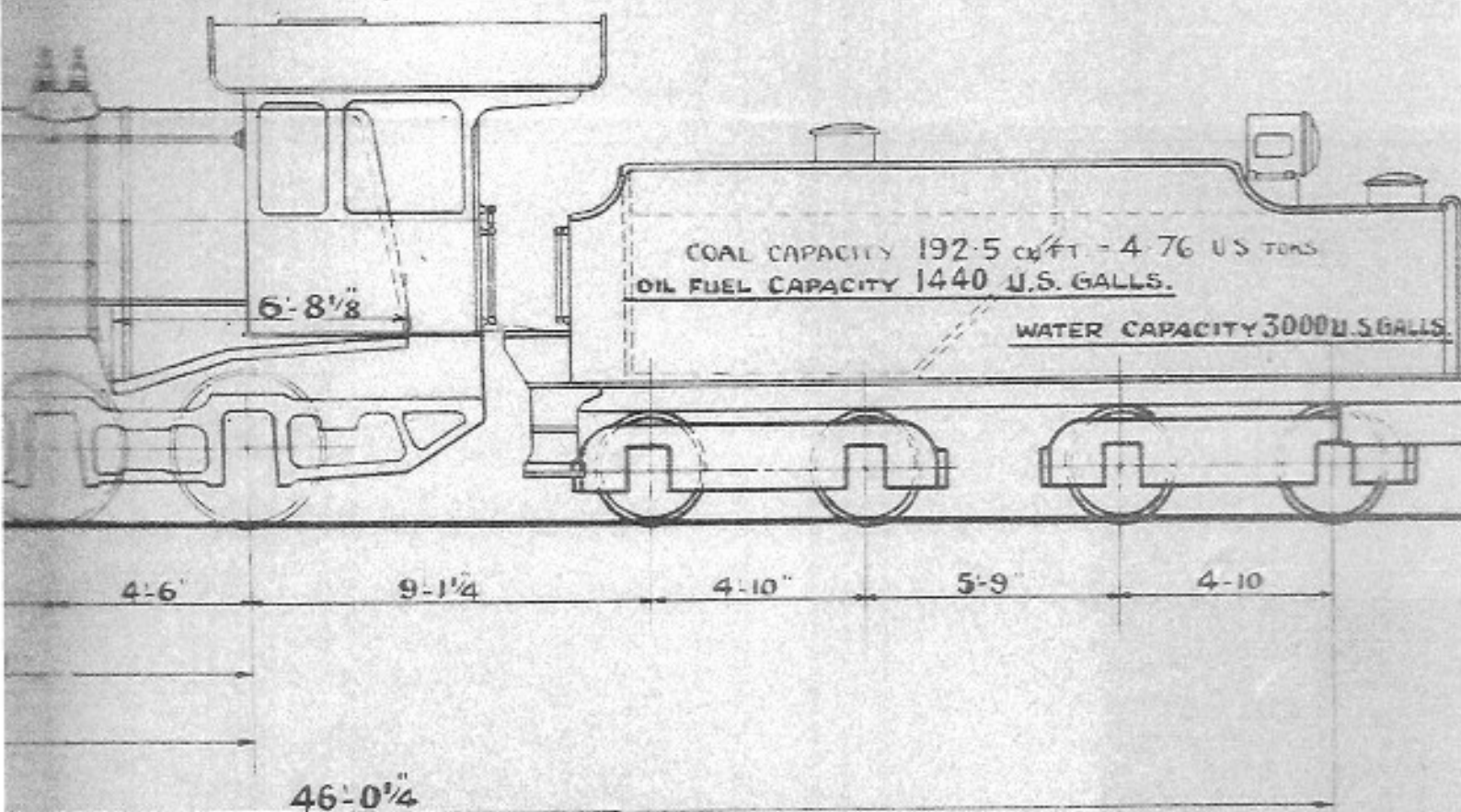


CYLINDERS	17 DIA. X 22" STROKE
DISTANCE BETWEEN TUBE PLATES	13'-4 <sup>3</sup> / <sub>8</sub> "
FIREBOX LENGTH	6'-0" INSIDE
WIDTH	5'-0" INSIDE
HEIGHT	4'-9 <sup>1</sup> / <sub>4</sub> " AT FRONT 3'-9 <sup>1</sup> / <sub>4</sub> " AT REAR
TUBES	117 - 2" O.D.
	23 <sup>1</sup> / <sub>2</sub> "

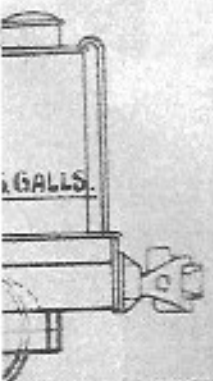
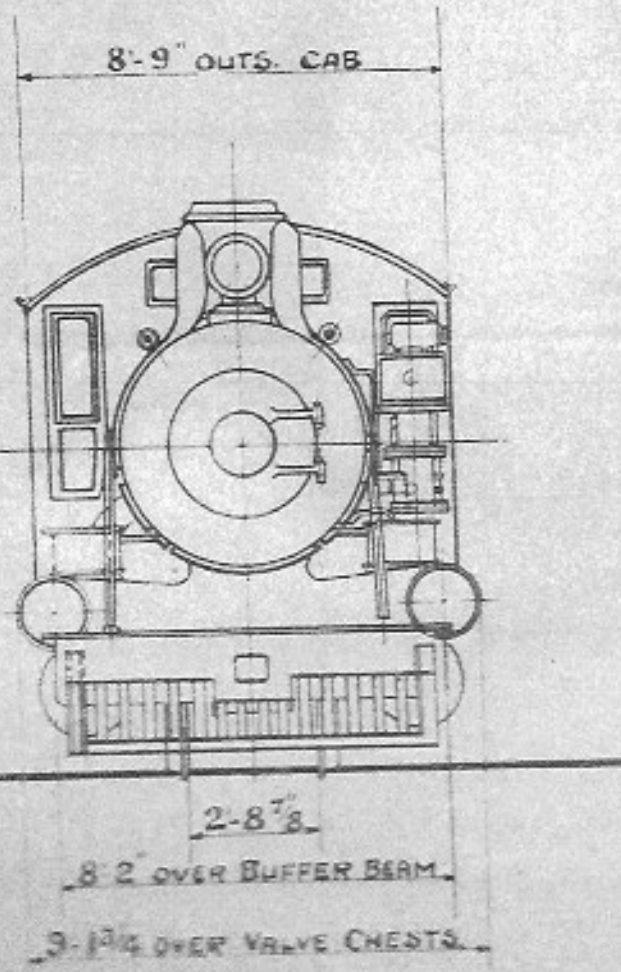
ROBERT STEPHENSON & HAWTHORNS LTD.

FORTH BANKS LOCO WORKS

NEWCASTLE-ON-TYNE.



			TENS OF 2240 LBS	
			LIGHT	LOAD
	HEATING SURFACE FIREBOX	975 sq. FT.	WEIGHT	
2 1/2	TUBES	1120	LEADING BOGIE	9.85 TONS 10.5
	TOTAL EVAPORATIVE	1217	COUPLED WHEELS	34.4 39.1
	SUPERHEATER	272	WEIGHT OF ENGINE	44.25 49.6
BACK	TOTAL	1489	TENDER	16.05 32.75
	GRATE AREA	30.4	TOTAL	60.30 82.3
	WORKING PRESSURE	180 LBS		



210 LBS	
LOADED	
10 5 TONS	
39.1	
49.6	
32.72	
82.37	



ROBERT STEPHENSON & HAWTHORNES, LIMITED  
FORTH BANKS WORKS,  
NEWCASTLE ON TYNE

S P E C I F I C A T I O N

O F

3'-0" GAUGE, 4-8-0 TYPE LOCOMOTIVE

W I T H

DOUBLE BOGIE TENDER



S P E C I F I C A T I O N  
OF  
3'-0" Gauge, 4-8-0 Type Locomotive  
with

Double Bogie Tender

Description and Particulars of Locomotive

The general design of the locomotive to be as shown on accompanying Design No.2951 and Photograph E.3714.

Gauge of railway .....	3'-0"
Type of engine ..	4-8-0 or eight wheel coupled with leading truck.
Cylinders .....	17" dia. x 22" stroke.
Coupled wheels...	40" dia.
Truck Wheels ....	26" dia.
Tractive force at 85% boiler pressure	24,319 lbs.
Coupled wheel base	12'-0"
Engine " " "	21'-6"
Total wheel base of Engine & Tender	46'-0"
Heating Surface:-	
Tubes .....	820 square feet
Superheater flue tubes .....	300 " "
Firebox .....	97 " "
Total evaporative.....	1217 " "
Superheater .....	272 " "
Grate area .....	30.4 " "
Working pressure.....	180 lbs. per square inch
Approximate light weight .....	99,120 lbs
Approx.weight in full running order	111,104 lbs.
Height to top of chimney .....	11'-8"
Width over steam chests .....	9'-1 $\frac{3}{4}$ "

Width of Firebox (inside).....	5'-0"
Length " " ( " ).....	6'-0"
Boiler Barrel plate thickness...	9/16"
Smokebox tubeplate " ...	5/8"
Throatplate " ...	5/8"
Wrapper plate " ...	9/16"
Inside firebox tubeplate" ...	5/8" - Steel
" " wrapper " ...	3/8" "
" " backplate" ...	3/8" "
Diameter of Water space stays...	7/8" "
Tubes - 117 Steel tubes 2" o/d x 11 SWG thick } 16 " " 5 <sup>3</sup> / <sub>8</sub> " " x 9 " " }	
Diameter of Piston Rods.....	3 <sup>1</sup> / <sub>8</sub> "
Section of Slidebars:-	
(Top Bar.....	5 <sup>1</sup> / <sub>2</sub> " wide x 2 <sup>3</sup> / <sub>4</sub> " thick
(Bottom bar .....	3 <sup>3</sup> / <sub>4</sub> " wide x 3 <sup>1</sup> / <sub>8</sub> " thick
Thickness of main frames .....	3 <sup>1</sup> / <sub>2</sub> "
Thickness of front buffer beam..	3/4"
" " hind " " ..	3/4"
Coupled Axlebox Bearing .....	7 <sup>1</sup> / <sub>2</sub> " dia. x 7" long
Leading Truck " .....	4 <sup>1</sup> / <sub>2</sub> " " x 7 <sup>1</sup> / <sub>2</sub> " "
Connecting Rod Small End Bearing	3" " x 3" "
" " Big " "	4 <sup>1</sup> / <sub>2</sub> " " x 5 <sup>3</sup> / <sub>4</sub> " "
Leading Coupling Rod Bearing....	4" " x 3" "
Inter. " " " ....	4" " x 3 <sup>1</sup> / <sub>2</sub> " "
Driving " " " ....	4 <sup>3</sup> / <sub>4</sub> " " x 4 <sup>1</sup> / <sub>2</sub> " "
Trailing " " " ....	4" " x 2 <sup>3</sup> / <sub>4</sub> " "
Tyre section - leading coupled wheels -	6 <sup>1</sup> / <sub>2</sub> " wide x 2 <sup>1</sup> / <sub>2</sub> " thick
" " - other coupled wheels -	5 <sup>1</sup> / <sub>2</sub> " " x 2 <sup>1</sup> / <sub>2</sub> " "
" " - truck wheels -	5 <sup>1</sup> / <sub>2</sub> " " x 2 <sup>1</sup> / <sub>2</sub> " "
Safety Valve - Ross Pop	

- Boiler lagging - Asbestos mattresses.
- Valve Gear - Walschaert, screw reverse, with 8" dia. Piston Valves.
- Wheel centres - cast steel
- Brakes - Westinghouse straight air with 8½" Cross compound air compressor. Braking on all coupled wheels.
- Lighting - Electric with turbo-generator
- Sanding - Westinghouse air sanders.
- Couplers - Sharon type central coupler or otherwise as required.

DESCRIPTION AND PARTICULARS OF TENDER

- Type - Double bogie (two four wheel bogies)
- Wheels - 28" dia.
- Bogie Wheelbase - 4'-10"
- Tender " - 15'-5"
- Water Tank capacity - 3000 U.S. gallons
- Fuel capacity - 192.5 cu.ft. (4.76 U.S.Tons)
- Weight light - 35,952 lbs
- Weight in full running order - 73,293 lbs.
- Bogie frames - steel bar type
- Front Buffer Beam thickness... 1"
- Hind " " " ... 1"
- Tyres ..... 5½" wide x 2¾" thick
- Axle journals ..... 3¾" dia. x 7" long
- Tender underframe ..... steel rolled sections.
- Wheels ..... cast iron
- Axleboxes ..... cast iron
- Brake ..... hand screw and straight air.
- Coupler ..... as on locomotive

64A  
3 copies

RECEIVED

407 Douglas Building  
P. O. Box 1846  
Seattle 11, Washington  
September 29, 1952

1 1952

PAID

RECEIVED

2 1952

Mr. F. H. Brown, President  
White Pass & Yukon Corporation  
1312 Standard Building  
Vancouver, B. C.

Dear Mr. Brown: MOTIVE POWER SITUATION

PREP

At board meeting Toronto July 10 it was decided that if further power was needed it would be better to attempt to purchase another steam locomotive of the 70 Class, rather than go into diesels until after the tests of the U. S. Army locomotives are made on our lines in 1953-54. It was also decided that the English market should be explored through Mr. D'Arcy and also the Canadian market.

ENGLISH MARKET FOR STEAM LOCOMOTIVES

On August 16, 1952 specifications of 70 Class were sent to Mr. D'Arcy. On September 15 Mr. D'Arcy telegraphed and on September 12 wrote us with complete specifications of two smaller locomotives for sale by the Anglo Iranian Oil Company at a very low price which he estimated to be about \$7000.00 each plus freight. Total weight on drivers is 67200 pounds vs \$70 at 108000 pounds with tractive effort 13200 pounds vs 21600 pounds respectively. For new locomotives of their size these are a bargain but with compulsion on us to reduce haulage costs it would be a long step backward to go to this size locomotive. Speed apparently is around 20 miles per hour which would be a definite handicap to us for through runs.

The firm, Hudswell Clarke and Co. Ltd., who built these and brought them to Mr. D'Arcy's attention stated that it would cost \$7000 to \$8000 for engineering dies and patterns to build us a Class 70 locomotive and that delivery would be about 2 1/2 years from order. On September 18 Mr. D'Arcy sent us specifications from Robert Stephenson & Hawthorns Ltd of a 4-8-0 that they had made for the "Dorada" Railways some years past. They are prepared to quote if we are prepared to take the design without major modifications. They say "the best we can do is offer our design most nearly approaching the requirements of your clients." The design is similar to our 69 Class, outside frame with overall width over valve chests of 9' 1 3/4" which is approximately same as 69, and would restrict this locomotive to operation south of Bennett in summer and lay it up in the winter account width of snow cut. The data on this engine will go to Mr. Abrams and Mr. Hoyt for their advice as to whether it would be worth while to ask Mr. D'Arcy for a price and delivery date on this locomotive.

UNITED STATES AND CANADA MARKET FOR STEAM LOCOMOTIVES

Baldwin Lima Hamilton Corporation Philadelphia visited on September 10-11. Mr. R. A. Matt, Vice President-sales advised as follows: They are completing in November 1952, 27 standard gauge locomotives for New South Wales. If they had an order from us at the time they started this order they could have run our locomotive through with that job even though it was



only one of a type. Now to build a single steam locomotive to their 70 Class design would cost in the neighborhood of \$175,000.00. Locomotives 72-73 without tenders cost us \$66,000.00. There is a possibility that there may be another order placed by New South Wales and if that happens they would build a locomotive along with this order at a considerable reduction from the \$175,000.00.

Meantime if we can interest someone in building a 70 Class locomotive they have agreed to furnish us in a short time the following:

1. A list of materials required for Class 70 locomotive
2. A list of casting patterns required
3. A list of patterns that they can supply that are available for disposal and whether such patterns are in condition for use and if not whether better to repair before shipping or ship as is to be repaired by new builder.
4. A list of patterns that are not available for disposal and from which they would have castings made.
5. A list of patterns that no longer exist and which would have to be duplicated.

On September 27 we traced them by wire for this information. There are between 300 and 500 blue prints involved in a 70 Class engine and they will produce these for us a \$4.00 per print in a period of 60 days. Total cost \$1200.00 to \$2000.00. They are not to commence to reproduce these till we advise. There are no forging dies in existence for this locomotive. Baldwin does not operate a boiler shop and can therefore only operate on steam locomotive orders large enough to set this and the other necessary shops in operation, recruit labor etc.

On September 22 visited plant of Davenport Beseler Corporation at Davenport, Iowa. Trip was primarily to talk about the Diesel locomotives which they are to construct for the U.S. Army and which are to be tested on our line. This is an old steam locomotive works which has lately been in the diesel locomotive business on smaller sizes and for gauges less than standard which the builders like Baldwin and General Motors do. It is more of a jobbing shop and the numbers of units in its orders are much less than of the plants named above. They have an adequate machine shop, foundry, sheet metal shop and erection shop and they have an arrangement with a boiler shop near them who have turned out boilers for them for several years. The arrangements made with Baldwin outlined above were gone over with these people and they are prepared on our submission to them of this data to name us a price and delivery for a 70 Class locomotive. Mr. Geo. D. Beseler is the President, Mr. J. Imbrie Jr. is his assistant, Mr. W. E. Rodler is the production manager. He has been in the firm for many years. His son W. E. Rodler Jr. is production designer

On September 18 Mr. G. A. Mueller (pronounced Miller) Vice President Canadian Locomotive Works, 980 St. Antoine St., Montreal called on me at the Ritz-Carlton Hotel, Montreal. He was unable to discuss a steam locomotive with me at all as they have gone completely out of steam construction.

Later that day called on Mr. R. G. Harwood, Sales Manager, Montreal Locomotive Works, 660 St. Catherine St. West. This is an affiliate of American Locomotive Works. He was unable to offer us any help on a steam locomotive. As far as I know there are no other possible sources of a steam locomotive.

DIESEL ELECTRIC LOCOMOTIVE

On September 8 visited Electro Motive Division of General Motors at La Grange, Illinois. Mr. W. N. Fritts, General Sales Manager and Mr. L. L. Turk, Sales Engineer. They have no 36" gauge locomotive to offer either Diesel Electric or Diesel Torque converted. They do not have a traction motor design that will fit between wheels of 36" gauge. Their business is a very large production line business and the building of a very few narrow gauge locomotives would have to be undertaken outside present production line and would be expensive. They suggested a smaller outfit like Davenport Bessler should do the job. In such a locomotive they would collaborate and be prepared to supply components such as engines, generators, compressors for brakes and cooling and electrical controls.

September 10 at Baldwin Lima Hamilton Corporation, Philadelphia learned from Mr. Matt that Westinghouse Electric had just completed design and testing of a traction motor for use between wheels of 36" gauge track. Model is 974A. They are at present including in their line a Diesel Electric locomotive for Meter Gauge (#39 3/8") with 800 H.P. 4 cycle "Superior" diesel engine with 3 axle trucks and 3 traction motors per truck. This would cost between \$115,000 and \$120,000. They are prepared to modify this locomotive to 3 6" gauge using above "Superior" engine, Westinghouse Generator #1607 modified to supply power to 6 Westinghouse Traction Motors #974A. The Superior engine develops its power at 1100 R.H.P.M. quite a high speed for this kind of work. The locomotive would have 40000# tractive effort at starting and 25000 at 10 miles speed versus 70 Class 22000# at starting and up to 10 miles per hour. From 12 miles up #70 has 2500 # more tractive effort up to 30 miles per hour.

Baldwin have a very large plant producing other things as well as locomotives. Their diesel locomotives particularly in the smaller sizes are more of an assembly job than manufactured by them. Engines, motors and generators are all purchased by them.

September 12 again visited Electric Motive Division General Motors at La Grange meeting with Mr. Dillworth one of the four originators of Electro Motive diesel locomotive and Mr. Fritts and Mr. Turk. They had received news of the new 36" gauge Westinghouse motor. They are of the opinion that they cannot economically create for us a 36" gauge locomotive but are of the opinion that Davenport Bessler can with the new 974A Westinghouse motor create a satisfactory 160000 # 6 axle locomotive with Electro Motive slow speed 2 cycle 800 H.P. 8 cylinder engine and their generator modified to handle the new traction motor. Their standard gauge diesel Electric 6 motor job of this weight and power cost about \$91,000.00 and in 36" gauge would cost more.

They point out that this diesel would produce more traction than our 70 for the reason that 70 has 108000 # on drivers to give 21600 # tractive effort with 20% adhesion whereas the diesel electric with 6 driving axles with 160000 # on drivers will give 40000# starting tractive effort. In the 70 the tender weighs 43 tons or 30% of the total which should increase the trailing tonnage load capacity of the diesel by at least that much.

Regarding bridges 27E Cooper allows 26500# per axle on 4 driving axles plus 46000# on lead and trailer trucks. Total 142000. With 6 axle diesel weighing 160000# with distance between trucks would reduce Cooper rating to 8.4% of 27 or 22.7 Cooper E. loading

September 29, 1952

On September 22 at visit with W.E. Rodler of Davenport Bessler Corporation, we discussed the two locomotives to be built for the U.S. Army which we are to test. The specifications we received from Mr. Truden with his letter March 10 has been changed and the 80 ton locomotive will have 6 driven axles instead of 4. There has been delay to these locomotives partly on steel shortage and partly awaiting development of Westinghouse traction motor for them. It is not now expected that the 48 ton will be delivered before March which would mean May before we receive it. The 80 ton will not start construction until May 1953 as engineering, particularly the trucks, has not been completed. The earliest date it can leave factory is now estimated July 15, 1953.

#### CONCLUSIONS

With the above information ahead of us I believe our best procedure is to ask Baldwin now to complete us a set of blue prints of 70 class to cost \$1200.00 to \$2000.00. They telegraphed me today that the lists mentioned above are being air mailed today. If it is decided to do this we should wire Davenport our intentions so that if any change in their situation as to completion of steam locomotive we may know it. If no such change we send full data, lists from Baldwin and blueprints when received from Baldwin and ask them to produce a price and delivery date as quickly as possible. Price and delivery date being satisfactory we order one steam locomotive from them.

Regarding the diesels it looks as though it would be midsummer 1954 before we can know whether there are any major difficulties on our line with this type of power and I do not think we should order a diesel before we do learn this. We have four 70 class locomotives now with from 20 to 25 years useful life in them and the addition of one more presents no great problem of maintenance or operation.

As to the diesels I think the combination of Electric Motive - Davenport Bessler - Westinghouse Electric will produce us the best job at the least money. We have a telegram dated September 17, 1952 from Electro Motive which reads:


"Will furnish 800 HP Diesel engine with load regulation and generator. Generator output will be limited to 600 volts to meet Westinghouse traction motor requirements. Westinghouse will furnish traction motors. Davenport Bessler will furnish carbody and trucks. No information available regarding six motor truck for this locomotive suggest this be obtained from Davenport Bessler."

This is the same arrangement as will be made for the 80 ton U.S. Army locomotive. A locomotive to that specification could not of course come out for us before the one for the Army does as the Army has or will pay for a large amount of engineering. If we buy a diesel electric, regenerative braking at an additional cost of \$10,000 or \$12,000 should be considered.

Regarding the 6 wheel trucks for the Davenport Bessler 80 ton diesel Mr. Rodler showed me the standard gauge 6 wheel truck frame they are using and which it is intended be adapted for narrow gauge and it appeared to me to be a feasible thing to do.

I believe we should proceed in this matter without delay.

Yours very truly,



President