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The Dominion Coal Co's hoisting tower at St. John N. B. is now in working order, and the cost of handling and unloading coal at that port has been reduced to one-quarter of what it was when the old bucket method of unloading was in use. Owing to the unusual rise and fall of the tide at this point, there is a long lift, all of 120 feet in fact, at the ebb of the tide. Six men are required to operate the machinery, which loads the fuel directly into the carts for distribution about the city and can work at the rate of 2,000 tons per day.

"Mine and Quarry" is the name of a quarterly bulletin issued by the Sullivan Machinery Co'y. of Chicago. The publication is bright and must prove of much interest to all users of the many kinds of machinery manufactured by the firm, and to those interested in a general way in mining matters.

The.... MARITIME MINING RECORD

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A few examples on the three laws of Friction of air currents in mines, by JAMES GRAY, DOMINION No. 6.

The first law with regard to the friction of air in mines is that the pressure required to overcome the friction of the air increases or decreases exactly in the same proportion as the area or extent of the rubbing surface exposed to the air increases or decreases, providing the velocity and sectional area of the airway remain the same. If we double or treble the extent of the rubbing surface we also double or treble the friction, and consequently, we require double or treble the pressure to overcome it. The rubbing surface depends upon the circumference or perimetes of the airway and its length. The following examples are given to show how the rubbing surface is found in various shaped airways:

What is the rubbing surface in each of the following airways:

(a) Airway, 6 feet square and 600 yards long.
(b) Airway, 9 ft by 4 ft. and 600 yards long.
(c) Circular shaft 6.7 ft. diameter, 600 yards deep.

(a) Rubbing Surface = 6+6+6+6 = 24x600x3 = 43200 sq. ft.
(b) " " = 9+9+4+4 = 26x600x3 = 46800 sq. ft.
(c) " " = 6.7 x 3.1416 eq. 21.048 x 600 x 3 eq. 37886.4 square feet.

In the above examples we see that a circular shaft or airway offers less rubbing surface for the same length than either of the other two, in fact the circumference of a circle is less in proportion to its area than the perimeter of any other figure is to its area. As the rubbing surface of an airway, in proportion to its area, plays a very important part as a factor in mine ventilation it would be as well to consider here the resistances offered by airways of various sizes. Take an airway 8 ft. square and 1000 feet long, the rubbing surface is 8 x 4 eq 32 x 1000 eq. 32,000 sq. ft., but divide this air into four parts, each 4 ft. square, and we exactly double the amount of rubbing surface exposed to the velocity of the air for the same area. Therefore the rubbing surface in the tour smaller ones eq. 16 x 4 ep. 64 and 64 x 1000 eq. 64,000 sq. ft. From this fact we learn that it is better to have one large airway than a number of small ones, even it together they make up the same sectional area. As the pressures employed to ventilate mines are reckoned at so much per square foot of area, and not by the entire pressure employed, I will here give a few examples as exercises for students to enable them to find the rubbing surface, per sq. foot of section of airway:

Let S eq. Rubbing Surface. A eq. Area of Section. W. G. eq. Water Gauge.

Find the rubbing surface per sq. foot of section in the airways previously given; (a) rubbing surface 43,200 sq. ft. Area 36 sq. ft. (b) rubbing surface 46,800 sq. ft. Area 36 sq. ft. (c) rubbing surface 37886.4 sq. ft. Area 36 sq. ft.

Rule $\frac{s}{a}$

(a) $\frac{43200}{36}$ eq. 1200 rubbing surface per sq. ft.

(b) $\frac{46800}{36}$ eq. 1300 rubbing surface per sq. ft.

(c) $\frac{37886.4}{36}$ 1052.4 rubbing surface per sq. ft.

If the velocities remained the same in the above airways the resistance would vary as $\frac{s}{a}$

If the Water Gauge in a read .75" What would it read in b and c, velocity to be the same in each case. As the rubbing surface per sq. ft. of section b is greater than a, the Water Gauge in b must be greater in the same proportion. ∴ W. G. in b eq. $\frac{1300}{1200}$ x .75 eq. .81"

Again, as the rubbing surface per sq. ft. of section c is smaller than a, the W. G. in c must be lower in the same proportion. ∴ W. G. in c eq. $\frac{1052.4}{1200}$ x .75 eq. .877 x .75 eq. .65775".

The friction of air in mine ventilation varies directly as the rubbing surfaces due to different lengths in the same airway, so that according to this rule as we increase or diminish the length of the airways so do we increase or diminish the friction. Therefore the pressure also increases or decreases accordingly.

Example—Take an airway whose pressure or resistance is equal to 5 W. G. What would be the W. G. required to maintain the same velocity if the length of the airway was increased .75. Suppose the length of the airway in the first instance was 600 ft, and to increase it .75 would equal 600 + (600 x .75) eq. 600 + 450 equal 1050 feet in length. ∴ W. G. eq. $\frac{1050}{600}$ x .5 eq .875" W. G. requ'red.

Take another example: An airway 1000 yards long, required a W. G, of .35. What W. G. would be required to maintain the same velocity if the airway was increased in length to 4000 yards.

∴ W. G. eq. 4000 x .35 eq. 4 x .35 eq. 1.4" W. G.

The second law of friction of air currents in mines includes the following:—(1) Pressure varies as the squares of the velocities. (2.) Velocities vary as the square root of the pressures. (3) Pressures are always equal to the resistances, but the velocities vary as the square roots of the resistances inversely, with a fixed

Water Gauge.

Example 1. The velocity in an airway is 5 feet per second, with a W. G. of 1.7, what W. G. would be required for a velocity of 10 ft. per second.

Ans.—As pressures vary as the squares of the velocities, therefore, as in this case, the velocity is increased so must there be an increase of W. G. in the following proportion: $\frac{10^2 \times 1.7}{5^2}$ eq. $\frac{100 \times 1.7}{25}$ eq. 6.8 W. G.

Example 2. (a) If a W. G. of 6.8" gave a velocity of 10 ft. per second, What velocity will be given with 1.7 W. G.

Ans.—Velocities vary as square roots of pressures. ∴ V eq. $\sqrt{\frac{1.7}{6.8}} \times 10$ eq. $\frac{1.3}{2.6} \times 10$ eq. 5 ft. per second.

(b) If we have a velocity of 5 ft. per second, with a W. G. of 1.7, what velocity will be given with 6.8 W. G. V eq. $\sqrt{\frac{6.8}{1.7}} \times 5$ eq. $\frac{2.6}{1.3} \times 5$ eq 10 ft per second.

Examples 3. (a) If we have a velocity of 20 feet per second in an airway 625 yards long, with a W. G. of 2 inches, what velocity would be obtained if the airway was increased in length to 1024 yards. W. G. the same

Ans.—Velocities with a fixed W. G. vary inversely as the sq. roots of the resistances:

∴ V eq. $\sqrt{\frac{625}{1024}} \times 20$ eq. $\frac{25}{32} \times 20$ eq. .7812 x 20 eq 15.624 velocity in ft. per second.

(b) Again suppose we have a velocity of 15.624 feet per second in an airway 1024 yards long, with 2" W. G. what would be the velocity if it was decreased in length to 625 yards.

This is exactly the reverse of the other.

∴ V eq. $\sqrt{\frac{1024}{625}} \times 15.624$ eq. $\frac{32}{25} \times 15.624$ eq. 1.28 x 15.624 eq. 19.99872, say 20 ft. as before. The slight deficiency here is owing to decimal points (in the previous example) being only taken to four places, but for all practical purposes it shows the correctness of the rule. Students should work out in full the examples given and other similar ones, as by doing so they will prove for themselves the truth of the above law. I may remark here that in the same airways quantities may be substituted for velocities. The reason why they can only be substituted in the same airways is that if we had a velocity of 6 ft. per second in an airway 10' x 6' the quantity would be: A (10 x 6) eq. 60 x 6 x 60 eq. 21600 cubic ft. per minute, Suppose the resistances offered were lessened to such an extent as to make the velocity 10, with the same airway, the quantity would equal (60 x 10 x 60 eq. 36000. But if we had a different airway say 10' by 10', this would equal (100x10x60) eq. 60,000 cubic ft. per minute. It may be seen from the above that quantities cannot be substituted for velocities when different airways are taken, but only in the same airways. Example.—If we have 10,000 cubic ft. of air per minute passing through an airway 1225 yards long and 10' by 5' with a W. G. of .368 inches, what amount of air would pass through if it was reduced to 900 yards. W. G. the same.

Ans.—The quantities in the same airways vary as the square roots of the resistances inversely.

∴ $\sqrt{\frac{1225}{900}} \times 10000$ eq. $\frac{35}{30} \times 10000$ eq. 11666.6 c. ft. min.

To prove the above, work out according to "Atkinson' and we have the following:

1st.—Find the pressure to pass 10000 cub. ft. of air per minute in the airway 1225 yards long and 50 feet area.

Rule Q eq. $\frac{KSV_2}{a}$ K eq. .0217 In this case a eq. 50 S eq. (30x1225x3) eq. 110250. V eq. $\frac{10000}{50}$, eq. 200. V_2 eq. $\left(\frac{200}{1000}\right)^2$ eq. .2x.2 eq .04

∴ Q eq. $\frac{.0217 \times 110250 \times .04}{50}$ eq. $\frac{95.697}{50}$ eq. 1.9139 lbs pressure req.

W. G. eq. $\frac{1.9139}{5.2}$ eq. .368"

2nd.—Find the velocity in the airway when it is reduced to 900 yards long, pressure the same 1.9139. S in this case eq. (900x3x30) 81000 ∴ Rule V^2 eq. $\frac{PA}{KS}$

∴ V^2 eq. $\frac{50 \times 1.9139}{.0217 \times 81000}$ eq. $\frac{95\,695}{1757\,7}$ eq. .05443. This number is the velocity squared in thousands of feet, therefore to obtain the velocity we must take the square root of this number and multiply it by 1000, and this multiplied by the area gives the quantity:— ∴ $\sqrt{.05443}$ eq. .23333x1000 eq. 233.33 Vx50 eq. 11666,5 cub. feet per minute, same as before.

The third law of friction of air currents in mines includes the following:

(1) Quantities vary as the cube roots of the powers.

(2) The powers vary as the cubes of the quantities.

From the above it will be seen that the third law of ventilation treats of the relationship of quantities to powers or powers to quantities in the same mine or airways. The following examples will illustrate and enable students to understand more clearly the above relationship of powers and quantities.

(1) Quantities vary as the cube roots of the powers.

Ex. 1—Suppose we had eight horse-power, and it produced a ventilation of 60,000 cub. ft. of air per minute, what quantity of air would be produced with 27 H. P.

In looking at this question we see clearly that a greater quantity will be produced because we have a greater power, but this increase will not be in the proportion of the powers as given but as the cube roots of those powers, Let

Q eq. Greater Quantity P eq. Greater Power
q eq Lesser " p eq. Lesser "

Then in the above example we have the following:—P eq. 27, p eq. 8, q eq. 60,000, Q eq. quantity to be found. Therefore the solution may be represented thus:

Q eq. $\sqrt[3]{\frac{P}{p}} \times 60{,}000$ eq. $\sqrt[3]{\frac{27}{8}} \times 60000$ eq. $\frac{3 \times 60000}{2}$ = 90,000 cubic ft.

Reverse the question and say. If we had 90000 cubic ft. of air per minute with 27 H. P., What amount should we have with 8 H. P.. In this case we should have a less quantity because we have a less power.

q eq. $\sqrt[3]{\frac{p}{P}} \times 90000$ ∴ q eq. $\sqrt[3]{\frac{8}{27}} \times 90000$ eq. $\frac{2}{3} \times 90000$ eq. 60,000 cubic ft.

Example 2.—If with 64 H. P. we have 120,000 cub. feet of air per miuute, what quantity will be produced with 27 H. P.

Rule—q eq. $\sqrt[3]{\frac{p}{P}} \times 120000$. ∴ q eq. $\sqrt[3]{\frac{27}{64}} \times 120{,}000$ eq. $\frac{3}{4} \times 12000$ eq. 90,000 cubic ft.

(2) The powers vary as the cube of the quantities.

Example.—If a ventilation of 60,000 cubic feet of air per minute required 8 H. P., What H. P. would 90,000 cub. ft. of air require. Here we should want a greater power, because we have a greater quantity in the following ratio:—P eq. $\frac{Q^3 \times p}{q^3}$

$\therefore$ P eq. $\frac{120,000^3}{60,000^3}$ x 8 eq. $\frac{2^3}{1^3}$ x 8 eq. 64 H. P.

Reverse this and say, if 120,000 cubic feet of air requires 64 H. P., what power will 60.000 require. Rule p eq. $\frac{q^3 \times P}{Q^3}$ $\therefore$ p eq. $\frac{60,000^3}{120,000^3}$ x 64 eq. $\frac{1^3}{2^3}$ x 64 eq. 8 H. P.

We will take another example. Suppose we had a ventilation of 80,0000 cubic ft. of air per minute with a H. P. of 64. what H. P. would be required to produce 160000 cubic ft. Here we should require a greater power because we have a greater amount of ventilation, therefore the ratio would be thus. Rule. P eq. $\frac{Q^3 \times p}{Q^3}$

$\therefore$ P eq. $\frac{160000^3}{80000^3}$ x 64 eq. $\frac{2^3}{1^3}$ x 64 eq 512 H. P.

When pressures and qnantities are given the powers are determined as follows:

Ques. 1.—A velocity of 840 ft. per minute is obtained in an airway 6 ft. high and 10 feet wide, with a W. G. of 3.5" between the main intake and return at pit bottom. What is the H. P. expended on the underground workings. Shaft friction not taken into account.

A eq. 60 V eq. 840 W.G. eq. 3.5. H. P. eq. horse power

Rule H. P. eq. $\frac{V \times A \times W.G. \times 5.2}{33000}$ eq. $\frac{840 \times 60 \times 3.5 \times 5.2}{33000}$ eq. 28.6 nearly.

Ques. 2—If we had a ventilation of 140,000 cubic ft. of air per minute with a W. G. of 2.5" in fan drift. Quantity measured in fan drift. Find H. P.

H.P. eq. $\frac{140000 \times 2.5 \times 5.2}{33000}$ eq. 55.15 H. P.

The theory of ventilation may be summed up as follows:—(1) Resistance varies as the rubbing surfaces per square foot of section, and the pressure is equal to the resistance.

(2) Friction varies as the squares of the velocities of the air currents, aud the velocities of air currents vary as the square roots of the resistances. (3) Powers producing ventilation vary as the cube of the quantities, and the quantities in aia currents vary as the cube roots of the powers. The following are the principal factors in determining the quantity of air passing in a mine:—

K eq. Co-efficient of friction. S eq. The rubbing surface of the airway in sq. feet. V eq. The velocity of the air current. A eq. The area of section of an airway. P eq. The pressure per square foot producing ventilation.

Before closing I will add a few examples from questions that have been given at Examinations for Mine Managers certificates in Scotland. The examples here given are based on the preceeding laws on ventilation.

What is the H. P. expended in the ventilation of a mine when the quantity of air passing is 95.000 cubic feet per minute and the W. G. is 3.75"

$\frac{95000 \times 3.75 \times 5.2}{33000}$ eq. 56.13 H. P.

What additional ventilating power would be necessary to double the quantity of air without altering the airways.

Power necessary for increasing the ventilation increases os the cube of the velocity, so that in this case the power required would be: $\frac{2^3}{1^3}$ eq. 8 times original power. Therefcre additional ventilating power will be 7 times original power.

If it requires 6 H. P. to circulate 25,000 cubic feet of air in a mine, what H, P. must be employed to pass 45,000 cubic feet through it. Airways to remain in the same condition. The power is according to the cube of the quantities Then we say, if

$25000^3 : 6 :: 45000^3$ eq. 34.9 H. P.

If you have 120,000 cubic feet of air per minute passing into a mine, at a temperature of 45° Fah., the temperature of the return at the bottom of the upcast shaft being 82° Fah., what is the volume of air circulating in the upcast per minute.

Answer—As air expands $\frac{1}{459}$ for every degree Fah., we should have a volume of air in the upcast shaft of 128809.5 cubic feet per minute. Calculation shown thus $\left(\frac{459+82}{459+45}\right) \times 120,000$ eq. $\frac{541 \times 120,000}{504}$ eq. 128809.5 c.ft.

If a fan, running at 80 revolutions per minute, generates a current of 100,000 cubic feet of air per minute, with a W. G. of 5.7 inches, what will be the H. P. in the air. If quantity is increased to 140,000 cubic feet per minute, what will be the H. P., also the W. G. and the number of revolutions of the fan.

H.P. eq. $\frac{100000 \times 2.7 \times 5.2}{33,000}$ eq. 42.54

W.G. eq. $\frac{140000^2 \times 2.7}{100000}$ eq. 5.292 inches.

H.P. eq. $\frac{140000 \times 5.292 \times 5.2}{33000}$ eq. 116.74

or as power increases as the cube of the quantity we can apply the following: $\frac{140000^3 \times 42.54}{100000^3}$ eq. 116.74.

As the volume of air produced varies with the spead of the fan if other conditions remain constant. Thus: 100000 : 80 :: 140000 eq. 112 revolutions.

Therefore:

H.P. for 100000 with 2.7 W.G. eq. 42.54
" " 140000 " 5.292 W.G. eq. 116.74
W.G. for 140000 eq. 5.292
Revolutions of fan for 140000 eq. 112

THE THICKNESS OF BARRIER QUESTION.

BY "PRACTICAL."

In the last issue of the Record there appeared an answer to the barrier question set at the last examination for Manager's Candidates. I am glad to see some one tackle the question as it opens up the way for further discussion and may result in finally bringing out the real solution.—if there is such a thing. It is a poor practice to criticise or smash any persons solution without putting forward an alternative but to leave the solution unchallenged might do more harm than good by allowing it to lead others astray. So far as the first part of the question is concerned there is nothing wrong and the head of water could easily and accurately be ascertained as described. The second part of the question however does not seem to be right. The writer assumes that he collects 91.5 cubic feet of water in ten hours from the first bore-hole and works out the velocity to be 1053.33 feet per minute. The rule used to find the velocity is rough and approximate but we will assume it to be correct. The velocity then is 1053.33 ft. per ten hours instead of per minute. To bring this to feet per minute we must divide by 600 the number of minutes in ten hours. This equals 1.75 ft. per minute In the second hole the quantity was 113 cubic feet in 10 hours and the velocity as worked out by the writer was 2488 ft. This again is the velocity for 10 hours so we must divide by 600 which gives 2.48 feet per minute, say $2\frac{1}{2}$ feet per minute. Now we come to the velocity at which water would flow through an orifice under a head of 100 feet—the head assumed by Mr. Scott. He qualified the velocity for vena contracta and got a velocity of 2976 feet per minute. Now vena contracta has nothing whatever to do with the calculation of velocities but is only used for calculating quantities, therefore the real velocity would be much more than 2976 feet per min. The following is the formula for finding velocity:

Neglecting friction V eq. $\sqrt{2gh}$

Allowing for friction V eq. $.97 \times \sqrt{2gh}$

V eq. velocity in ft. per second.

h eq. head or height in feet.

g eq. gravity eq. 32.2 but we will take it as 32.

Therefore V eq. $.97 \times \sqrt{64 \times 100}$

Therefore vel. per min. eq. $60 \times .97 \times \sqrt{64 \times 100}$

$60 \times .97 \times 80$

4656 feet per minute.

Now let us follow the same method of calculation as Mr. Scott.

First velocity squared eq. $\frac{7}{4} \times \frac{7}{4}$ eq. $\frac{49}{16}$ eq $3\frac{1}{16}$

Second velocity squared eq. $\frac{5}{2} \times \frac{5}{2}$ eq. $\frac{25}{4}$ eq. $6\frac{1}{4}$

Then $\frac{16}{49} \times \frac{30}{1} \times \frac{25}{4}$ eq. 3000 eq. 61.2 ft.

Therefore every square equal to 6.25 eq. a resistauce due to 61.2 feet of barrier.

Therefore $\left(\frac{4656^2}{6.25}\right) \times 61.2$ eq. thickness of barrier.

$\therefore \frac{4656 \times 4656 \times 61.2}{6.25}$ eq. 2,123,000,000 ft. approxim.

Therefore it will be unnecessary to do any more boring for a few years more.

Now let us suppose that the velocity in the first bore hole was really 1053.33 feet per minute and in the second borehole 1488 feet per minute. This would be equal to 91.5 cubic feet per minute in the first borehole and 113 cubic feet per minute in the second. Then taking Mr. Scotts figures a square equal to 2214144 represents a thickness of 60 feet in the barrier.

Now calculate the thickness with the velocity without qualifying for vena contracta.

$\frac{4656 \text{ squarred}}{1488 \text{ squarred}}$ eq. 9.79

9.79×60 eq. 587.4 ft.

Add the 30 feet for the borehole and we have 617.4 ft. of barrier.

Having worked out the question in both ways let us see what the rule is worth. The small quantities calculated on first would be more like the quantities given off from a borehole under such conditions and yet the rule when worked out for that quantity gives a barrier which would represent an exceedingly extensive coal field. Now let us look at the calculation with the large quantities. I would like to see a vessel fixed to hold 10 minutes water under such conditions to say nothing about one to hold the quantity dishharged in ten hours. If a borehole discharged water at the velocity rate of 1053.33 feet per minute would any manager risk taking off other 30 feet of coal and boring a second hole, or would he conclude that the hole was through into the old workings? Would it be possible to have such a flow of water through a barriet 617 feet thick. I think not, and if I am right then the rule must be wrong. I have seen quite a number of boreholes put in where workings have been advancing towards old flooded wastes and even under heavy pressures the hole has been almost through before any noticeable feeder of water was struck. If there is any rule for finding the thickness of a barrier without holing how is it that so many lives have been lost by accidents due to unexpected holiugs, and how is it that even when boring has been done that accidents have still happened. Badly placed holes and lack of judgement may be the causes in such cases but if there is a rule that can be used how is it that it is'nt used. For my part I am certainly glad that prudent mine managers do not depend on rules of this kind or we would likely have more accidents than we have. If I struck a feeder of water in a borehole 8 yards in advance of the face I would reckon on being almost through and act almost accordingly. Better to make the mistake of having too much barrier than having too little. I still doubt whether there is any method of calculating the thickness of a barrier without holing but I am willing to be convinced if anyone can advance a reasonable solution.

The wheat fields and the scenery are not the only marvels of our great West. In the small towns, in the mining camps, in isolated spots, one may see business conducted with equipments that put to shame many of those in our largest cities. Electricity has made mining profitable, and sometimes possible. In many cases, where it would hardly pay to operate a mine on account of the excessive cost of fuel, by the employment of water power and electric transmission, all the advantages of cheap power are obtained.

The Canadian Consolidated Mines at Trail B. C., are now using a Westinghouse electric locomotive for hauling cars to and from the mines, as well as three Westinghouse 1,250 k. w. transformers. The company finds that the use of electricity for power and haulage increases the output of the mines, and actually decreases the operating expenses.

One of the fine exhibits at the Dominion Fxhibition in Halifax this year will be that of the Province of Saskachewan. President Longley is in receipt of a communication from the Government of the New Provinces announcing their intention to send an exhibit to include a display of the products of those far western provinces, pictures of ranching scenes and speciments of the forestry of the province. With the notice of this intention to send on exhibit came also a request that it be given a location on the spacious ground where it may be seen to a better advantage. This will be attended to by the Commission.

At the last meeting of the Exhibition Commission it was decided to prepare specifications for painting all the buildings on the Exhibition Grounds in a uniform colour with that on the three new buildings. A tender was also awarded for the construction of the new grand entrance and administration building. Work on this structure will begin at once, thus giving four new buildings along the Windsos Street front.

The Manufacturers Building is to be increased in size by the addition of 60 feet on the whole of its eastern side. The Canadian Pacific Railway will have their standard exhibit at the Dominion Fair, a splendid collection, artistically arranged, of the products of Canada's great west.

The amusement feature of the forthcoming Exhibition will be on a scale of grandeur and to secure this result Manager Hall will leave no stone unturned.

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SYDNEY MINES.

One may not easily institute a comparison between the Sydney Mines of to-day, and that of ten years ago. He might make contrast which would be striking. And this applies as well to the town as to the collieries which go by the one name.

Ten years ago the pit at Cranberry Head, now called No. 1, was the only producer, now there are three actively engaged in the production of that which forms the chief industry in Nova Scotia, coal. The coal produced at Sydney Mines has for long had a wide reputation, and in many parts is held to be among the best, its friends say the best of household coal.

Ten years ago the production at Sydney Mines did not average eight hnndred tons per day, now it is nearly four times that quantity. Sydney No. 1 is what one might call an old colliery, and yet like some other of the older mines, the quantity produced daily is increasing instead of diminishing. The output of No. 1 is not far short of a thousand tons daily. Sydney No. 3 which is a comparitively new colliery, and which has not a high seam to draw from, has produced as high as 1851 tons, This is a most creditable showing for so new a mine. Sydney No. 5 is a new old mine. After being abandoned for a couple of score of years, it is now being worked for the sake of the coal left in the pillars. The output is about two hundred tons per day. This will be increased as the days go bye. The best days combined output so far was on June 13th, when over 3000 tons were hoisted to the surface. Gradually the output of the Sydney Mines is mounting up. The aim of the management is to show a steady, and constant if not startling increase. An effort is being made to make one day show a little better than the day preceeding, a week better than the week before, a month better than the preceeding month and each year show gains on its predecessor. This is the aim and it is intended that this shall not apply to this year only or the next, but be the story to be told for many years to come. There are to be no great special efforts, no big splurges but steady, perceptible, if not exciting developments.

The motto of the management is economy with efficiency and order with activity. The surface works at the three mines give ample indication that nothing is allowed to go to waste and that the surroundings are not made an eyesore by the debris of broken or discarded machinery. Economy is perhaps being on some minor points carried to the extreme. For instance there is no stair from the ground to the screens platform at No. 5, or rather there is a stair without steps. Instead of steps there are batons. These are hard on the instep going up, and on the boot heels coming down, and they are not soothing to the nerves. And then there is no battened ladder let alone a stairway between the screens and the bank head. This, I remarked to one, was economy with a vengence. "Ah" was the reply, you seem to fail to realize where the real economy comes in. Dont you see the men up there cannot come down to talk Butts or Gillis with the men down here, or the men here cannot go up to disclaim on the shortsightedness of politicians in general". I had to confess that the reason was an excellent one, though some might say it was a reflection, in general, on discipline at the mines.

There are no gee gaw's at No. 5. If No. 3 is a simple mine, No. 5 is simplicity itself. The whole surface outfit could not have cost more than $10,000. The engine house is the one that did duty fifty years ago. It has no polished wains coating. Its interior walls are of the stone which forms the exterior. The floor wont admit of polish. And the engine for hoisting, it is as ancient as the building; was made by a Sydney Mines man in Elliot's early reign. It wont do for a thousand ton output but serves its present purpose admirably, and will not require to be replaced by something more modern for a few years. Two men is the number required on the screens and not more than three on the bank head. There is no patent tipple or modern shaker. The screen bars are two inches apart therefore no scrapers are needed. The coal that goes through the bars makes excellent bunker coal. The coal is mostly in large lumps, which would not permit of the use of the shovel in loading the boxes in the mine. There are no machines in No. 5 nor is it likely that there will be. The output is about two and a half tons per man employed above and below ground. This is better than at either No. 1 or No. 5. At the former the output is about a ton and an eighth per man on the roll, and at No. 3 a little over a ton and three quarters, not quite two tons. Sydney No. 3 shaft is 350 feet deep. A single cage is employed. There are no slides etc, in the shaft. The cage runs on wire guides which answer the purpose admirably. The employment of wire guides enables operators to begin months sooner than they otherwise would. Economy as I have already hinted has been reduced to a fine art at the mines. There has been a process of evolution from prodigality to thrift. For instance; the firemen at No. 3 when the mine started said they could not keep up steam with slack alone, and demanded some run-o-mine coal, after a little the latter was dispensed with, and the boilers fired with slack and splint. Then other purposes being found for the splint it was taken away and the coke breeze or braise, then the breeze was mixed with the slate from the washplant, and the next experiment is to be with slate alone. How is it possible to burn braise and slate, All made possible by the application of forced draft and the installation of more boilers. In May, 1904, the colliery consumption, for power purposes of coal was 2300 tons, while in May of this year the consumption was only 290 tons for Sydney No. 1 colliery. Taking Sydney No. 3 the consumption in May of last year was 1230 tons against 128 tons only for May of this year. As coal is an item of considerable importance even at a colliery the greatly decreased consumption must have an appreciable effect on the cost of output. This revolution was accomplished by the use of washing plant smut as fuel, and also by the utilization of other waste products.

The General Superintendent T. J. Brown takes an active and intelligent interest in every one of the many departments of the company's work. There is method observable everywhere. He pays minute attention to details. Asked in January last what the output of the mines would be up to the end of May his answer was 245,000. The actual figures were 247,000. It is estimated that this years production will be 650,000 or about 100,000 tons better than last year. This estimate means that for the seven months, May—December inclusive, the monthly average output will be 60,000. It means further that August and Sept. and possibly October will witness phenomenal shipments, as June and July are as a rule not the briskest in shipments. The collieries below and above ground are in excellent shape. And what may be said of the colliery plant may be said of the iron and steel plant. Everything is in good condition and the output of pig iron and steel is fully up to expectations. The furnace is discharged say once in five hours. Each discharge contains from 35 to 40 tons of iron, or a total for the 24 hours of say 180 tons. About 250 tons of coke are daily consumed in the production of pig. About 4000 tons of coal are used monthly in the production of gas for the open hearths, while 13,000 tons are sent to the washing plant subsequently to be converted into coke. The total quantity of coal required in a year for iron and steel making purposes is say 200,000 tons a year, equal to the full product of Sydney Mines a dozen years ago. The Record early in the year gave it as its opinion that the shipments to points beyond the county would not be much in excess of the quantity shipped last year, as the increased output would go to the steel plant. It is possible that the Record underestimated the capacity of the mines or the ability of the management to push the work. The same economy that marks operations at the collieries has also a place at the steel plant. Nothing is allowed to go to waste not even the old fire-brick. These are ground up and used as a substitute for fire-clay in lining ladles etc. At other collieries the engine cotton waste after it has become soiled is cast aside and put under the boilers. It is not so here. In the engine house there is a compact little machine, costing not over $160,00 which cleans the old waste and extracts the oil. This machine effects a genuine saving. The various enginemen are instructed to put the used waste into barrels. When his supply of waste is exhausted the engine man sends his supply of dirty waste to the general storekeeper and gets clean waste in return. The old waste is put into the cleaner which may be said to consist of a square iron box. Inside of this box is a cylinder into which the waste is put. The cylinder revolves at a tremendous speed, steam is injected, the oil is driven out of the waste by the rapidity of the motion of the cylinder, while the steam cleans the waste. The oil is conducted from the machine to a tank by a pipe. The machine needs no attention beyond filling and emptying. Is this not a case of much ado about nothing? Certainly not; the saving is substantial. Here is what the machine effects in the way of saving. A little over 268 lbs. of old waste were sent to the machine. All of this waste was recovered cleaned, and besides, one would think the impossible quantity of 42 gallons of oil. The 268 lbs. of waste represented a saving of over $18,00, and 42 gallons of oil at 10 cts. a further saving of $4,20. As the waste can be washed three times before becoming unfit for use the apparent saving of $22,00 has to be doubled or trebled. In other words the machine enables 268 lbs. of waste to perform the service which formerly required 1072 lbs. The machine pays itself in a month or two. At the steel plant there are 7 batteries of boilers, two in a battery, equal to 14 boilers. In charge of these 14 boilers there is only one man and he is not overworked. These boilers produce all the steam that produces the electricity which supplies the motive power not only at the steam plant but to the fan and pumps at the colliery at Cranberry Head. Power, generally an expensive item, costs nothing, as the boilers are fed not with coal but the waste product of the coke ovens and the gas producers.

A few over 1900 men are employed at the three collieries. The monthly wage paid the colliery workers totals $75,000. The pay roll at the steel plant and other departments such as piers and railways, amounts to $35,000, or a total for all services of $110,000 monthly or nearly a million and a quarter dollars a year. There is little or no construction work being done, and accordingly extraordinary expenditures are nil. The company seems determined to earn money this year and it must be doing it. An outsider cannot say whether a dividend will be declared next spring as the result of this years operations, but one thing he can say with tolerable certainty and that is that dividend is being earned, and with equal certainty—he might say if dividends cannot be made this year they never can be made. The company is fortunate in its management. Management in most cases is the main thing. Mr. T. J. Brown is ever on the alert and is ably seconded in all efforts after improvement by John Johnston, Mr. Preston, R. J. Brown, Ed. Wilkinson and others of the staff which taken as a whole is efficient in every respect.

The citizens of North Sydney, instead of seeking so frequently to obtain permission to exempt from taxation, might seek after some method of uniformity in the construction of side walks. The main sidewalk is evidently an effort after a compromise. One part consists of flags, a second of concrete, a third of plank, and a fourth of primeval Macadam. Here is a variety that cannot be said to be pleasing.

The distance from the bank head at Dominion No, 1 to the face of the angle deep is 7000 feet. At this point the cover, that is the thickness of the strata to the bed of the ocean, is 1450 feet. From the shore line to the face of the deep the distance is 1700 feet. The deep is still being driven in an easterly direction, and so far as can be calculated it may be driven a mile or two further. About a mile out the bed of the ocean dips suddenly, but that is no indication that the coal is cut off at this point.

AROUND THE COLLIERIES.

The average output per day at Dom. No. 1 is a little over 2000 tons. This is creditable for a single shift

A shearing machine is expected to shear four to five rooms daily, while the undercutter is allotted two rooms, at Dom. No. 1.

The chief part of the output in Dom. No. 1 comes from the south side, the yield being as much as from the two other sections in the mine.

Mr. Alex. McEachren is still active as ever at International and is working the mine for all it is worth. The ousput is wonderful all things considered.

The coal to be won in the future in Dom. No. 1 will come in most part from the submarine portion of the area, as operations on the south side have nearly reached the boundary line.

The Reserve mine, though it cannot be expeeted to do as well as last year, is on some days putting out a large quantity of coal. On the 22nd. inst. the output reached 2698 tons.

The Diamoud under cutter in operation at the Reserve is giving excellent satisfaction. This machine it is claimed has cut here and repeated it easily eighty yards of a face, the cut being 5 ft. 6 inches deep. This of course is in long wall.

The sinking of the shaft to the Emery at Reserve has reached a depth of 100 feet. The sinking has to go 60 feet further before the coal will be struck. The coal taken from the Emery at present comes from the old drift known as the 'Routledge.'

A new fire engine house has recently been erected at Dom. No. 1, and it takes first place at the southern collieries. The Hub firestation held first place until Mr. Debison got permission to build one at his colliery. When at it Mr. Debison did it well as he does everything in connection with the colliery.

The new steamer the 'Times' arrived at the landing on the 13th. and went out on the 16th. Coming closely on the heels of the Unique there was a little delay in loading. The 'Times' is not what may be called a self trimmer. She is, however, a smart sailer as she made the passage out from England to Pictou in eleven days.

Probably the Reserve will not at the close of the year make as good a showing for the twelve months as last year. The output may fall short by some 100,000 tons. This will be a striking decrease, and is to be accounted in great part by the unwillingness of new comers as well as old hands to 'go' loading. The lack of loaders is felt at all of the collieries. The Reserve alone could furnish employment to a hundred additional loaders.

The distance from the bankhead to the face of the South deep at Dom. No 1. is 8000 feet.

There are some 700 men employed at Dominion No. 1. Mr. Debison is active, energetic and intelligent as Superintendent; Mr. John Munro is underground manager and Andrew Scott has charge by night.

Within the past few months more money has been expended on additions and improvements at Reserve Mines than during all the years the Dom. Coal Company has held the property. The expenditure in effecting the improvements lately completed will foot up about $80,000. Fnll value will in course of time be returned for the money expended.

The contractors for the water shaft at International are making fair progress. The sinking is already down about seventy feet. A large quantity of water is finding its way into the shaft. This water is forced from the bottom by a pump suspended in the shaft when pumping is necessary, and hoisted to the surface, when the sinkers are at work.

The superintendents of the several collieries of the Dom. Coal. Co. are put through their facings every morning succeeding a day in which there has been an increase in the cost of production of coal. The superintendents are all men of resource, and are generally at little loss to give a reason which cannot with grace be scouted as insufficient.

At a majority of the C. B. mines there are now lots of old countrymen. It takes them a few months to get into the knack of working the coal, but after three months experience they do almost as well as the natives. It takes them some time to adapt themselves to conditions as prevailing on this side, and are inclineb to be somewhat fractious at first. They'll get out of that in time.

The heavy rains of May caused so heavy an inflow of water into the International mine C. B. that the pumps were drowned. The Record is pleased to learn that this will not, as asserted in some papers, effect the workings, as it will take about six months for the water to rise sufficiently to interfere with the section from which coal is being drawn, and by that time it is expected to have the water shaft completed, on which work is now being vigorously prosecuted.

Loaders in many of the C. B. mines will soon be a thing of the past. The calling is evidently falling into disfavor. At Dom. No. 1 for instance the shooting and loading is done by two men. The work of these men one of whom must be a certificated miner is to shoot a room and load the coal, the quantity to be loaded daily being about 35 tons, and the price paid per ton about 12 cts. This is high for loading as compared with former years.

STEAM TURBINES

At the present time much interest is being taken in steam turbines which it is said are to be the engines of the future. We have received from the Allis-Chalmers Company, Bulletin 1505, handsomely illustrated which treats in an exhaustive manner of steam turbines and generators.

This company has made a careful examination of the situation with a view to adopting the type of steam turbine which would produce the best results. Briefly stated, steam turbines can be divided into two general types; the "impulse" and the "reaction."

In the impulse type the steam, before doing any useful work, is expanded in nozzles of various shapes, its pressure being considerably reduced while it acquires a high velocity before acting upon the revolving buckets or blades. In some constructions there is only one row or ring of revolving buckets and the turbine runs at a very high speed proportionate to that of the steam, thus necessitating the employment of gearing to reduce the speed to workable limits. In other constructions two or more rows of buckets are used, each of which rows absorbs a part of the high steam velocity, thereby reducing the turbine speed. For the purpose of obtaining a better economy, in the newer impulse turbines the steam is passed through several successive sets of nozzles and their subsequent rows of buckets, necessitating a very careful adjustment of the pressures and velocities by the accurate proportioning of nozzles, buckets and turbine speed.

In the reaction type the steam acts directly upon the blades without initial reduction in pressure such as may be effected by the governor in securing speed regulation. The steam flows through the large number ot rows of blades, alternately stationary and revolving. Guided by the stationary blades upon the revolving ones, the steam expands continuously throughout the length of the turbine, alternately gaining velocity and imparting it to the rows of blades, partly by impulse, but to a greater extent by the reaction as it issues from the revolving blades. There is no violent change in pressure at any time; the reduction seldom exceeds three pounds at any row of blades, and the velocieties are therefore comparatively small.

In deciding upon the reaction type of turbine the Allis-Chalmers Company was influenced not only by the large number of that type in successful operation and its superior economic result in actual practice but also by the fact that the reaction turbine will maintain its original steam economy after long service, princpally on account of the low steam velocities.

We cannot recount all the good points in the type of machine turned out by this company, but must call attention to the two following :—

The arrangement of balance pistons described, and illustrated in Fig 1, is used by the Allis Chalmers Company in turbines of small sizes only; but has proved itself objectionable for larger sizes, the trouble being with the largest or low-pressure piston. These low pressure pistons are of comparatively large diameter and it has been found difficult, if not impossible, to so construct them that they will not unduly distort pressure and repeated heatings and cooling, a condition which renders it impossible to run the balance piston rings (or "dunnies") with a sufficiently small clearance to excessive leakage of steam.

This difficulty has been overcome in the Allis Chalmers turbine by a very simple yet effective patent device.

The Allis Chalmers method of blading differs from the older method, briefly, as follows: Each blade is individually formed by special machine tools, so that at its roots it is of angular dovetail shape while at its tip there is a projection

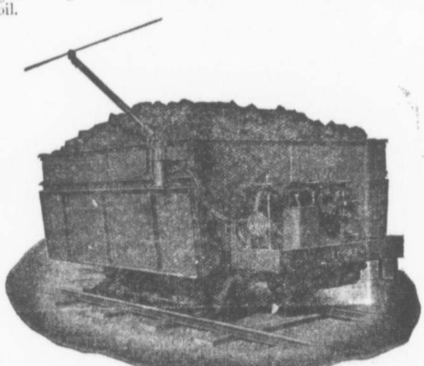
To hold the roots of the blades firmly there is provided a foundation ring, which, when formed to a circle of the proper diameter, has slots cut in it by a special milling machine; these slots being formed of dovetail shape to receive the roots of the blades, and at the same time being accurately spaced and inclined to give the required pitch and angle to the blades.

DESCRIPTION OF ELECTRIC DUMP CAR.

The accompanying cuts illustrate the Jeffrey Manufacturing Company's new design of Electric Slack Dump Car which covers a wide range of usefulness, and which may be adapted to meet a number of different requirements.

The car consists of a structural steel truck or frame, upon which is mounted a steel hopper. The truck is provided with such electrical equipment as the required duty demands.

In the car here illustrated, the equipment consists of two Jeffrey M. H. 64, 250 volt motors, one motor being geared through a single reduction to each axle, the gears being enclosed in dust proof cases and running in oil.



The journal boxes are removable without dropping the wheels, and are provided with renewable steel wearing faces. The boxes are held in cast steel pedestals which are securely bolted to the steel channel frame, and which are also braced at the lower end with diagonal braces.

Four sand boxes of liberal capacity are provided.

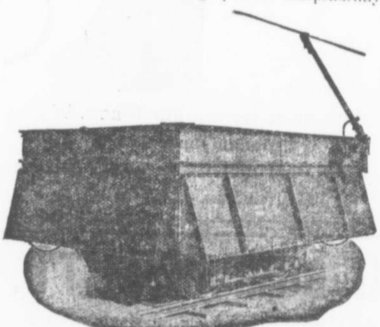
The brake is of the well known Jeffrey Self-Locking type.

The hopper is built of heavy sheet steel suitably braced and re-enforced, and when loaded as shown in the accompanying illustrations, has a capacity of 25,000 lbs. of run of mine coal. This hopper is so supported on the frame that the weight is uniformly distributed throughout the structure.

Probably the most novel feature of this car is the ease and rapidity with which the load may be discharged.

To facilitate this, the bottom of the car slopes from a hip or ridge in the centre down to the bottom edge of each side door, and at the front end is a triangular face or slope descending from the ridge to the bottom edge of the front door. The angle of slope of the bottom is made whatever may be necessary to readily discharge the material to be hauled. The doors are securely hinged to the body of the hopper, and are so hung that they open slightly by their own weight whenever the holding chains are loosened. This feature, together with the sloping bottoms result in a free and rapid discharge of the load

Each door is provided with three chains for holding it closed. The two side doors are operated simultaneously, the front door being operated independently.



The chains are wound upon windlass shafts, and each chain is provided with a length adjustment so that the strain may be equally distributed on all of the chains. The method of operating these doors may be arranged to suit the purpose for whitch the car is to be used. For instance, each door may be operated seperately, any two may be operated together, or all doors may be arranged to operate simultaneously.

The mechanism for operating the doors is self locking in any position, and is easily and quickly manipulated. Figure 1 shows the convenient arrangement of the operating mechanisn. The vertical shafts and hand wheels at the right and left operate the front and side doors respectively, and the hand wheel and shaft in the centre operate the brake. At the left of the operator's seat is seen the controller, and at the right, supported between the brake and the front door control shafts are seen the sand valve handles.

The capacity of the pumps drowned at the International Mine, C. B. was about 1400 gallons per minute. The feeder must be flowing at the rate of over a million gallons every twelve hours. Two of the pumps lost were Northeys, one of these a duplex. It is not expected that the inflow of water will cause any interruption in the working of the mine.

The International mine, C. B., produces some days between eleven and twelve hundred tons, the average, however is about a thousand. The week following pay day the output declines to say 900 tons; the week before pay day it rises to 1100 tons or over. This looks as if the Scott Act had still work to do in C. B. The present scarcety of labor in C. B. will not permit of the enforcement of rigid discipline.

NOTICE.

MINES OFFICE HALIFAX, N. S., June 16, 1906.

AN Examination for Granting Certificates of Competency to Stationary Engineers will be held at Springhill, Stellarton, North Sydney and Inverness, on July 17th., 1906. Applicants for certificates of service and firemen will be examined on July 18th.

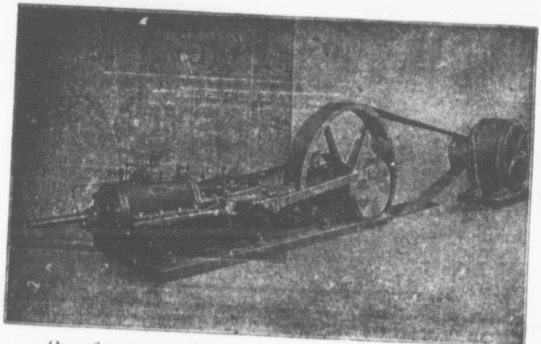
Applications must be sent in not later than July 9th., to the members of the Board for each district, who can furnish any other information that may be desired.

MEMBERS OF THE BOARD.

John Barrington, North Sydney, A F. Campbell, Inverness.
H. F Coll, Stellarton, H. R. Groggett, Springhill

WM. T. PIPES,
Commissioner Public Works and Mines.

Allis-Chalmers-Bullock, L't'd.



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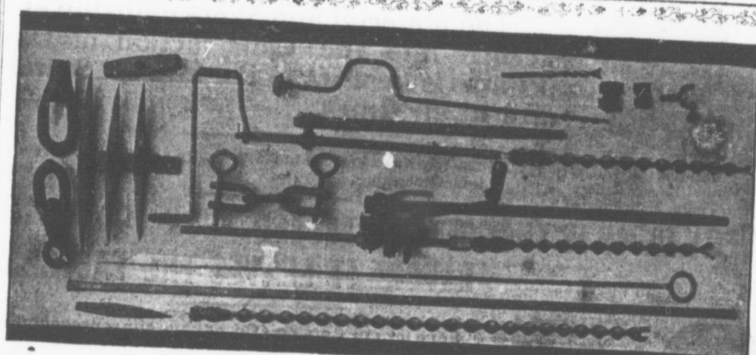

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Synopsis of Canadian North-West.

Homestead Regulations.

ANY even numbered section of Dominion Lands in Manitoba or the North-West Provinces, excepting 8 and 26, not reserved, may be homesteaded by any person the sole head of a family, or male over 18 years of age, to the extent of one quarter section, of 160 acres, more or less.

Application for homestead entry or inspection must be made in person by the applicant at the office of the local Agent or Sub-Agent.

An application for entry or inspection made personally at any Sub-agents office may be wired to the local Agent by the Sub-agent, at the expense of the applicant, and if the land applied for is vacant on receipt of the telegram such application is to have priority and the land will be held until the necessary papers to complete the transaction are received by mail.

In case of "personation" the entry will be summarily cancelled and the applicant will forfeit all priority of claim.

An applicant for inspection must be eligible for homestead entry, and only one application for inspection will be received from an individual until that application has been disposed of.

A homesteader whose entry is in good standing and not liable to cancellation, may, subject to approval of Department, relinquish it in favor of father, mother, son, daughter, brother or sister, if eligible, but to no one else, on filing declaration of abandonment.

Where an entry is summarily cancelled, or voluntarily abandoned, subsequent to institution of cancellation proceedings, the applicant for inspection will be entitled to prior right of entry.

Applicants for inspection must state in what particulars the homesteader is in default, and if subsequently the statement is found to be incorrect in material particulars, the applicant will lose any prior right of re-entry, should the land become vacant, or if entry has been granted it may be summarily cancelled.

DUTIES.—A settler is required to perform the conditions under one of the following plans :—

(1) At least six months' residence upon and cultivation of the land in each year during the term of three years.

(2) If the father (or mother, if the father is deceased) of a homesteader resides upon a farm in the vicinity of the land entered for by such homesteader the requirement as to residence may be satisfied by such person residing with the father or mother.

(3) If the settler has his permanent residence upon farming land owned by him in the vicinity of his homestead, the requirement may be satisfied by residence upon such land.

Before making application for patent the settler must give six months' notice in writing to the Commissioner of Dominion Lands at Ottawa, of his intention to do so.

SYNOPSIS OF CANADIAN NORTH-WEST MINING REGULATIONS.

COAL. Coal lands may be purchased at $10 per acre for soft coal and $20 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at the rate of ten cents per ton of 2000 pounds shall be collected on the gross output.

QUARTZ. A free miner's certificate is granted upon payment in advance of $5 per annum for an individual, and from $50 to $100 per annum for a company according to capital.

A free-miner, having discovered mineral in place, may locate a claim 1500 x 1500 feet.

The fee for recording a claim is $5

At least $100 must be expended on the claim each year or paid to the mining recorder in lieu thereof. When $500 has been expended or paid, the locator may, upon having a survey made, and upon complying with other requirements, purchase the land at $1 per acre.

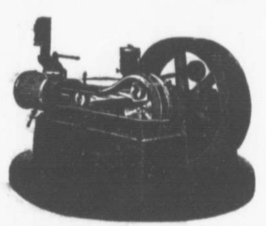
The patent provides for the payment of a royalty of 2 1-2 per cent on the sales.

Placer mining claims generally are 100 feet square; entry fee $5 renewable yearly.

A free miner may obtain two leases to dredge for gold of five miles each for a term of twenty years, renewable at the discretion of the Minister of the Interior.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles. Rental $10 per annum for each mile of river leased. Royalty at the rate of 2 1-2 per cent collected on the output after it exceeds $10,00.

W. W. CORY,
Deputy of the Minister of the Interior.



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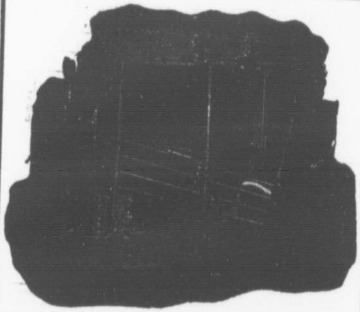

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...ANALYSIS...

	NO	NO 2	NO 3
Moisture	*2.02 %*	*1.41 %*	*2.71 %*
Volatile combustible matter	*18.94 %*	*27.93 %*	*28.41 %*
Fixed Carbon	*75.29 %*	*67.47 %*	*64.69 %*
Ash	*3.75 %*	*3.19 %*	*4.19 %*
	100.00	*100.00*	*100.00*
Sulphur	*1.15 %*	*.58 %*	*.79 %*

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LOCOMOTIVE USE.

BEST COAL FOR
GENERAL STEAM PURPOSES.

Delivered By Rail or Water
The year Round
IN Lots To Suit Purchasers.

BEST COAL FOR
DOMESTIC CONSUMPTION.

BEST GAS COAL
Mined in the Province.

Head Office—
MONTREAL

Mines—
SPRINGHILL
N. S.