

A COMPARISON OF THE BOILER PLANTS AT THE CHAMPION  
AND BALTIC MILLS TO SHOW THE SAVING POSSIBLE IN  
ONE YEAR WITH MODERN EQUIPMENT, ALSO AN ESTIMATE  
OF THE COST OF THIS EQUIPMENT NECESSARY TO EFFECT  
THE SAVING.

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Present Condition.

The boiler plant test of March 23, 24, 1916 at the Champion Mill showed an evaporation F. and A. 212° per pound of dry coal of 8.42 pounds. At this rate, it requires 118.75 pounds of coal to evaporate 1000 pounds of water.

The average of six tests at the Baltic Mill boiler house on Taylor stoker equipped Stirling boilers was 10.02 pounds of water F. and A. 212° per pound of dry coal. At this rate, it requires 99.8 pounds of coal to evaporate 1000 pounds of water.

Therefore, it is possible to decrease the amount of coal burned at the Champion Mill by 15.95%.

The Champion Mill boiler plant uses approximately 26,400 tons of coal a year. By decreasing this 15.95%, we can save 4210 tons. Pittsburgh coal containing 13800 B.T.U. per pound and costing 11.05 cents per 1,000,000 B.T.U. makes the cost per ton \$3.05 at the Mill. The 4210 tons saved at \$3.05 per ton makes a saving in money of \$12,840.00 for one year.

Stoker equipment can effect a further saving by burning a cheaper coal than that in use at present. Take Farmington Slack for example which costs 9.18 cents per 1,000,000 B.T.U. with each pound containing 13950 B.T.U. making a price delivered at the mill of \$2.56 per ton. This means a decrease of 49 cents per ton in cost of coal. There would be 22190 tons of coal needed per year after allowing for the saving brought about by efficient operation. By saving 49 cents on every ton of this coal, we could show \$10,875.10 in money saved in one year.

If stokers are installed, the plant could be operated with one less fireman per shift, or a total of three firemen at \$78 per month each, making a labor saving of \$2308. in one year.

Summing up these three cuts in the cost of plant operation gives a total for one year of \$26,521.10.

New Equipment.

To bring about this saving it is proposed to duplicate the boiler plant of the Baltic Mill with regard to boilers and stokers. The present coal handling equipment at the Champion



Mill being adequate with a few changes.

4 - 550 H.P. Stirling boilers	-	-	\$12,000.00
4 - 4 Retort Taylor stokers	-	-	12,000.00
4 - Soot Blowers installed	-	-	1,350.00
1 - Ash Conveyor "	-	-	1,500.00
Remodeling coal handling Equipment	-	-	1,000.00
Boiler House Piping	-	-	500.00
Venturi Meter	-	-	500.00
Total Erection Cost includes cost of brick, cement, etc., also labor of installing and tearing out old boilers	-	-	<u>15,000.00</u>
			‡ 43,850.00
For Contingencies add 10%	-	-	<u>4,385.00</u>
		Total	‡ 48,235.00
Interest at 5%			<u>2,411.75</u>
			‡ 50,646.75

Thus it is evident that the total investment would be returned in two years.



# COPPER RANGE COMPANY

Adams Township, MI

CHAMPION MILL

PLANT

TEST OF BOILER PLANT BOILERS LOCATED AT FREDA, MICHIGAN.  
 TO DETERMINE COMBINED EFFICIENCY OF BOILER, FURNACE AND GRATE.

DATE	March 23, 24, 1916	CAPACITY	
DURATION	24 Hours	BOILER HORSE POWER DEVELOPED	1820
KIND OF DRAFT	Induced	RATED CAPACITY IN EVAPORATION FROM AND AT 212°	
KIND OF FURNACE		BUILDERS RATING IN BOILER HORSE POWER	1450
GRATE SURFACE		PERCENT OF RATED CAPACITY DEVELOPED	125
PERCENT AIR OPENING IN GRATE		<b>ECONOMY RESULTS</b>	
WATER HEATING SURFACE		WATER FED PER POUND OF COAL FIRED	7.77
SUPERHEATING SURFACE		WATER EVAPORATED INTO DRY STEAM PER POUND OF DRY COAL	8.08
RATIO OF GRATE TO WATER HEATING SURFACE		EQUIVALENT EVAPORATION - DRY STEAM - FROM AND AT 212° PER POUND OF DRY COAL	8.42
KIND AND SIZE OF COAL		EQUIVALENT EVAPORATION - DRY STEAM - FROM AND AT 212° PER POUND OF COMBUSTIBLE	9.10
<b>AVERAGE PRESSURES</b>		<b>EFFICIENCY</b>	
STEAM PRESSURE BY GAUGE	162.2	CALORIFIC VALUE OF ONE POUND OF DRY COAL	14182
BAROMETER 28.83 INCHES OF Hg - 4910	14.1	CALORIFIC VALUE OF ONE POUND OF COMBUSTIBLE	15140
DRAFT AT BOILER DAMPER		EFFICIENCY OF BOILER-FURNACE AND GRATE	57.6
DRAFT OVER FIRE		EFFICIENCY OF BOILER AND FURNACE	58.3
AIR PRESSURE UNDER FIRE		<b>PROXIMATE ANALYSIS OF COAL</b>	
DRAFT AT ENTRANCE TO ECONOMIZER		MOISTURE	FIXED CARBON
DRAFT AT BASE OF STACK	1.09		VOLATILE MATTER
<b>AVERAGE TEMPERATURES</b>			ASH
EXTERNAL AIR	26.5	5.20	6.35
BOILER ROOM	64.7	SULPHUR - DETERMINED SEPARATELY	
STEAM		<b>COMBUSTIBLE IN ASH</b>	
FEED WATER ENTERING ECONOMIZER	142.4	PERCENT COMBUSTIBLE IN ASH	26.90
FEED WATER ENTERING BOILER	216.1	TOTAL WEIGHT OF COMBUSTIBLE IN ASH	3590
FLUE GASES LEAVING BOILER - Average	700.0	<b>FLUE GAS ANALYSIS</b>	
FLUE GASES AT BASE OF STACK ?	419.0	CO <sub>2</sub>	O
<b>TOTAL QUANTITIES</b>		CO	HYDROGEN AND HYDROCARBONS
WEIGHT OF COAL AS FIRED	188514	N	
PERCENT MOISTURE IN COAL	5.2	S.- 10.4	
TOTAL WEIGHT OF DRY COAL	178712	<b>REMARKS</b>	
TOTAL WEIGHT OF ASH AND REFUSE	13342	CO <sub>2</sub> Entrance to No.1 Economizer-7.5% Lbs. Rock stamped per lb. coal fired-35.9 Stamping Rate per 24 hrs. per head-601 Ton 6 Heads operated for total of 135 Hr. 1 Min 2.01% dry coal- combustible in ash	
TOTAL COMBUSTIBLE CONSUMED	165370		
PERCENT ASH AND REFUSE IN DRY COAL	7.46		
TOTAL WEIGHT OF WATER FED TO BOILER	1465661		
TOTAL WEIGHT OF WATER CORRECTED FOR MOISTURE IN STEAM	1442943		
FACTOR OF EVAPORATION	1.0427		
TOTAL EVAPORATION FROM AND AT 212°	1504556		
<b>HOURLY QUANTITIES</b>			
DRY COAL CONSUMED PER HOUR	7440	42° Feed Water	
DRY COAL CONSUMED PER SQUARE FOOT OF GRATE SURFACE PER HOUR		<b>ENGINEER IN CHARGE OF TEST</b>	
WATER EVAPORATED PER HOUR	60122		
EQUIVALENT EVAPORATION PER HOUR FROM AND AT 212°	62689		