, ?

Ans. 3.—It is easy to see that this is a case of natural ventilation, and it does not require any calculation to prove that the air is passing down the furnace shaft into the mine.

If the furnace was lighted under such conditions the products of combustion would pass into the mine instead of ascending the shaft. Some means must therefore be adopted to destroy the motive column producing the natural ventilation and bring the current to a standstill first, and then start it in the contrary direction.

The best way to do this would be to use what is known as the "fire lamp." This is a large iron cage, or basket shaped receptable which can be suspended, by means of chains, in the shaft. A fire is lighted in the lamp and allowed to burn for a while until it is glowing bright and clear, giving off little smoke. The lamp is then lowered into the furnace shaft and it heats up the air sufficiently to first bring the current to a standstill and finally start it in the proper direction—i. e, passing "up" the furnace shaft. The furnace fire can then be lighted and its heat will strengthen the enrrent and maintain it. This method is often adopted under similar conditions in the metal mines in England

Ques. 4.—An airway 6 ft. by 8 ft. and 2000 yards long is passing 28,800 cubic feet of air per minute with 15 horsepower. Find the coefficient of friction and water gauge. Give the formula and work out each in full.?

Ans. 4.—By Atkinson's well known formula

$$P = \frac{KSV^2}{A}$$

$$\therefore\ P = \frac{CSQ^2}{A^3}$$

but $\frac{\text{pressure} \times \text{quantity}}{33000}$ = horsepower.

$$\therefore\ P = \frac{KSQ^3}{a^3 \times 33000}$$

$$\therefore\ 15 = \frac{KSQ^3}{a^3 \times 33000}$$

$$\therefore\ \frac{15 \times a^3 \times 33000}{S \times Q^3} = K$$

$$\therefore\ K = \frac{15x48x48x48x33000}{28x2000x3x28800x28800x28800}$$

$$\therefore\ K = \text{·}000000013 \text{ lbs per square ft.}$$

In the above formula P = pressure in lbs per sq ft.
" " " " S = rubbing surface in sq ft.
" " " " V = velocity in ft per min.
" " " " Q = quan. in cubic ft per min.
" " " " A = area in sq. ft.
" " " " K = coefficient of friction.

(b) $P = \frac{KSQ^2}{a^3}$

$$\therefore\ WG = \frac{KSQ^2}{a^3 \times 5{\cdot}2}$$

$$\therefore\ WG = \frac{.013 \times 28 \times 2000 \times 3 \times 28.8 \times 28.8}{48 \times 48 \times 48 \times 5.2}$$