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M-DIAMOND VALE 13(1)A

MERRITT COLLIERIES LIMITED

VANCOUVER, B.C.

OPEN FILE

Seattle, Wash, U.S.A. June 30th..1913.

COPY.

Mr. T. J. Smith,
P.O. Box #722,
Vancouver, B.C.

Dear Sir: Re: SYNOPSIS REPORT DIAMOND VALE,
mentioned in yours of 25th. :

I beg to note statement you made of the opinion of certain parties, who in reference to this synopsis, "called attention to the very wide margin between four millions and ten millions as prospective earnings and thought it was a loose sort of estimate etc."

The estimate is not loose at all. I consider that you have fairly proven some ten millions tons in the upper series of seams. As to the lower seams, it is pure conjecture to base a positive estimate thereon. We know that the #2 Seam has been worked for a price that allows a margin of at least 50 cents per ton, therefore the statement of value for the upper series is correct. If the lower series contains the additional round thirty millions tons, then the value of the field could be readily appraised at Ten Million Dollars.

GEOLOGICAL BRANCH
ASSESSMENT REPORT

(Signed) Frank C. Green.

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SYNOPSIS.

Coal Report Diamond Vale Collieries.

By Frank C. Green, October 10th, 1913.

Page	2	Location	Nicola Valley B.C. 227 miles east of Vancouver, B.C.
"	2	Accessible	Via Canadian Pacific Railway.
"	2	Area	Two Thousand superficial acres.(2,067 acres)
"	3	Improvements	Salvage value about \$50,000.00 Utility not considered.
"	3	Geology	Tertiary matured by adjacent volcanics.
"	4	Structure	Synclinal or boat shaped Basin. Outcrop to 1,500'.
"	4	Seams	Three series. Four to twenty feet. Many.
"	8	Quality.	Good steaming and coking. 12,000 to 13,000 BTU.
"	10	Tonnage	Gross forty millions.
"	11	Prospecting	By boring and mines on and adjacent.
"	12	Mining	Total \$2.00 when producing 300,000 tons annually.
"	14	Markets	Two thousand to twenty five hundred tons daily.
		Selling price	\$2.50 average per ton produced.
"	17	Valuation	15% return on One Million investment.

REPORT ON THE COAL PROPERTY

of the

DIAMOND VALE COLLIERIES LIMITED.

By Frank C. Greene, Consulting Colliery Engineer,

Seattle, Washington, October tenth, Nineteen Thirteen.

EXAMINATION of the property of the Diamond Vale Collieries Company Limited in particular, during May 1913, and of the adjoining properties in general at the same time, together with data obtained from a number of prior visits to the Nicola Valley since 1910, enables the writer to base this report upon information personally obtained.

LOCATION AND ACCESSIBILITY This property is situated at the juncture of the Coldwater and Nicola Rivers, near the City of Merritt in British Columbia. By rail (Canadian Pacific Railway) the present shipping outlet is about forty seven miles northwest to Spence's Bridge, on the main line of the C.P. Ry. Spence's Bridge is 180 miles east of Vancouver the main port in B.C. From this field also the Kettle Valley Railway (C.P.R.) is constructed some thirty miles to the southwest, up the Coldwater River, where a junction with the V.V. & E. (Great Northern) is being effected. Second outlet will then be by the Coquihalla River Valley to the main line of the C.P.R. at Hope, reaching Vancouver in about 140 miles rail haul. Also from the above mentioned junction the V.V. & E. Ry will provide outlet to the Boundary District Smelters, a rail haul of about 200 miles from this field. See Map 224-0.

AREA The Canadian Geological Survey has estimated the area of the whole Nicola Valley Coal Basin at "forty square miles" all

of which does not appear to be underlain by coal.

It seems probable that less than eight square miles will be found to contain coal in mineable quantities or condition.

This property comprises some two thousand acres, of which probably three-fourths are underlain by coal. This is the largest coal area under one ownership in the Nicola Valley Basin.

Photographs herewith illustrate the surface characteristics, plant, equipment at present etc..

IMPROVEMENTS ON THIS PROPERTY TO date consist of Nos. 1 and 2

shafts and buildings at same (see photograph) and some limited amount of salvageable equipment, and the #3 slope mine and very limited equipment. The whole salvage value of better mention the property will possibly total Fifty Thousand Dollars. They are not considered in connection with any valuation of the property nor as reducing cost of future proper equipping of the property for economical production of the coal.

GEOLOGY The Basic Rocks of the Valley are Triassic Volcanics.

Early Tertiary (Eocene) erosion concurrently (or later) with lava extrusions prepared the sediments of the valley upon which the Oligocene coal swamps spread.

These are of fluviatile littoral character (river or stream-like) varying greatly in both vertical and horizontal extent; especially variable in the upper horizons of the coal measures. See sections 224-3 & 4. Hence the difficulty of correlating individual coal seams as exposed in widely separated prospects. During and exceeding the Oligocene Tertiary (coal-forming period) igneous intrusions and extrusions occurred locally. These were responsible probably for the unusually well matured character of the Nicola Valley coals.

The position of both the Triassic and Post-Oligocene Volcanics defines the limits of the coal basin. They also have an intimate bearing on its structural features. See map 224-1.

STRUCTURE of the coal field is, in general, that of a synclinal basin with its axis plunging (so far as this property is concerned) at a low angle to the north-west. See section 224-2. The northwest limb of the syncline raised to pass over an anticlinal axis at about #11 Borehole for at #14 Borehole the persistent conglomerate horizons are identified at much lower elevation. Also the increasing dip to southwest in #3 slope with depth and various physiographic (surface forms) features confirm the existence of this anticline.

Faulting to a notable degree occurs along the southwest limb of said syncline beyond the confines of this property. Simple folding or flexing of the measures seems to be the rule otherwise. Remoteness of the volcanics presupposes an undisturbed attitude of the coal measures. Hence we should expect to find the mining conditions on this property those normal to gently folded, or bowed structure.

The Boring (See 224-2) records verify this condition so faithfully as to place credit in them. These records are otherwise unsubstantiated by recent development or additional boring.

SEAMS The difficulty in correlating seams in widely separated prospects on this field, has been assigned the reason hereinbefore. The writer feels more certain of recognizing three horizons of seams and has designated them (See 224-2) as UPPER, COAL GULLY AND COAL HILL SERIES.

The upper seams contain, from top downward three workable seams, viz 'Browitt' 'No. 3 Slope' and 'No. 2' or 'Rathole' Seams.

Their sections are shown on 224-4 as exposed in mines, prospect drifts, etc. generally.

The Browitt and No. 3 Slope seams are considered to persist in mineable thickness across the central portion of this property and to the northwest along the bottom of the basin; but, they are evidently bifurcated or split into smaller seams, as they rise to the southeast rim of this basin as shown in #1 borehole on the Indian Reservation.

It will be noted that this hole is one-half mile southeast of the line on section A-B. (See 224--) hence these seams are delineated there on a split, the Rathole Seam is the most valuable of the Upper series seams from standpoints of cleanliness and economical extraction. It apparently depreciates in thickness as it raises on the northwest limb of the synclinal basin. The wedge thinning of this seam in this manner is also exemplified by similar thinning of the previously deposited barren (or almost so) sediments underlying same.

These barren sediments are about 500 ft. thick at the southwest rim of the basin (See #1 borehole on 224-4 and #9 borehole on 224-3) whereas on the opposite limb of the syncline at #2 borehole (224-4) they are reduced to about 300 ft. thickness.

Naturally the wedging out of the overlying Rathole seam would be expected to follow.

The same line of reasoning applies to the Coal Gully Series. Their wedging out or thinning to the northeast while less pronounced, is considered to have its correlated influence upon the thickness of the Coal Gully Seams, and, inasmuch as they are not of mineable thickness or condition in Nos. 11 & 14 Boreholes, their persistence may be questioned to the northeast of the median line of the synclinal basin.

At least one of the Coal Gully seams persist (with a coal content of 67" out of 86" of formation) probably to the syncline median as shown by borehole #7.

This hole, unfortunately was stopped before all of the Coal Gully seams were penetrated. However in the absence of further information from this hole, and considering the creditable showing of the one Coal Gully seam that was reached it seems most likely that this series of seams may be expected to persist in mineable thickness to the center of the basin. Their contents was not included in my preliminary report of June 10th, 1913, but a tonnage estimate hereinto follow will include them based on their persistence as noted.

The Coal Gully Series are known to contain at least three seams that have been (and are being) worked at the #1. (until recently; now on fire), #4 and #5 collieries of the Nicola Valley Coal and Coke Co. Ltd. See 224-1.

The sections of these seams are shown on 224-4. Despite fault displacements this company has persistently worked them for five or six years. Recently they have commenced mining another seam (12') which I am authoritively informed is an addition for those mentioned above for the Coal Gully series.

The Coal Gully seams occur in predominately argillaceous measures encased in conglomerates. These conglomerates occupy correlated positions in the #11 and #14 Boreholes.

The lowest or Coal Hill series are believed to contain the greatest mineable tonnage on this property. They are believed to persist from the western rim on Coal Hill (Inland Coal Co. property) to a point near the center of section 24 where the converging proximity of the Volcanics probably disturb them beyond the point of economical mining. The length northeast-southwest is thus about four

miles. They probably average in width about one mile. Quite two thirds of this area is encompassed within the boundaries of this property.

They were reached in only two of the boreholes (#11 & #14) where the anticline (mentioned under 'structure') elevated them to within the 800 ft. or 900 ft. limit to which it was apparently thought necessary to bore in the early work of prospecting this property.

The evidence at hand, in the writer's opinion, is so strongly in favour of correlating the Coal Hill Series with the seams struck in the #11 & #14 boreholes that to refuse such recognition would be equivalent to misapplying the facts in an attempt to correlate the Nos. 11 and 14 boreholes showings with the Coal Gully seams. There is no other plausible relation.

The proximity of underlying volcanics, the overlying conglomerates and heavy sandstone horizon the characteristic greater thickness of the seams formation in the Coal Hill series, the physiographic and structural evidence of the eastern anticline and particularly the utter lack of correlative evidence between the Coal Gully and Coal Hill Series and Seams where they are so closely being operated, all support the contention that the Coal Hill series occupy the lowest Oligocene horizon, that they extend clear across the basin as a result of their persistence which persistence is clearly more and more in evidence in the lower series. The seams of the Coal Hill Series will therefore, in the opinion of the writer, be found to contain the largest tonnage in the Valley and upon this property. On Coal Hill, on the property of the Inland Coal and Coke Co. (formerly Coal Hill Syndicate) the known seams in this series exhibit the Sections shown on 224-4.

They have a combined thickness of about 45 feet for at least four of the workable seams. Their attitude is one of increasing pitch as they approach the Post-Oligocene Volcanics intruded to the north. Both the Coal Hill and the Coal Gully seams have had their northeast dips modified locally, apparently under the influence of this Post-Oligocene Volcanic boss, to southeast and south dips. The Coal Hill seams probably reach a depth of 1,500 feet below surface at the syncline median. On the east anticline these seams, so far as bored through, exhibit 24' of workable coal in the #11 borehole. The #14 borehole record shows that they become dirty to the northeast of the field or (and what is more probable) the #14 borehole was sunk in disturbed ground.

Under Caption TONNAGE the Coal Hill seams content will be based upon thickness twenty feet. They are much more however.

QUALITY The uniformly similar appearance of these coals from various seams is notable. They are clean, bright, hard and pitch black. The more splinty pieces frequently contain mineralized resin particles. They mine with cubic fracture into slab-like lumps and finger-like fines. Whilst moderately brittle they stand handling well, and with careful preparation will result in about 55% of coarse coal on the railroad cars.

The waste in the seams is about ten per cent. Proper underground supervision will tend to reduce the amount of waste loaded out by the miner to about two per cent. The need for proper preparation equipment is evident. The fine sizes below 1/2 inch will require washing.

The writer has sampled the seams of the Nicola Valley a number of times, the resulting analyses from such sampling exhibit a close agreement with each other and with Government and with other

reliable published analyses. A fair average statement combined from many analyses would be:

	Maximum	Minimum	Average
Moisture	3.5%	1.0%	2.4%
Volatile Hydrocarbons	43.7%	33.7%	37.4%
Fixed carbon	55.7%	50.6%	53.5%
Ash (white to grey)	9.5%	4.5%	6.7%
			----- 100.
Sulphur	.9%	.3%	.6%
British thermal Units	13,500	12,600	13,000 (coal as mined).

The attached sheet 224-5 shows the relative fuel value of these coals to other well known coals. Their characteristics are almost identically those of the same age (Tertiary) coals of the state of Washington. An exception is to be noted however in the lower moisture content of the Nicola Coals. They are also higher in the bitumen quality and are to be classed as true sub-bituminous coals with particularly low (for western seams) moisture element.

The liberal volatile element insures their ready ignition and long flame burning. Their use by the C.P.R. has demonstrated their desirable steaming qualities. The size above 1/2" unwashed has proven very satisfactory for locomotive use on heavy mountain grades. The only objection from the railroads has been on account of the dirty fine coal which in the early operations of this field was furnished this trade. Washing of the fine coal will remove such objections.

The Nicola Valley coals produce a superior metallurgical coke with well developed cell structure and ample strength for iron furnace stacks. From English coking tests noted by the writer, the following resulted:

	From raw coal	In Bee-Hive Ovens	In Retort Ovens.
Moisture	3.4%	1.2%	1.0%
Volatile matter	34.90	1.20	.50
Fixed Carbon	56.70	84.00	92.25
Ash	5.00	13.60	7.00
	<hr/>	<hr/>	<hr/>
	100.00	100.00	
Sulphur	.65	.63	<hr/> .25
			100.00

No report on Phosphorus.

It is to be noted that the cokes from the Crow's Nest Pass region that reach the Boundary Country Smelters will average a much higher ash content than that shown above for coke made in Bee-Hive Ovens.

These coals do not decrepitate during long exposure to the weather. The waste piles do not "fire" readily. The fire in #1 mine of the N.V.C&C. Co. mentioned above was due to crushed timber in "Squeezed" territory.

TONNAGE based upon the foregoing data is to be considered as purely as close an approximation as can be made. The following estimate is believed to be warranted by the facts at hand and conservatively so.

	<u>Combined Seams</u>		<u>Content</u>
	<u>Acres</u>	<u>Thickness</u>	<u>Gross Tons.</u>
Upper Series	850	12 feet	10 millions.
Coal Gully Series	350	18 "	6 "
Coal Hill Series	1400	20 "	28 "
Totals		50 feet	44 millions.

Of this amount a considerable allowance must be deducted for faults, wants, dirty areas, etc. Ten to twenty per cent. may cover such deficiencies but this can only be arrived at by future boring and mining. It may be explained that the wants will be quite different from those so prevalent in the Vancouver Island Coals of Upper Cretaceous Age. The Vancouver Island wants are due to crustal movement (of roof sliding or tending to slide, over the floor, using the seam as a plane of lubrication). There the result is alternating areas of abnormally thick seam separated by depreciated seam areas. There is no evidence of such crustal movement on the Nicola Valley Basin. The wants will all be due to deposition of littoral in contracted ancient stream beds. That this condition has not been of wide-spread occurrence is evidenced by total lack of canal accululation on any of the seams thus far worked.

PROSPECTING All past prospecting and mining on this property is shown on 224-1, 3 & 4. Nos. 1 & 2 Shafts sunk close by each other here were disappointing, but purely so on account of lack of knowledge of the measures. No. 1 Shaft did not get through water bearing gravel wash even at shallow depth. No. 2 shaft (See 224-2) was sunk sixty-eight feet deep to what was then supposed to be the Rat Hole Seam opened by the close-by #2 Slope operation of the N.V.C. & C. Co. The Rat Hole Seam however will be found 150 feet deeper. This shaft is now filled with water. #3 Slope mine

is very small. (See 224-6). It represents an entirely negligible tonnage extracted.

The Borings whilst some years old have been carefully studied by the writer from the original drillers records. Their authenticity is too well borne out by this study to cast any suspicion upon them. The writer accepts them as bona fide records. Precedent however to future operations some six or eight additional borsholes should be sunk. Choice of position would not be made especially to verify the original borings but to further determine the attitude of the seams and their measures in laying out the proper mining program.

The cost of core-drilling ranges from \$3.00 to \$5.00 per foot depending upon amount and depth. Eight holes would cost about \$25,000.00.

MINING The #2 Slope of the N.V.C.&C. Co. is worked right up to the western boundary of this property, on the Rat Hole Seam. It is now retreating with pillar coal production. During the advancing period this mine produced coal for as little as \$1.45 (labour and supplies) and for as much as \$2.90 (labour and supplies). Its average mine cost for six consecutive months in the same year was \$2.10 on a production of 13,000 tons. Inside cost was average \$1.90 and inside cost was average \$.? during this period.

It is to be seen that the production was very small, hardly 100 tons per day worked and that the working territory was limited. Rockwork absorbed more than 25¢ per net ton and timber and yardage costs were correspondingly large.

In unbroken ground this seam can be mined for \$1.50 line cost when producing 1,500 tons per day. It is believed that the thicker seams of the Coal Hill Series are being mined for about

this figure on a present production of about 600 tons daily. Some of them should be mined for less.

The writer has estimated the approximate cost for which the coal on this property can be placed upon the railway cars when producing 300,000 tons annually as follows:

Mining Yardage Timber and Rockwork	.95	
Haulage draining ventilating	.12	
Supplies etc.	.08	
Inside and Outside Labour Office, etc.	.35	
Mine cost is then		1.50
Liability Insurance (3% of payroll)	.04	
Other Insurance and Taxes	.02	
Royalty B.C. Government	.10	
Interest and Sinking Fund (20 year retirement).	.34	<u>.50</u>
		2.00

per gross ton based upon the following:

When producing annually	300,000 gross tons
When property costs (Cash)	\$500,000.00
When Plant costs (Cash)	300,000.00
When Working Capital is (Cash)	<u>200,000.00</u>
When total investment is (Cash)	\$4,000,000.00

This does not include coking plant. The modern plan of installing coking plant of by-product ovens at point of consumption of coke from these coals to erect their own coking plants. Possibly a moderate investment in say the elongated type of bed-hime oven might be advisable; enough ovens to make waste heat for power purposes at the mines and ship the coke to small users.

These mines in the Nicola Valley work with locked lamps, but they are not to be considered as very fiery mines. Proper methods of working the coal would probably influence the B.C. Mines Department to permit use of electric haulage apparatus etc. Vancouver Island Mines are so operated.

MARKETS At present due to long labour suspension at the Vancouver Island Collieries the market is more broad and active for the absorption of the Nicola Valley coals than is usual. Some of the market thus obtained will doubtless be retained.

The Canadian Pacific Railway Company takes about 75% of the output of the mines in the Nicola Valley ordinarily. It has taken as much as 90% when the production was much larger than it is to-day. This output is at present about 1,000 tons daily from two operating companies. The car supply is usually adequate except in crop moving season. Additional equipment is reaching the mines in recent times. There seems to be no "hold up" policy on the part of the railway.

However it is to be desired that other trans-continental railways now building will enter the Nicola Valley. It seems that they must do so if an adequate fuel supply with a short haul is to be obtained by them.

Along the Main Line of the C.P.R. this coal will reach east to Revelstoke to meet the Crow's Nest and Cascade Basin coals from the Rockies.

It will now meet the Vancouver Island coals at North Bend, with promise of reaching them nearer (or even at) Vancouver or other Coast points, when the Kettle Valley Ry. and the V.V. & E. (G.N.) connect through to Hope.

It has at present no Boundary outlet, but, when the above roads are connected at Coldwater Junction the way is clear practically without competition to the Boundary Country Smelters.

I should describe the fuel requirements in the above described territory which these coals will reach to be quite 2,000 to 2,500 tons daily, at present including all rail, commercial and smelter needs, Further it seems most probable from the growth of the provincial population and industries requiring fuel that the market for this coal will expand for many years at the rate of about 500 tons annually. Some idea of the Smelter fuel used (coke) is gained from the following statement from an authoritative source.

On basis of $12\frac{1}{2}\%$ coke charge in smelter furnace:

The Greenwood Smelter uses	250 tons coke daily.
The Granby Smelter uses	500 tons coke daily.
The Trail Smelter uses	<u>125 tons coke daily.</u>
Total	875 tons coke daily.

This coke is hauled from the Crow's Nest Pass region via rail a distance of 450 miles. It costs about \$6.50 per ton at the Smelters. When the Crow's Nest supply has, at times, failed due to labour troubles etc. the Eastern coke via Duluth reaches the Smelters at from \$9.00 to \$11.00 per ton;

This attractive market for a coking coal that can reach the Smelters by rail with a two hundred mile haul presents an advantage of from .50 to \$1.00 per ton of coke to the Smelter Companies if they purchase coking coal from this field at \$2.50 and coke it at their plants in modern ovens, after paying \$2.00 freight charge. Personally I know that they are keenly alive to the possibility of so obtaining their coke supply.

They would require (even on so high a yield as 80% from retorts) not less than 1,000 tons of such coal daily.

The sales prices, combined for several grades and sizes of coal from the Nicola Valley will average better than \$2.50 per net ton run-of-mine f.o.b. cars at mines. Certainly the use of oil by the railroads is not increasing.

The operating difficulties of oil have indeed urged the railroads to abandon its use in many cases recently. The increasing C.I.F. price of oil in Coast Ports does not argue against the price of coal being maintained and there seems to be no other factor that will reduce the selling price.

I have knowledge of oil using railroads making satisfactory tests of burning fine coal with stokers on locomotives which leads me to believe that the economies produced will result in many oil burners on the railroads being changed to stokers. With navigation fuel the oil fuel is entirely a different matter. Railways cannot afford to have "dead" engines laid up awaiting tube renewals due to burning oil.

It is therefore confidently submitted that the NET PROFIT per ton output from Nicola Valley mines properly equipped and managed will be fifty cents per net ton.

Competition to reduce such profit does not appear to be probable from any external source. Internally to this field the price will not be cut below \$2.50. Only one mine in the Valley at present seems to be able to produce coal for total cost of \$2.00. On the Tulameen River the Columbia Coal & Coke Co. are the nearest competitors. They may or may not continue their exploratory work. The Princeton lignites have their fields of usefulness but not as a competitor. Their selling price in Spokane is about \$2.00 below coals of the Nicola quality. Even their eventual preparation into briquettes can hardly be said to present them as competitors.

VALUATION of coal properties, which are not developed, at so many cents per ton in the ground is a pure makeshift in the opinion of the writer. Their value is nil if never operated. If they are worked, their value is represented by their earning capacity. Based upon the earning capacity of this property when developed, it is therefore submitted that net return of \$150,000.00 annually will result from the well managed operation of same when One Million Dollars of Cash Capital is expended thereon, and as a result 300,000 net tons are being produced and marketed annually at \$2.50 selling price.

Again from a standpoint of evaluating this property on a royalty basis, the B.C. Government has (Coal Mines Act 1910) planed the fiat of law upon such value (to it) by exacting and very justly so for the protected exploitation of its natural resources the small sum of ten cent per ton produced.

If the owners of this property care to, in turn, sub-lease this field they might properly exact a royalty of twenty-five cents per ton as mined.

On such royalties method of valuation when the believed tonnage shall have been definitely proven by additional boring and mining, the value of the property may be said to be between Four Million and Ten Million Dollars - the former amount if only upper seams are considered and the latter if lower seams also are taken into account.

GENERAL items of interest would include nothing of labour conditions, titles operation program etc. detailed plant expenditures, estimates etc. etc.

The supply of labour is more than adequate at present owing to incoming men from Vancouver Island where suspension of work

exists. Many of these men will wish to remain in the valley, since their earnings are quite as large here as on the Island. Merritt is a desirable city for men to live in.

The title of this property is understood to be Crown Grants. The writer has not been called upon to investigate this item.

An operation program cannot be properly decided upon until the recommended additional boring is completed. The alternatives of slope and shaft openings must await the information to be obtained from the additional borings. It may be stated however that the amount mentioned for plant equipment does not include 1,500' shafts to reach the bottom of the basin. Either moderate depth (say 500') shafts or more properly, slope openings is so included.

For same reason, detailed plant expenditures would be estimated prematurely at present.

This field while it will not be without the western mining difficulties, is believed to be one of the most favourable in point of location from any other bona fide field and in point of probable large tonnage that ought to be mined with profit of the Northwestern Coal Fields. Wide travel over many of them has familiarized him with conditions so that he can state conscientiously that this field is worthy the most thorough investigation by substantial financial parties. The additional boring recommended as precedent to large expenditure, will, in the opinion of the writer, confirm his belief that this property will under same financing and competent managing return a very satisfactory income from investment made.

Respectfully submitted

(Signed) F.C. Green.

Consulting Colliery Engineer.