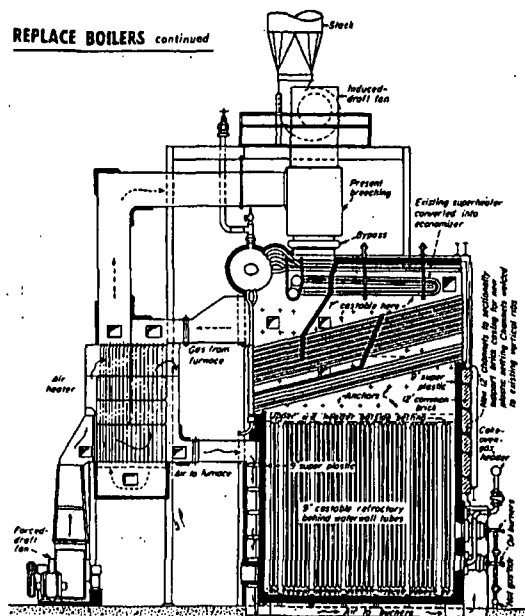
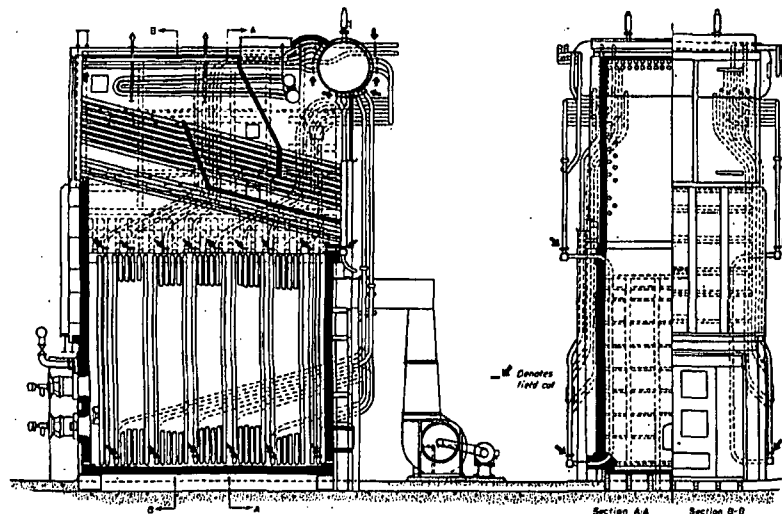


REPLACE BOILERS *continued*



FINAL ARRANGEMENT of rebuilt sectional-header boiler. Redesigned unit now operates at 150 psig, uses former superheater as economizer, has air heater



FIELD CUTS on straight-tube boiler were made for easy shipping and reassembly. Engineers moved sectional headers and connected tubes as units, cut waterwalls through the headers to meet railway clearances. This saved re-erection time.

IX, ASME Power Boiler Code, made all field welds on pressure parts.

Redesign. Meanwhile, engineers at White's Denver office were redesigning the unit, adapting it to the services required. Because of the boiler height, they had to raise four bays of the existing East Mill plant. They designed and detailed foundations and structural steel alterations; CF&I shops gave priority to the fabrication.

The original, suspended tile setting could not be salvaged, nor could new tile shapes be used because of delivery requirements. So White designed a completely new setting, arranged for air-cooled rear wall and floor instead of the original air-cooled side walls. The new setting, which uses plastic and castable refractories, is designed for full suspension. Where needed, new channels and angles were welded to the boiler structure for the suspension anchors and clips. This design permits replacing any section without disturbing the sections above.

Original design of rebuilt boiler was for 450 psig, 650 F. East Mill generates steam at 150 psig, saturated. By analyzing the tube surface and baffling, the engineers found that changing the gas path and using the superheater surface

Table I: Progress on Dismantling, Moving, Re-erecting the Boiler

Subsidiary unit located, examined; insurance company's inspection completed	Jan 7	Pressure parts completed and tested, baffles and plastic refractory setting started
Contract awarded. Construction equipment leaves Denver for Coffeyville, Kan.	Jan 31	Power piping started
Dismantling started at Sinclair Refinery, Coffeyville	Feb 13	Insulation started on drum, ducts and breeching
Plastic refractory-setting design completed, engineering design on boiler burners and fans completed, fans located and purchased, miscellaneous boiler trim and fittings purchased	Feb 19	Refractory setting completed, drying-out started
Dismantling completed and last of five railroad cars shipped	Mar 3	Unit cut into full service. Complete except for insulation
Induced-draft fan received on job	Mar 7	Platforms, walkways, building alterations completed
Instrument and control piping started	Mar 8	Final adjustment of combustion control completed
	Apr 3	Insulation finished on boiler, auxiliaries and plant piping
	Note	During above operations, CF&I removed three condemned Stirling boilers

as an economizer would develop desired capacity with proper auxiliaries. They left the surface in its original location in the hot pass (about 1500 F) between the first and second boiler passes, but tilted it to provide drainage. This design has performed outstandingly well, with no evidence of steam binding. In the boiler-circulation system. See Table II for performance figures.

Burners. Coke gas, natural gas and fuel-oil are used at East Mill. Original burners in the replacement unit could not burn these fuels satisfactorily. So a combination natural-gas, coke-gas and fuel-oil burners, together with new windboxes and structural front, were installed. (Photo, p 81)

Draft equipment was inadequate to handle the volumes necessary for the

required capacity. White personnel located, in Baltimore, Md., an unused induced-draft fan with correct characteristics. They moved a temporary forced-draft fan from idle mill equipment. This has now been replaced with another in conjunction with a Riley Stoker Corp air heater to increase the unit's efficiency and capacity until the additional 100,000 lb-per-hr boiler is ready for service. Table III summarizes auxiliary equipment.

Construction went on without incident, and the boiler cut into the plant system on March 5, 1952, 17 weeks after date of contract. This period included time for complete dismantling and transporting to Pueblo, Colo., some 500 miles from Coffeyville, Kan. Unit has carried over 100,000 lb per hr on both

natural and coke-oven gas. It was shut down and inspected during the recent steel strikes. Pressure parts and refractories have been troublefree.

Conventional boiler design would normally provide at least 25% more surface to develop capacity shown in Table II. This more efficient use of surface is largely due to the economizer being in the 1500-F zone, with consequent high temperature difference and improved heat transfer.

This installation shows what can be accomplished with idle equipment, in an emergency. The new boilers, ordered in November 1951, could not be scheduled for delivery until October and December 1952, many months after March 5, when the rebuilt unit was cut into full service for the first time.

Table II: Performance of Rebuilt Unit

	Without air heater at two capacities (Observed)	With future air heater (Predicted)
Actual evaporation, lb/hr	30,000	100,000
Temp. gas to economizer (approx), F	—	1500
Temp. water entering economizer, F	198	199
Temp. water leaving economizer, F	253	272
Gas to boiler exit gas, %	9.4	10.4
Temp. boiler exit gas, F	380	376
Temp. air-heater exit gas, F	—	400
Temp. ambient air, F	83	83
Temp. air leaving air heater, F	—	335
Draft loss through boiler, in.	0.00	0.98
Draft loss through air heater, in.	—	1.90
Draft loss through breeching, in.	0.00	0.40
Furnace draft, in.	0.17	0.32
Section of induced-draft fan, in.	0.17	1.70
Air press. loss through air bte, in.	—	2.50
Air press. loss through ducts, in.	0.10	0.90
Air press. in windbox, in.	0.00	3.60
Static press. at f-d fan, in.	0.10	4.50
Furnace heat release/hr, Btu/cu ft	—	25,000
Overall efficiency, %	85.6	73.9
Heat rate, Btu/cu ft	—	82.3

Note: Unit is rebuilt Walsh-Waldner sectional header boiler with waterwalls, Foster-Wheeler extended surface economizer, and future Riley Stoker air heater. Saturated steam temperature is 360 to 378 F, operating pressure 150 to 175 psig, feedwater temperature 199 F. Fuel is natural gas at 985 Btu per cu ft.

Table III: Equipment Description

Boiler	Walsh-Waldner sectional header 525 psig
Surfaces, sq ft	
Boiler	6150
Waterwall	1280
Economizer (tubular)	630
Total	8060
(Table II data based on this total)	
Air heater, sq ft now being installed	9480
Furnace volume, cu ft	5570
Setting	A F Green East-Set side walls, Super-Plastic front and rear walls. Fully suspended setting designed by J F White Engrg Corp
Burners	Peabody Engrg Corp. Type A-20 forced-draft burners with coke-oven gas ring; center-fired natural-gas gun and steam-atomizing oil burners
f-d fan	Buffalo Forge Co. No. 84 SCLD induced-draft fan direct-connected to 1200-rpm 75-hp motor
F-d fan	Buffalo Forge Co. No. 8 SCLD forced-draft fan, belt-driven from 900-rpm 75-hp motor