$\therefore$ WG = 3.15 inches.

In this case K and Q are both in thousands of ft per minute.

By the ordinary formula

$$WG = \frac{P \times 33000}{\text{quantity} \times 5.2}$$

$$\therefore WG = \frac{15 \times 33000}{28000 \times 5.2}$$

$\therefore$ WG = 3.30. inches.

Answers { Coefficient = .000000013 lbs per sq. ft.
WG = 3.15 inchns. or 3.3 inches.

Difference of WG due to coefficient now being worked far enongh out.

Ques. 5.—In a mine worked by the pillar and room system it is found difficult to keep the far off districts clear of gas; when the regulators of the short districts are nearly closed the faces of the districts are no better. What is the cause and how would you remedy it. ?

Ans. 5.—The air ways are too small to pass sufficient air for the far off districts, and therefore the closing of the regulators on the short splits has little or no effect.

I would enlarge the area of the airways, or endeavour to lessen the friction by adding more splits. The latter would really be enlarging the area available for the current to pass and would considerably lessen the friction if splits could be made so as to shorten the distance which part of the quantity has to travel.

Increasing the area of the airways might be an expensive undertaking, but not so expensive as increasing the power, because the quantity only increases in proportion to the cube root of the power applied.

Ques,6.—An airway measuring 7" x 7" = 49 sq ft is passing 30000 cubic ft of air per minute with a pressure of a pound per sq ft. We enlarge the area to ninety square ft. the form still remaining square, what quantity will now pass the pressure remaining the same, will the velocity be increased or diminished in the larger section. ?

Ans. 6.—$\sqrt{90}$ = 9.486 ft square.

$\therefore$ perimeter of large airway = 9.489 x 4
= 37.944 ft.

perimeter of small airway = 7 x 4 = 28 feet.

Relative quantity is found by the formula

$$R = \sqrt{\frac{A^3}{S}}$$

A = area in sq. ft.

S = rubbing surface in sq. ft.

R = relative quantity.

Length remains unaltered therefore I will substitute perimeter for rubbing surface in the formula.

Large airway.

$$R = \sqrt{\frac{A^3}{\text{Perim}:}} = \sqrt{\frac{90 \times 90 \times 90}{37.944}}$$

$= \sqrt{19212.52} = 138.6$

Small airway.

$$R = \sqrt{\frac{A^3}{\text{Perim;}}} = \sqrt{\frac{49 \times 49 \times 49}{28}}$$

$= \sqrt{4201.75} = 64.8$

Then

As 64.8 : 138.6 :: 30000 : X

$$X = \frac{138.6 \times 30000}{64.8}$$

$\therefore$ Increased quantity = 64000 cubic ft. approximately.

Velocity in small airway = $\frac{30000}{49}$ = 611 ft. per min approximately.

Velocity in large airway = $\frac{64000}{90}$ = 711 ft per min. approximately.

$\therefore$ Velocity is increased about 100 ft per minute in the larger area.

Ans.—New quantity = 64000 cubic ft per minute (approximately.)

Velocity is increased about 100 ft per minute in the larger area.

Ques. 7.—In which workings of a mine is the greatest pressure required for the removal of firedamp.

Ans. 7.—In the rise workings. Fire damp, next to hybrogen is the lightest substance known, and owing to its exteeme lightness it floats near the roof, making its way to the hightest points of the mine. Air is twice as heavy as firedamp and it is a fact, which is well known, that air falls easily to the dip but has to be forced to the rise, owing to its weight. Thus we have two conflicting conditions in rise workings, viz:—heavy air unwilling to go up, and light gas unwilling to come down, and it is easy to understand that considerable pressure will be required in rise workings to keep a sufficient current of air sweeping the faces and diluting and rmeoving the firedamp. The greater the degree of inclination the greater will be the pressure required to keep the rise working clear.

Ques.8.—What is the object of splitting air in mines.

Ans, 8.—The chief object is to supply each district with a current of fresh air, instead of coursing the vitiated air from one district into another This increases the safety of the mine and lessens the anxiety of the management, because:—

(a) The ventilation of each district is to a certain extent independent of the other districts, and should a fall block the airway in one, the others will benefit rather than otherwise.

(b) There will be fresh air on the main haulage roads and travelling roads of each district.

(c) Wood doors on main haulage roads are dispensed with, and fewer doors are required through out, although more air crossings are required.

(d) Gases given off in one district are not carried into any of the others; therefore there is less danger of explosion.

(e) Should an explosion occur in one district, its effects may not extend to the others.

(f) The composition of the air is more uniform throughout the mine and, except in the first working places, the temperature of the mine is somewhat reduced.

(g) Each seperate district is considered a seperate mine under the Mines Act, a fact which carries several advantages with regard to shotfiring and inspection.

The second object, and one which is just as important as the first is to obtain the greatest pos-

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