wise by wedging, or blasting, the coal is brought down, broken to requirements, and filled into the tubs.

In seams of moderate thickness the whole of the coal should be got out, but in the pillar and stall method small portions of coal are frequently lost, whereas in the long wall system there is (practically speaking) no waste. This is a very big advantage of long wall, over pillar and stall working.

If the output of the mine was considerable, the roads in a long wall pit would consist of main engine planes, main gates, cross gates, and ordinary gate roads. The gate roads are displaced by cross gates, the old cross gates by newer ones, and the main gates by engine planes.

This is necessarily required in order to keep down the length of the roads as much as possible, which is economical in cutting down expenses.

It is a matter of convenience for the direction of the roads in flat seams, but where the seam dips the gradient has to be considered.

The great advantages of the 'long wall' method are simplicity of plan (and consequently, of ventilation) and the entire removal of all the coal; added to which under most circumstances, are greater safety to the men, and a larger proportion of round coal is obtained, a matter which, considering the prices, is of vital importance in the selection of the mode of working.

VENTILATION.

Q—Other conditions remaining constant, what alterations in a current of 50,000 cubic feet per minute, travelling an airway, would result from (a) doubling the length; (b) doubling the velocity; (c) doubling the power; (d) doubling the area?

A.—(a) We know that if we double the length of an air-way we must at the same time (other things remaining constant) offer a double resistance to the air current by presenting a double area of rubbing surface for the air to brush against, and at the same time double the pressure will be required. Thus, the volume of air in this case will vary inversely as the square root of their lengths, or ratio of rubbing surfaces.

$\therefore \sqrt{2} : \sqrt{1} :: 50,000 : x.$

$\therefore 1.41421 : 2 :: 50,000 : x = 35,355$ cub. ft. per min.

Now $50,000 - 35,355 = 14,645$ cubic feet per minute lost in overcoming the resistance offered by the double area of rubbing surface exposed to the air current.

(b) By doubling the velocity we shall get double the quantity, as the quantity in this case varies directly as the velocity.

$\therefore 1 : 2 :: 50,000 : x = 100,000$ cubic ft. per minute. An increase of 50,000 cubic ft. per minute.

(c) The quantity of air circulating varies as the cube root of the power

$\therefore \sqrt[3]{1} : \sqrt[3]{2} :: 50,000 : x$

$\therefore 1 : 1.1599 :: 50,000 : x = 62,995$ cub. ft. per min.

$\therefore 62,995 - 50,000 =$ an increase of 12,995 cubic feet per minute.

(d) The quantity varies as the areas multiplied by the square root of the area

$\therefore 1 \times \sqrt{1} : 2 \times \sqrt{2} :: 50,00 : x$

$\therefore 1 \times 1 : 2 \times 1.41421 :: 50,000 : x = 141,421$ cub. ft.

$\therefore 141,421 - 50,000 = 91,421$ cubic feet per minute increase.

From the above calculations we have pointed out to us in a marked degree the value to be got by increasing the sectional area of air ways in mines, as doubling the area nearly gives us approximately three times as much air.

At the same time doubling the velocity gives us double the quantity, but this is not so easily done, while doubling the power only gives about a quarter more air. Thus, the greatest benefit is to be got by increasing the area if possible.

PERMITTED EXPLOSIVES AND BLACK POWDER

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An "Explosives Circular" issued by the United States Geological Survey reminds us that as a part of the investigation or mine explosions authorised by Congress in May, 1908, it was decided by the Secretary of the Interior that a careful examination should be made of the various explosives used in mining operations, with a view of determining the extent to which the use of such explosives might be responsible for the occurence of these disasters.

The preliminary investigation showed the necessity of subjecting to rigid tests all explosives intended for use in mines where either gas or dry inflamable dust is present in quantity or under conditions which are indicative of danger.

It may be wise to point cut certain differences between the permissible explosives as a class and the black powders now so generally used in coal mining, as follows:—

(a) With equal quantities of each, the flame of the black powder is more than three times as long, and has a duration three thousand to more than four thousand times that of one of the permissible explosives, also the rate of explosion is slower.

(b) The permissible explosives are one and one-fourth to one and three-fourths times as strong and are said, if properly used, to do twice the work of black powder in brining down coal; hence only half the quantity need be used.

(c) With 1 pound of a permissible explosives or two pounds of black powder the quantity of noxious gases given off from a shot averages approximately the same, the quantity from the black powder being less than from some of the permissible explosives, and slightly greater than from others. The time elapsing after firing before the miner returns to the working face or fires another shot should not be less for permissible explosives than for black powder.

The use of permissible explosives should be considered as supplemental to, and not as substitute for, other safety precautions in mines where gas or inflamable coal dust is present under conditions indicative of danger.

As stated above, they should be used with strong detonators; and the charge used in practice should not exceed $1\frac{1}{2}$ pounds, and in many cases need not exceed 1 pound.

In as much as no explosive manufactured for use in mining is flameless, and no explosive is entirely safe under the variable mining conditions, the use of the terms "flameless" and "safety" as applied to explosives is likely to be misunderstood, may endanger human life, and should be discouraged.