

ELECTRIC COAL MINING PLANT.

A most interesting matter in connection with a visit to the underground workings of the new Vancouver Coal Company's mine at Nanaimo, B. C., is the electric plant in operation there. It has been in operation for four years now and has worked smoothly from the first, and given perfect satisfaction. It has quite superseded mule haulage over the underground trunk roads, but for branch roads mules are still employed.

The engine used for generating the electricity is the well-known Eric Ball high speed type, 16-inch cylinder by 16½-inch stroke, automatic cut-off, centre crank, double fly wheel, and is run at a speed of 235 revolutions per minute. Its rated h. p. is 150, although the work is being done with an expenditure of 90 h. p. It is bedded on a foundation of concrete, brick and stone, immediately resting on two large blocks of dressed sand-stone, which keep it perfectly firm and rigid.

Two boilers are used for supplying power. External fire, Lancaster pattern, 24 feet in length by 4 feet 6 inches in diameter, and carrying a pressure of 80 lbs., but, should more power be required, are good for 120 lbs. The steam is carried from the boilers to the engine, a distance of 200 feet, in covered pipes and without appreciable loss.

The dynamo is a large one (150 kilowatts), and was made and supplied by the Canadian General Electric Co., of Peterborough, Ontario, Canada. It is run from engine by an endless perforated belt 15 inches in width. The speed at which it is run is 640 revolutions, giving 340 amperes at a pressure of 250 volts. This low pressure, although tending to loss in the mains, gives entire immunity from danger, which is absolutely necessary in a mine where it is almost impossible to keep workmen from coming in contact with the wire. Spare armatures are always kept in reserve, so that there are never any delays for repairs.

The power house, containing engine and dynamo, is a large building 60 by 32 feet, and most complete in detail, having been specifically designed for the purpose. It has capacity enough to contain another plant the size of the present one, and in addition provides a store room and work room for winding armatures, etc., all of the work being done on the premises.

There are five locomotives, all of which were made in Canada, four by the Canadian General Electric Company, of Peterborough, and one by the Royal Electric Company, of Montreal. Four of the motors weigh 8 tons each, and are capable of hauling 40 tons of coal along a level track at the rate of 6 miles per hour. The other locomotive is a small one (4½ tons), and only draws 20 tons at a trip. The distance of road along which coal is hauled is two miles in one level, making four miles for the round trip, and in the other level where the other motor is worked the distance is one mile, or two miles for the complete run. In addition to the locomotives there is a 30 h. p. electric hoist, operating an endless rope on one of the slopes.

The line conveying the current from the surface to the shaft and down to the bottom, a distance of 1,000 feet, is a 0000 copper cable, well covered to protect it from water, and hung on strong insulators. From the bottom of the shaft and extending throughout the mine, the trolley wire is smaller—000 wire—and suspended from the roof or timbers of the gallery by specially made insulated hangers, and held in position over the rail in

rounding curves by side wires or pull-offs, which are also insulated. A second or auxiliary wire (insulated) is carried in the levels as a feeder, to which the trolley wire is attached at stated distances.

The plant is fitted up with all the latest contrivances, switches, automatic cut-offs, safety fuses, etc., and in addition to the work mentioned, supplies light for the engine rooms, boilers, pit-head and other buildings on surface, and the whole of the pit-bottom and stables below ground, also all important sidings or partings. Each locomotive is fitted with head lights.

TWO SYSTEMS OF FIRING A WATER TUBE BOILER.

BELOW is given the results of two systems of firing a water tube boiler, conducted by Mr. George H. Barrus, at the Edison Electric Illuminating Company's power house, Boston. The first test consisted in the common method of spread firing, carrying a bed of coal 6 to 8 inches thick, and on the second trial a brick roof was inserted above the lower row of tubes, covering over half the length of the furnace, the flames passing to the rear end before the gases were discharged into the tube space. A second roof was placed above the upper row of tubes in front of the flame plate. The length of tubes was 8 feet, and the first roof extended backward 4 ft. 6 inches, leaving opening 3 ft. 6 inches. The upper roof extended forward 4 ft. 6 inches. The method of firing on the second trial consisted in the coking system, with 18-inch fire on forward part of grate, and a very thin fire at the extreme rear end. Green coal was fired only on forward part of grate.

The boiler was 325 h. p., constructed with two sets of headers connected by short pieces of pipe; the tubes, 168 in number, were of the ordinary 4-inch size, 18 ft. long, and arranged in two banks, 14 sections wide, with six in each section; two steam drums, 44 in. in diameter; area of heating surface of boiler, 3,737 sq. ft.; area of grate surface, 58.3 sq. ft.

Instead of the coking system showing a more perfect combustion of gases, as expected, the actual result was a loss, the difference being 5.5 per cent.

DATA AND RESULTS OF EVAPORATIVE TESTS ON 325 HORSE-POWER BARCOCK & WILCOX BOILER MADE WITH NEW RIVER SEMI-BITUMINOUS COAL.

System of firing	Ordinary	Coking, with brick roofs over furnace.
Percentage of moisture in coal	2.4	2.1
Date of test	April 19	April 21
TOTAL QUANTITIES.		
1. Duration	2	2.58
2. Weight of dry coal consumed including waste equivalent	5,611	10,698
3. Weight of ashes and clinkers	357	519
4. Percentage of ashes and clinkers	4.1	4.9
5. Weight of water evaporated	89,890	92,464
HOURLY QUANTITIES.		
6. Coal consumed per hour	1,402.8	1,739.8
7. Coal per hour per square foot of grate	18.5	21.3
8. Water evaporated per hour	10,103.6	10,729
9. Equivalent evaporation per hour, feed 100 degrees, pressure 70 pounds	9,057	10,682
10. Horse-power developed, A. S. M. E. basis of 33,000 ft. lbs. per minute	310.7	350.1
11. Equivalent evaporation per square foot heating surface per hour	2.7	2.9
AVERAGES OF OBSERVATIONS, ETC.		
12. Average boiler pressure	157.9	157.1
13. Average temperature of feed water	132.1	136.2
14. Average temperature of flue gases	466	466
15. Average draft suction	1.35	1.54
16. Weather and outside temperature	Cloudy, Moderate.	Cloudy, Moderate.
RESULTS.		
17. Water evaporated per pound of dry coal	9.15	9.69
18. Equivalent evaporation per pound of coal from and at 212 degrees	10.52	9.84
19. Equivalent evaporation per pound of combustible from and at 212 degrees	11.00	10.47