The.... MARITIME MINING RECORD

Vol. 10, No. 5. Stellarton, N. S., Sep. 11th. 1907. New Series

SPLITTING AIR.

—BY PRACTICAL.—

In the issue of July 10th. of the Record, Mr. Baird challenged the whole mining fraternity to prove that his solution of a certain ventilation question was not a correct one. This is rather a bold thing for any man to do, but when a man of Mr. Bairds calibre does it, one is apt to pause before tackling him. Aftet carefully considering the matter over I am just as confident now that he is wrong as when I discussed the question with him personally almost a year ago. I wish it to be fully understood that I take up this challenge in the proper spirit and have no wish to become personal in any way.

The question is as follows: If 30,000 cubic ft. of air is being produced in an airway 1200 ft. long 8 x 5 ft, how many cubic ft. of air would be produced if the air were split into three splits, the first being of the dimínsions given above, the second 1500 ft. long 8 x 7, the third 1800 ft. long 9 x 6 ft., the power remaining the same.

Ans.—First let us look at the derivation of the accepted formula for working the question. It would be too much to go back in the three laws of friction which lead up to Mr. Atkinson's well known formula so I will start at the formula itself.

PA eq. KSV^2 P = pressure in lbs. per sq. ft. producing ventilation.
A = area in sq. ft.
K = coefficient of friction.
S = rubbing surface in sq ft.
V = velocity in ft. per minute.

By transposition P eq. $\frac{KSV^2}{A}$

Now pressure X quantity eq power.
Let U eq. power in units of work per minute.
Let U eq. $\frac{KSV^2 \times V \times A}{A}$

because velocity x area eq. quantity.
By cancellation U eq. KSV^3

Now transpose so that if we had the units of work we could find the velocity,

$$\frac{U}{KS} \text{ eq } V^3$$

$$\therefore \sqrt[3]{\frac{U}{KS}} \text{ eq. } V$$

Now velocity x area being equal to quantity

$$\sqrt[3]{\frac{U}{KS}} \times A \text{ eq. quantity.}$$

This then is the accepted formula:

We first find the units of work in the first airway to get the value of U.

K eq. .00000001

S is the total rubbing surface of the three airways together.

A is the the total area of the three airways together.

Now Velocity = quantity divided by area,

Let Q = quantity,

Then $\frac{Q}{A} = V$

$$\therefore V^3 = \frac{Q \times Q \times Q}{A \times A \times A} = \frac{Q^3}{A^3}$$

$\therefore$ by a preceding formula $U = \frac{KSQ^3}{A^3}$

so we can substitute the values of the first airways for the U in the formula.

$$\therefore Q \text{ in three airways } \sqrt[3]{\frac{\frac{KSQ^3}{A^3}}{KS}} \times A$$

$$\text{eq. } \sqrt[3]{\frac{\frac{SQ^3}{A^3}}{S}} \times A \text{ because K cancels out.}$$

$$\therefore Q \text{ eq. } \sqrt[3]{\frac{\frac{26 \times 1200 \times 30000 \times 30000 \times 30000}{40 \times 40 \times 40}}{\frac{130200}{1}}} \times 150$$

eq. 69870 c. ft. (worked by logarithms,)

Now power in first case eq. $\frac{KSQ^3}{A^3}$

$$\text{eq. } \frac{.00000001 \times 26 \times 1200 \times 30000 \times 30000 \times 30000}{40 \times 40 \times 40}$$

eq. 131600 units of work.

Now to prove this answer let us find quantity in each airway by relative quantity formula R eq. $\sqrt{\frac{A^3}{S}}$

1st. airway R eq. $\sqrt{\frac{40 \times 40 \times 40}{26 \times 1200}}$ eq. 1.43

2nd. airway R eq. $\sqrt{\frac{56 \times 56 \times 56}{30 \times 1500}}$ eq. 1.975

3rd. airway R eq. $\sqrt{\frac{54 \times 54 \times 54}{30 \times 1800}}$ eq. 1.708

1.43 + 1.975 + 1.708 eq. 5.113

Then by proportion: 1st. airway gets......19540
2nd. airway gets......27000
3rd. airway gets......23330
Total......69870

Pressure eq. $\frac{KSQ^2}{A^3}$

1st. split P eq. $\frac{.01 \times 26 \times 1200 \times 19.54 \times 19.54}{40 \times 40 \times 40}$ eq. 1.863 lbs.

2nd. split P eq. $\frac{.01 \times 30 \times 1500 \times 27 \times 27}{56 \times 56 \times 56}$ eq. 1.868 lbs,

3rd. split P eq. $\frac{.01 \times 30 \times 1800 \times 23.33 \times 23.33}{54 \times 54 \times 54}$ eq. 1.867 lbs,

This is the place where Mr. Baird goes astray. He adds together his three pressures, but that is totally