W. E. Williams

[illegible] by F.W. Schroe[illegible]

PLASTIC and CASTABLE *Furnace Linings* for FIRE TUBE boilers

A.P. GREEN FIRE BRICK CO.

A.P. Green REFRACTORY PRODUCTS

MEXICO, MO.

Introduction

This booklet illustrates and explains facts about the application and installation of A. P. Green Plastics and Castables in Fire Tube Boiler settings. Its purpose is to present the SOUND ENGINEERING principles on which the highly successful and economical application of these materials is based.

Plastic and castable refractories were originally produced to fill a definite need for materials that would eliminate many special shaped refractory tile and also could be used for repair and maintenance work.

As improvements were made these materials far surpassed their primary purpose. A new type of refractory application was developed — COMPLETELY ENGINEERED MONOLITHIC CONSTRUCTION. It has been proved in every industry in which fire-clay refractories are used. This booklet covers the application of plastics and castables in furnace linings for Fire Tube Boilers.

The A. P. Green Fire Brick Company was a pioneer in this field. Over thirty-eight years of research, engineering and "on-the-job" service are behind A. P. Green Plastic and Castable refractories—today they are confidently accepted by industry as the "Standard of Quality".

Contents

Introduction 1
SUPER-PLASTIC 2
PLASTIC Quik-Pak 2
KAST-SET 3
KAST-O-LITE 3
Advantages 4, 5
Plastic Construction 6
Castable Construction 7
Boiler Wall Construction . . 8, 9, 10
Application of Plastics and Castables, 11, 12, 13, 14
Drawings of Typical Applications, 15, 16, 17
Two-Pass Fire Tube Boiler . . . 18
Fire-Box Type Boiler 19
Scotch Marine Boiler 20
Anchors, Brackets and Supports . 21
Blow-Off Protector Tile 22
Rear Arch Blocks 22
Observation Port 22
Typical Installation Photographs 23
Location of Warehouse Stocks . 24

Copyright 1949 by A. P. Green Fire Brick Company

A. P. GREEN FIRE BRICK COMPANY
MEXICO, MISSOURI, U. S. A.

A. P. Green PLASTIC FIREBRICK

A. P. Green Plastics are firebrick in plastic, putty-like form, shipped ready to install. Plastic refractories are used for one-piece, monolithic linings in all types of industrial furnaces. They mature with the application of heat.

One material will not meet the requirements of all conditions found in different furnace zones. A. P. Green manufactures SUPER-PLASTIC and PLASTIC Quik-Pak to meet most service conditions. All A. P. Green refractories are made from new, unused materials.



SUPER-PLASTIC

A super duty plastic firebrick produced from the finest Missouri flint fire clays. SUPER-PLASTIC is recommended where operating conditions require super duty refractory materials. It is highly refractory—gives excellent service close to its high fusion point with minimum softening or vitrification—superior in spalling resistance and load-bearing strength at high temperatures.

A. P. Green SUPER-PLASTIC gives excellent service in monolithic linings for boiler settings and in most industrial furnaces. Burner openings, door arches, piers, large sprung arches, suspended arches and other usually difficult installations are easily constructed with SUPER-PLASTIC. It is ideal for maintenance and repair work in high temperature zones.



PLASTIC QUIK-PAK

A high heat duty fire-clay refractory in plastic form. It is made from high quality Missouri fire clays. PLASTIC Quik-Pak has all the desirable features of a high heat duty brick *plus* the many working advantages of a plastic refractory. It combines the refractoriness, low shrinkage and hot load bearing strength of high heat duty firebrick with increased spalling resistance.

PLASTIC Quik-Pak is recommended for complete furnace linings and general maintenance work wherever service conditions specify a high heat duty refractory material.

PACKAGING – Both SUPER-PLASTIC and PLASTIC Quik-Pak are packed in 100-pound cartons. For export shipments special packing is available. The plasticity of the material is retained by a moistureproof inner wrapping. The plastic in the carton is pre-sliced for easy installation.

A. P. Green CASTABLE REFRACTORIES



KAST-SET®

A high quality castable refractory material packed dry for "on-the-job" mixing. KAST-SET was specially developed for monolithic wall construction and "job-poured" special shapes. It is quick setting and can be put into service within 12 to 24 hours after pouring. A minimum of 6 hours may be allowed under special conditions. KAST-SET has hydraulic-setting properties—matures without applying heat—shows no service shrinkage. It is suitable for use at temperatures up to 2750°F. (1510°C.).

RECOMMENDED USES . . . . . .

Stoker hearths • burner blocks • door linings • boiler baffles • upper walls of boilers • complete linings for small fire-box type boilers • cinder hoppers • ash pit linings • top decks • rear arches • dead plates • smoke box throat linings • breeching and stack linings.

KAST-SET is packed in 25, 50 and 100-pound waterproofed bags, suitable for both export and domestic shipments.



KAST-O-LITE®

A hydraulic-setting castable refractory combining insulating properties with light weight and strength in one dependable, easy-to-use refractory. The use of KAST-O-LITE where recommended reduces heat transfer and keeps heat loss at a minimum. It is packed dry for "on-the-job" mixing.

KAST-O-LITE provides lightweight monolithic refractory linings. Special shapes can be molded quickly and easily. It withstands continued direct exposure to flame and gases up to 2500°F. The insulating value of 9 inches of KAST-O-LITE is equal to that of 27 inches of heavy firebrick.

® Trade-Mark Registered U. S. Pat. Off.

RECOMMENDED USES . . . . . .

Breechings • flue and stack linings • convection sections of boilers • door linings cinder hoppers • sub-hearth insulation • high temperature back-up insulation dampers and tube decks • and complete linings for many types of industrial furnaces.

KAST-O-LITE is packed in 50 and 100 pound waterproofed bags.

ADVANTAGES of A. P. GREEN *Plastic* an

1 MONOLITHIC CONSTRUCTION

Monolithic or "one-piece" refractory furnace lining, properly installed, gives better combustion efficiency and longer, more trouble-free service life than any other type of lining. Due to the higher operating efficiency of the furnace and lower maintenance costs, important savings are made every year of service life.

In one-piece monolithic wall construction, the joints of brickwork are eliminated. Slagging and erosion at the brick joints expose more surface to the attack of flames and other destructive furnace elements. In plastic and castable monolithic construction only the service face is exposed.

During operation the sections of a furnace are subjected to different conditions. Each A. P. Green product has been developed to meet the service requirements of the zone for which it has been specified. A. P. Green Plastic and Castable furnace linings installed under the capable supervision of trained personnel give you the full benefit of this monolithic construction plus the additional advantages of "zone-rated" materials.

2 ANCHORED FURNACE LININGS

The monolithic wall construction recommended by the A. P. Green Company is properly anchored to the outside casing wall. The useful life and service of a refractory lining ends quickly when the side walls begin to bulge—complete failure of the lining follows. Anchored monolithic construction prevents bulging, gas leakage and air infiltration.

In sections of a furnace requiring the use of plastic firebrick, A. P. Green recommends the "floating" anchor construction which holds the plastic securely against the casing wall. A. P. Green anchors prevent bulging, but permit free expansion and contraction movement. Developed to withstand severe operating conditions, A. P. Green Plastics are usually installed in areas of highest temperatures.

A. P. Green castable refractories are ideally suited to carry out monolithic construction in the upper walls or convection sections of boiler furnaces and to meet specific service and installation requirements in other parts of the boiler setting. A. P. Green's KAST-SET is a material of hydraulic-setting properties requiring no heat for maturing. As this material is easily poured into simple forms, difficult furnace lining construction problems are quickly solved. Securely anchored to the outside casing wall, KAST-SET gives a smooth, unbroken surface necessary for maximum results. In monolithic construction there are no joints or openings for destructive furnace elements to

Castable CONSTRUCTION

begin their attack on the furnace lining. Efficient and economical operation of the furnace demands that the upper or convection section be completely sealed against gas leakage and air infiltration. A. P. Green KAST-SET does this job.

3 SECTIONALLY SUPPORTED

The high load bearing strength of A. P. Green Plastics makes sectional supports unnecessary in the average boiler setting. However, high temperature alloy supporting plates are available for use in extremely high walls, over stoker arches and burner walls or where their use may be advisable due to a specific condition. Use of supporting plates permits replacement of any section without disturbing the adjacent areas.

4 LOWER INSTALLATION COSTS

In plastic and castable construction special shapes are eliminated—production and shipping delays are avoided. These materials can be installed where other products may be difficult to handle—expensive, time-consuming brick cutting is not necessary. With proper supervision, the installation of plastic and castable furnace linings can be done by average labor. These advantages make A. P. Green monolithic installations more economical.

5 EXPERIENCED DISTRIBUTORS— QUALITY WORKMANSHIP

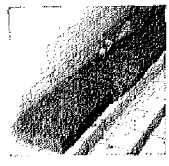
Having an organization trained in refractory problems close to your job is one of the extra values you get in contacting your near-by A. P. Green Distributor. Located in major industrial centers (see inside back cover for location), authorized Distributors have the training and experience to give you the kind of quality workmanship that your refractory job demands.

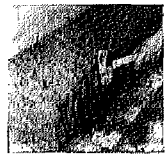
Behind A. P. Green Distributors is the engineering staff of the Green organization — engineers qualified in every phase of combustion, ceramic and mechanical engineering. This advisory service is available to all Distributors.

A. P. Green — THE NAME IN

Plastic CONSTRUCTION . . . HOW IT IS DONE







Plastics are Ready to Use

A. P. Green plastic refractories are shipped ready to pound in place — six 2" x 8" x 13" slices to each 100-pound carton. A. P. Green Plastics are of proper consistency for easy installation with either pneumatic rammers or hand hammers.

How Plastic Linings are Installed

Plastic linings are installed directly against backing or casing walls. The installation of the plastic refractory wall is begun with a layer of slices laid flat and pounded into place. Successive layers of plastic are built up in the same manner. Anchors are put in their proper place as the wall is built up. Trimming to finish thickness is done as the wall progresses. As soon as the wall is completed it is scraped to roughen the surface to aid in proper drying during the burning-in period.

Expansion and Contraction Allowances

Furnace walls expand and contract in service. This movement is both vertical and horizontal. To obtain maximum service from a plastic lining—or any refractory lining—expansion joints and anchors must be provided.

Expansion joints are placed in all corners and contraction cuts are made at proper intervals. The corner expansion joints are packed with resilient high temperature insulating material. *In addition to the major corner expansion* joints there are others that must be provided to take care of expansion of the bridge wall, boiler drum, floor and other areas.

Anchors

A. P. Green "floating" anchors are installed in specified locations. These anchors are attached to metal clips or refractory "boxes" in the backing wall. *A. P. Green anchor design* permits free wall movement, both horizontal and vertical, yet provides positive anchorage to prevent bulging.

Use of Forms

Forms are not required for installation of plastic walls. Simple wood forms of the desired contour may be used to form plastic sprung or suspended arches, door arches and burner openings. The form is removed after the plastic is installed.

Quantities Required

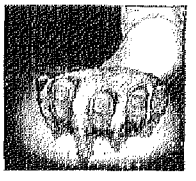
For purposes of estimating proper quantities, one square foot of 9-inch thick wall requires approximately 100 pounds of plastic—one cubic foot requires 133 pounds of plastic.

Castable CONSTRUCTION . . . HOW IT IS DONE

A. P. Green Castables—KAST-SET and KAST-O-LITE—are dry, grain-sized refractory materials. When mixed with water a hydraulic bond is formed and the castable hardens into a solid refractory unit. Refractoriness, light weight and high strength are features of A. P. Green Castables. In addition, KAST-O-LITE possesses insulating properties.

Mixing Castables

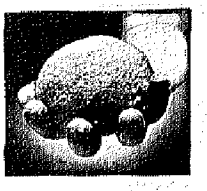
As segregation of material may have occurred in shipment or storage, castables should be thoroughly dry-mixed in a clean mortar box or mechanical mixer before water is added. When only part of a bag is to be used, dry-mix the entire contents of the bag and return the excess material to the bag for storage. Clear water should be added only in the quantities directed on the bag. Illustrated below is a consistency test made by "bouncing" the castable material in the hand.



TOO WET



TOO DRY



JUST RIGHT

Material Required

To pour one cubic foot of castable in place, use:

KAST-SET—110 pounds of dry material

KAST-O-LITE—78 pounds of dry material

Use of Castable in Wall Sections

A. P. Green KAST-SET or KAST-O-LITE should be poured and tamped between wood forms and the backing wall. Formwork is similar to that used to pour construction concrete. Specially designed A. P. Green anchors are installed between the backing wall and the castable lining.

Use of KAST-SET in Hearths, Door Linings and Dead Plates

For these jobs KAST-SET can be poured directly in place. Normally no formwork or anchorage is necessary. Although not required in Fire Tube Boilers, leakproof monolithic baffles are easily poured with A. P. Green Castables. In some furnaces castables are used to form the complete lining.

Plastic and *Castable* application to BOILER WALL CONSTRUCTION

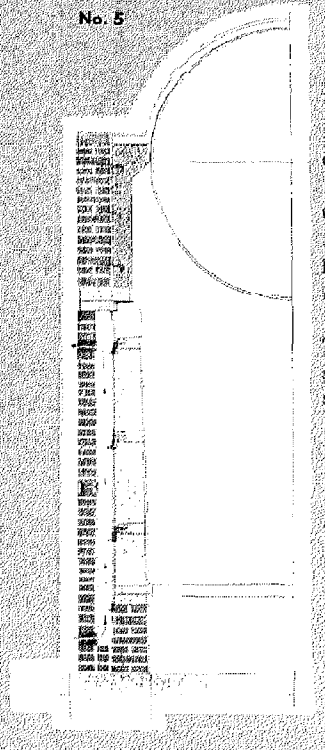


Refractory plastics and castables are adaptable to a variety of furnace casing arrangements. Illustrated here are some of the more commonly used types of casings with A. P. Green monolithic linings.

Three basic factors are important in obtaining high operating furnace efficiency with low maintenance cost: (1) properly engineered design of the complete setting, (2) careful construction of the setting under qualified supervision, (3) properly selected high quality refractories to meet service conditions. A. P. Green Distributors can assist you in planning a new setting, or revamping and making repairs to your present installation.

The legend at the left identifies the materials employed in the typical boiler walls illustrated on these pages.

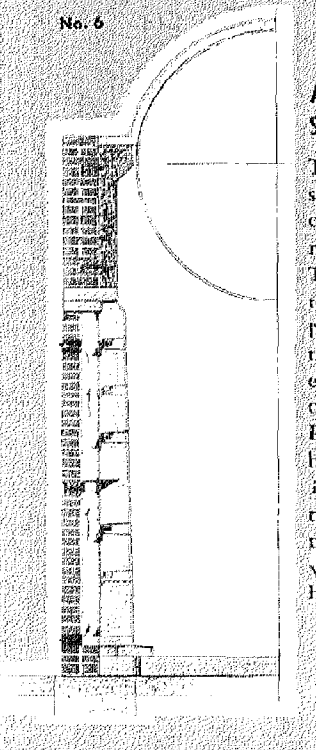
No. 5



AIR-COOLED WALL

A. P. Green's standard air-cooled wall is recommended for extremely severe conditions. Heated air discharged from the air lanes may be exhausted to the atmosphere or reclaimed, depending on the type of firing arrangement. This is a pre-engineered design providing an air-cooled structural steel supporting frame for both the refractory lining and the furnace casing. All "floating" anchor attachments are secured to the steel. The castable upper wall section provides an airtight and gastight wall that seldom requires air-cooling.

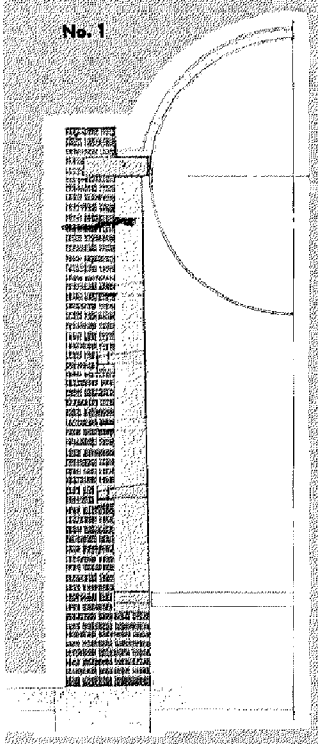
No. 6



AIR-COOLED SECTIONALLY SUPPORTED WALL

This is basically the same sectionally supported air-cooled wall as used to encase many large steam generators. The horizontal rows of high temperature alloy supporting plates support the upper section of the wall. This permits easy replacement of any part of the wall area. Because A. P. Green plastic refractories have excellent hot load bearing characteristics, this sectionally supported construction is only recommended when the walls are of unusual height.

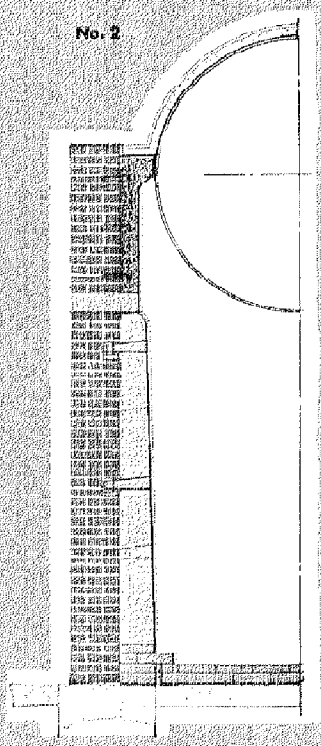
No. 1



COMPLETE PLASTIC WALL

This type of wall is commonly identified as solid wall construction. The plastic lining is secured to brick casing wall with A. P. Green patented refractory and metal anchors, allowing free movement of the plastic wall. The plastic wall may be installed plumb or tapered as illustrated. A special corbel tile seal arrangement is used as a wall cap closure at the boiler drum to obtain a leakproof seal at the expansion joint between the corbel tile and the top of the plastic wall.

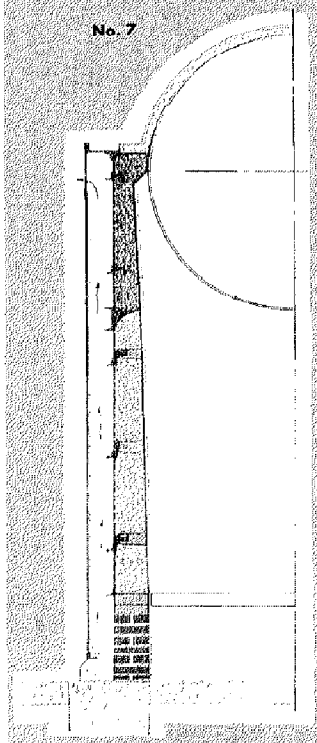
No. 2



COMBINATION PLASTIC AND CASTABLE WALL

This wall has all the advantages of monolithic construction in addition to providing support for the castable refractories in the upper section of the walls. When necessary, repairs can be made to the entire lower section of the wall without disturbing the upper wall lining. Castable refractory construction forms an airtight and gastight closure at the top of the wall.

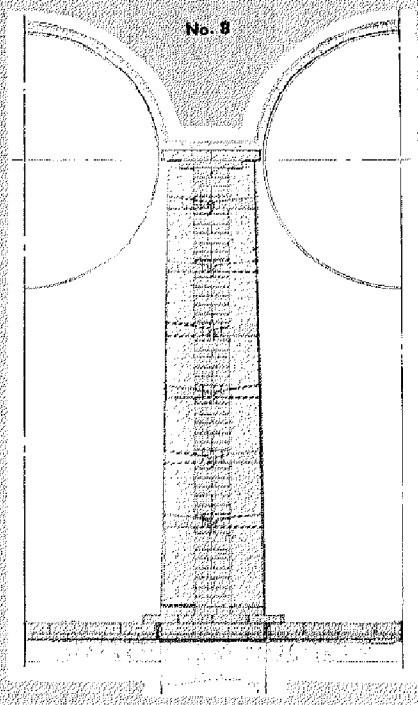
No. 7



STEEL CASED AIR-COOLED WALL

This is a panel type pre-engineered, pre-fabricated, steel cased air-cooled wall. Either a complete plastic refractory lining or a combination plastic castable lining can be adapted to this modern setting arrangement. Cooling air may be reclaimed or discharged to the atmosphere. This air-cooled panel casing has the same features as the STEEL CASED panel type solid setting.

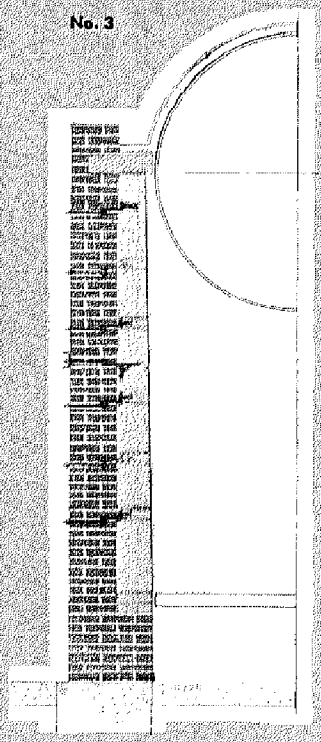
No. 8



SOLID BATTERY WALL

For the average solid batte
wall construction, A. P. Gre
recommends this arrang
ment. It is a solid core of fi
quality firebrick faced wi
plastic monolithic walls a
anchored with all refracto
"floating" anchors. This co
struction eliminates the use
common brick. When co
mon brick are used for t
core of a battery wall, t
build-up of high temperatu
resulting from heat penet
tion from both wall fac
soon causes disintegratic
Refractory anchors only a
recommended for the sol
battery wall construction.

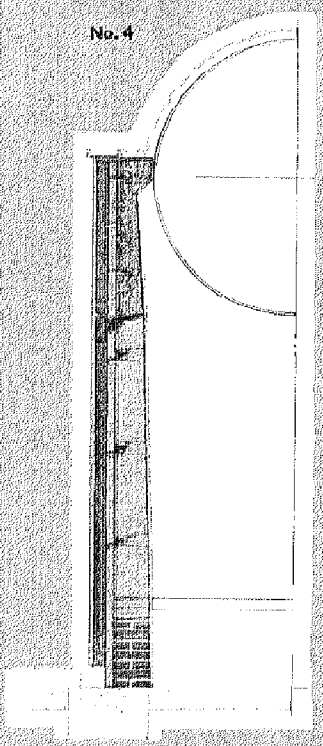
No. 3



SECTIONALLY SUPPORTED WALL

Sectionally supported plastic wall construction consists of the plastic monolithic lining supported by rows of high temperature alloy supporting plates. Used primarily for larger settings, this is identical to the supported wall construction successfully used for unusually high walls of large steam generators.

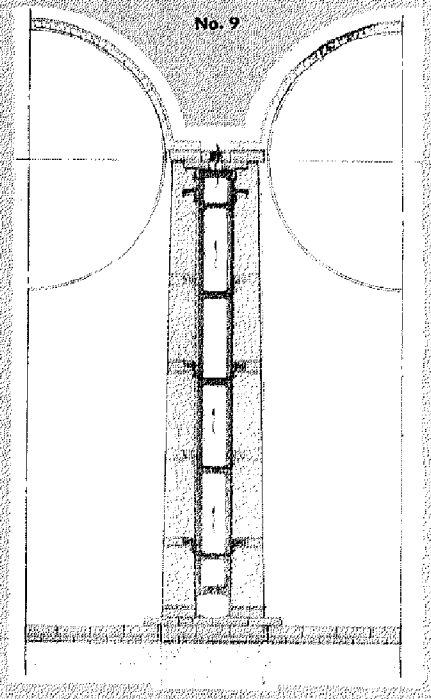
No. 4



STEEL CASED WALL

Steel cased, insulated, monolithic setting. This popular setting has met wide acceptance because of its many outstanding advantages. It is more than a metal box around a setting. It is a pre-engineered and pre-fabricated casing arrangement adaptable to existing or new boiler units and can be constructed faster than other types of settings. The monolithic refractory lining is backed up with high temperature block insulation. This construction has higher thermal efficiency than normally obtained with ordinary brick cased settings — resulting in important fuel savings.

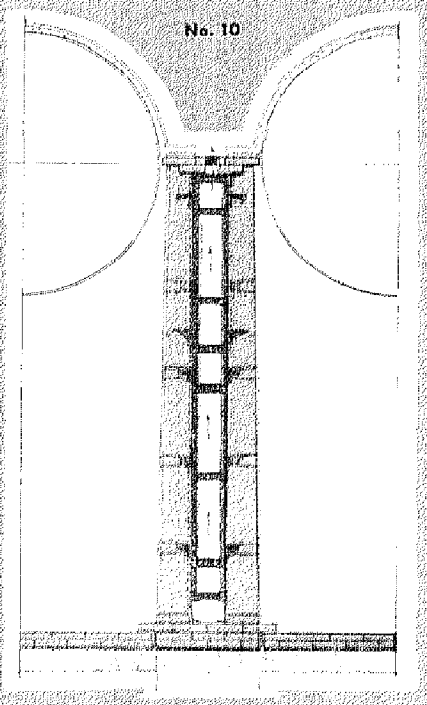
No. 9



AIR-COOLED BATTERY WALL

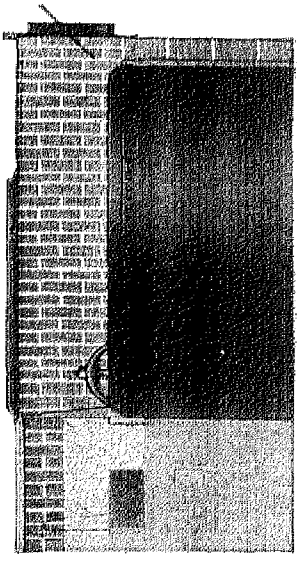
The air-cooled core of the battery wall eliminates excessive maintenance cost that may be experienced with solid battery wall construction. This simple but sound arrangement permits air flow in any direction, is adaptable to either existing or new construction. The warm air discharged from the wall may be reclaimed or discharged to the atmosphere.

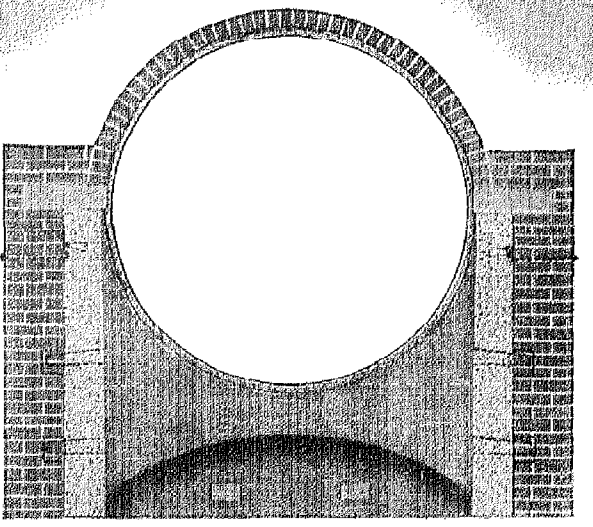
No. 10



AIR-COOLED SECTIONALLY SUPPORTED BATTERY WALL

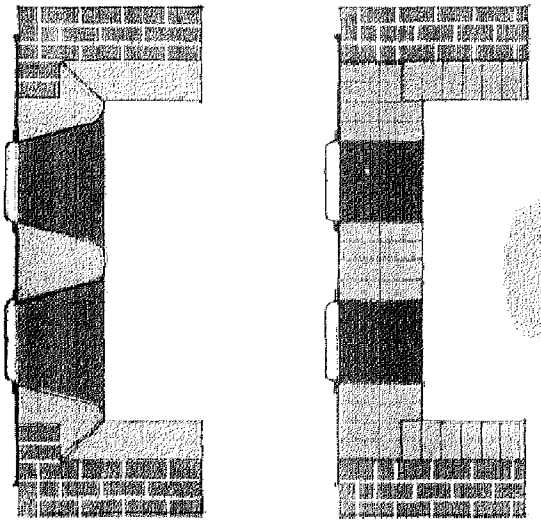
The air-cooled core o
the battery wall incorpo
rating high temperatur
alloy sectional support
ing plates is basically th
same as the regular air
cooled core wall arrange
ment shown at the left
Cooling air may be di
rected horizontally o
vertically and reclaime
if desired. Sectional sup
ports are more commonly
used for larger type
settings operated at high
ratings.



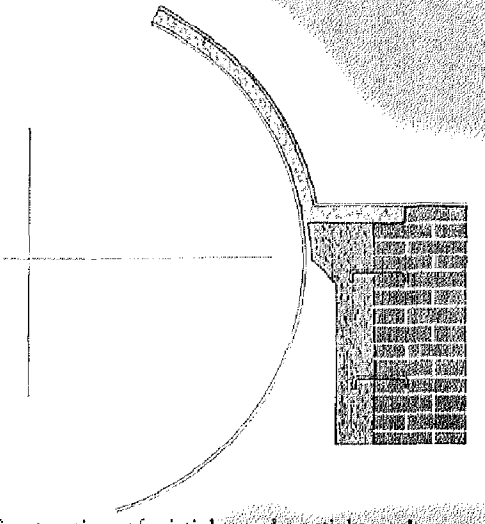


The important plastic front arch protects the dry sheet and front head seam from damage due to overheating. In brick construction the front head seam is protected by corbeling out from the front wall. This arrangement makes the front arch a part of the front wall. In service, expansion and contraction of the wall causes severe strain on the corbeling and eventually results in cracking and failure of the arch. When this type arch needs repair, it is necessary to rework the entire front wall.

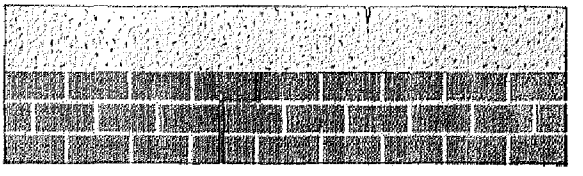
A. P. Green plastic front arch is an independent structure—no added weight is placed on the front wall. As this arch is self supporting, there are no expansion and contraction troubles. The solid, one-piece plastic arch illustrated is not affected by any movement of the front wall.



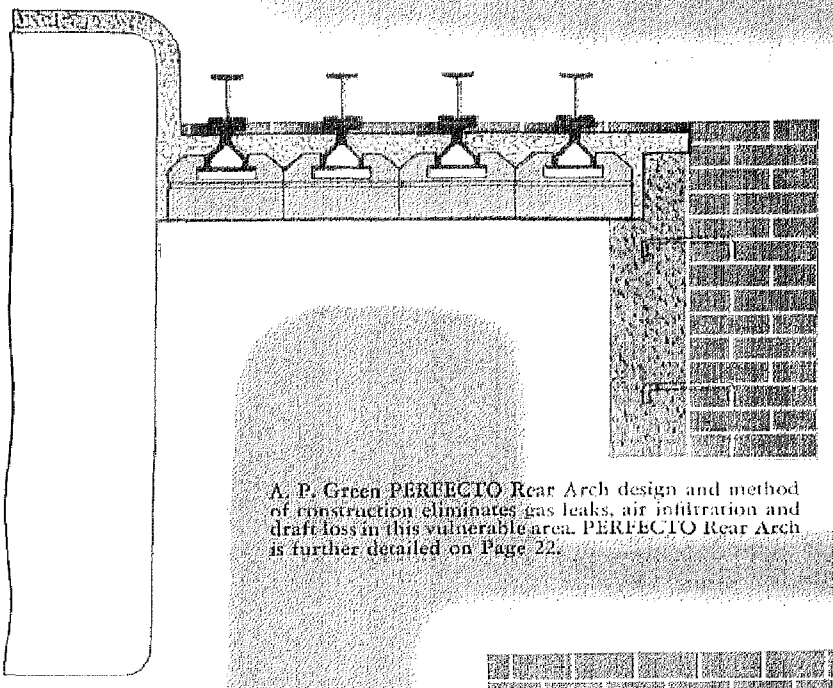
A. P. Green Plastics permit forming of tapered and flared door arches and jambs. This construction reduces mechanical abrasion caused when firing tools hit and catch on arches and jambs; permits more even distribution of fuel on grate; allows use of entire grate area with no dead spots in the corners; increases resistance to thermal shock caused by the inrush of cold air when firing doors are open. Plastic jambs and arches do not spall or break off under the strain of unequal expansion. With tight plastic construction, reflected heat and hot gases cannot damage metal front plates.



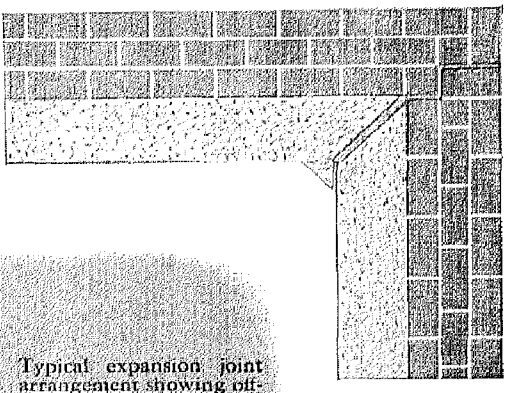
Construction of airtight and gastight seal where castable upper wall meets boiler drum. When A. P. Green Castable Block Mix is used as a drum covering, the use of rowlock red brick is eliminated.



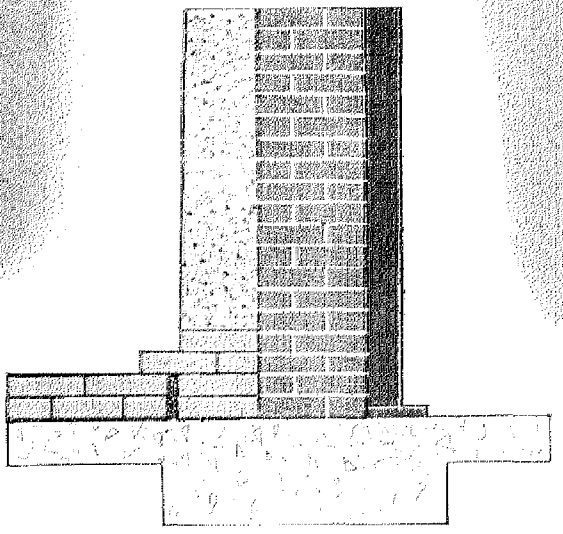
Offset expansion joint in casing wall and contraction cut in the plastic lining. Contraction cut in face of plastic wall develops desirable offset contraction joint through entire wall thickness.



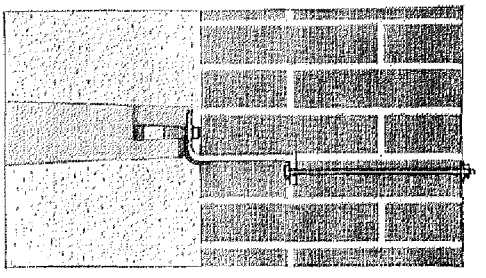
A. P. Green PERFECTO Rear Arch design and method of construction eliminates gas leaks, air infiltration and draft loss in this vulnerable area. PERFECTO Rear Arch is further detailed on Page 22.



Typical expansion joint arrangement showing offset construction in casing wall and diagonal expansion joint in plastic lining. All expansion joints are packed with high temperature insulation. Plastic fillets protect the insulation.

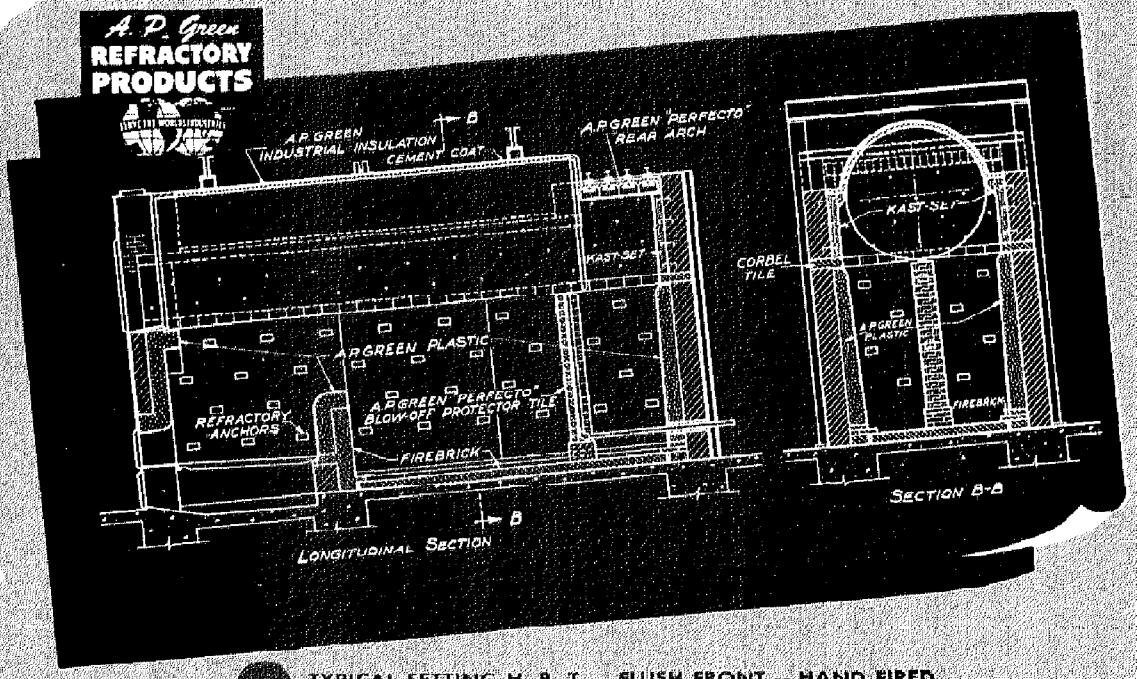


Floor expansion joint and floor seal construction forming plastic wall foundation. This construction provides excellent heat seal and prevents bulging and thrust of floor due to expansion at base of wall.

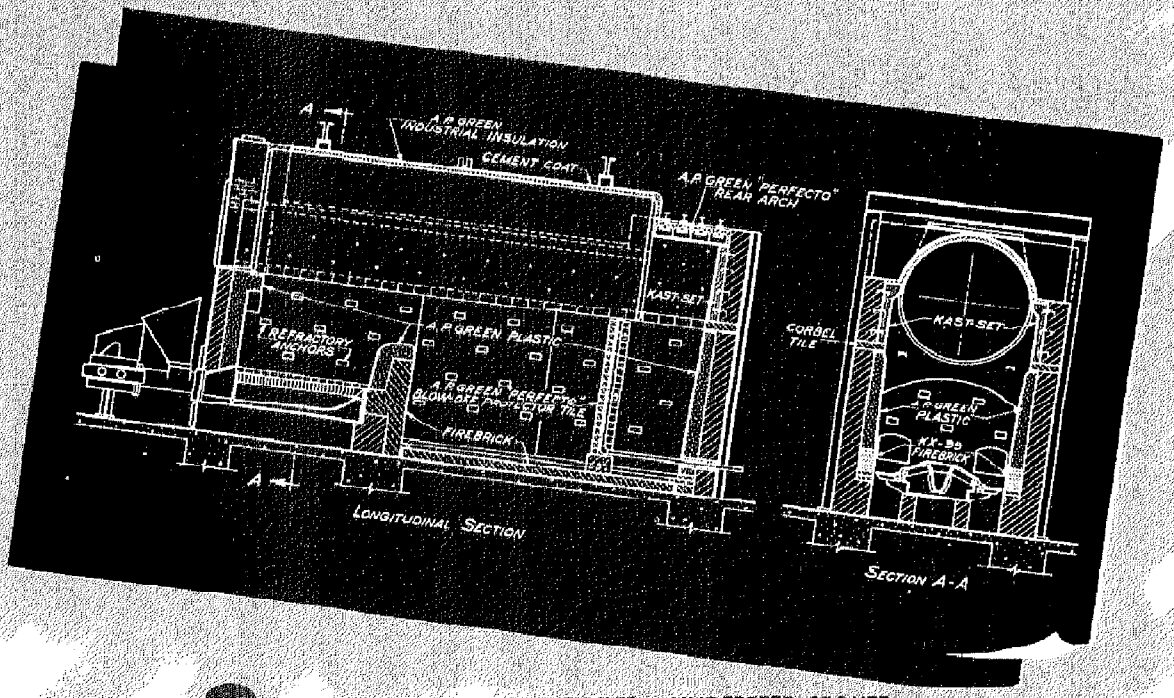


The A. P. Green "floating" anchor holds the plastic lining tightly against the outer wall—BULGING IS STOPPED. The refractory anchor extends through the entire lining thickness and is secured to the backing wall by an alloy clip (or refractory box) which allows both vertical and horizontal movement of the anchor and the lining.

Typical Applicat

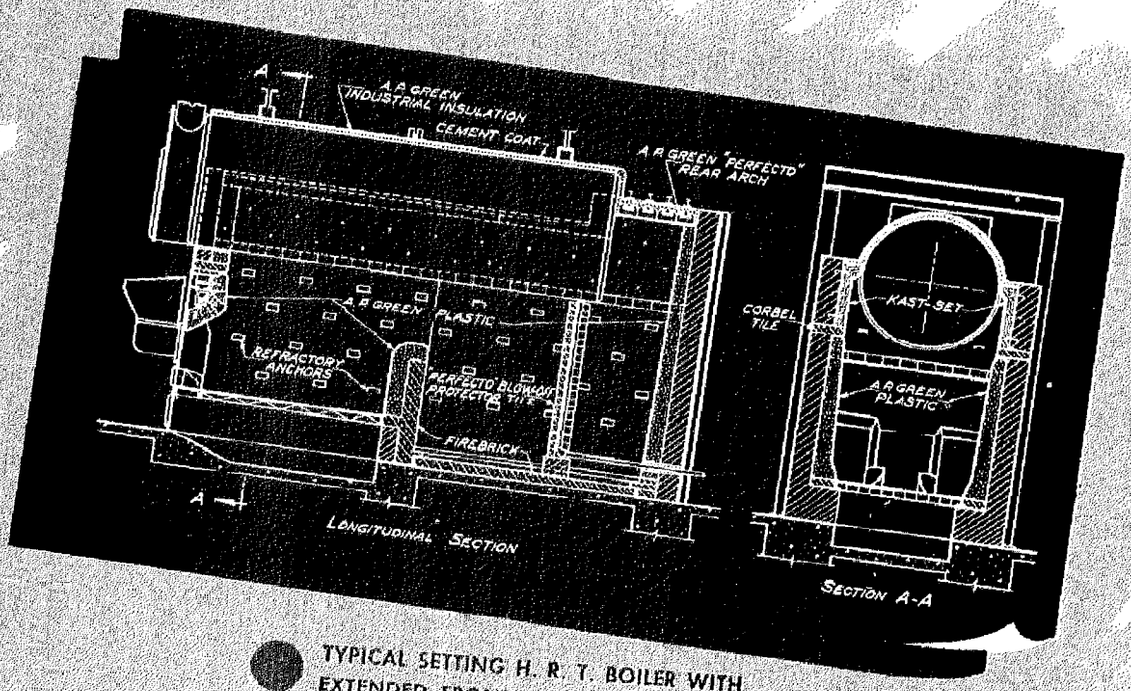


TYPICAL SETTING H. R. T. — FLUSH FRONT — HAND FIRED

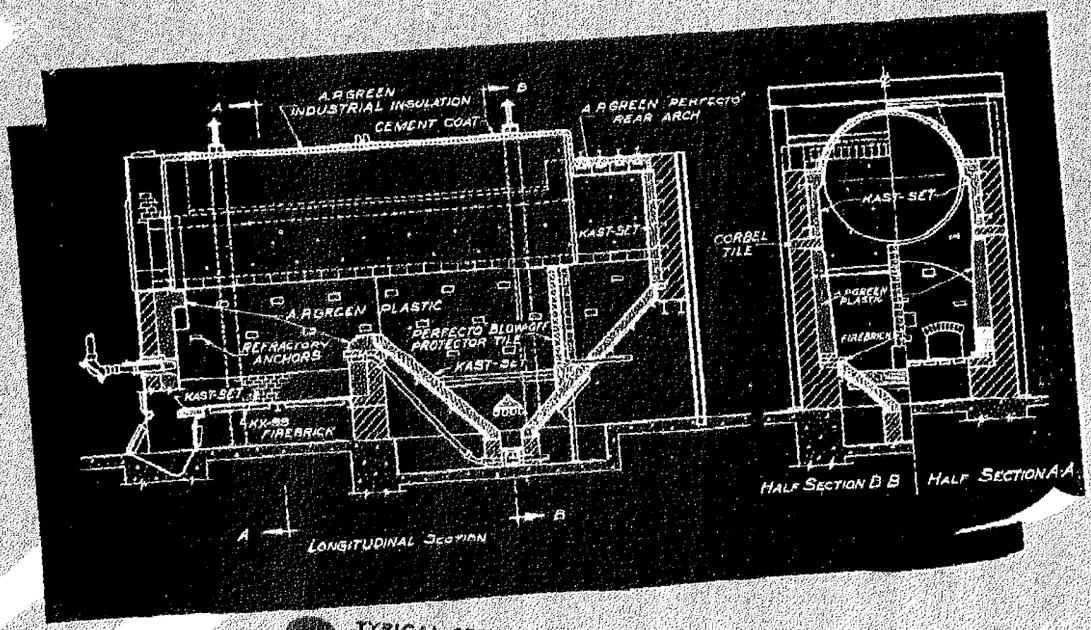


TYPICAL SETTING H. R. T. BOILER — UNDERFEED STOKER

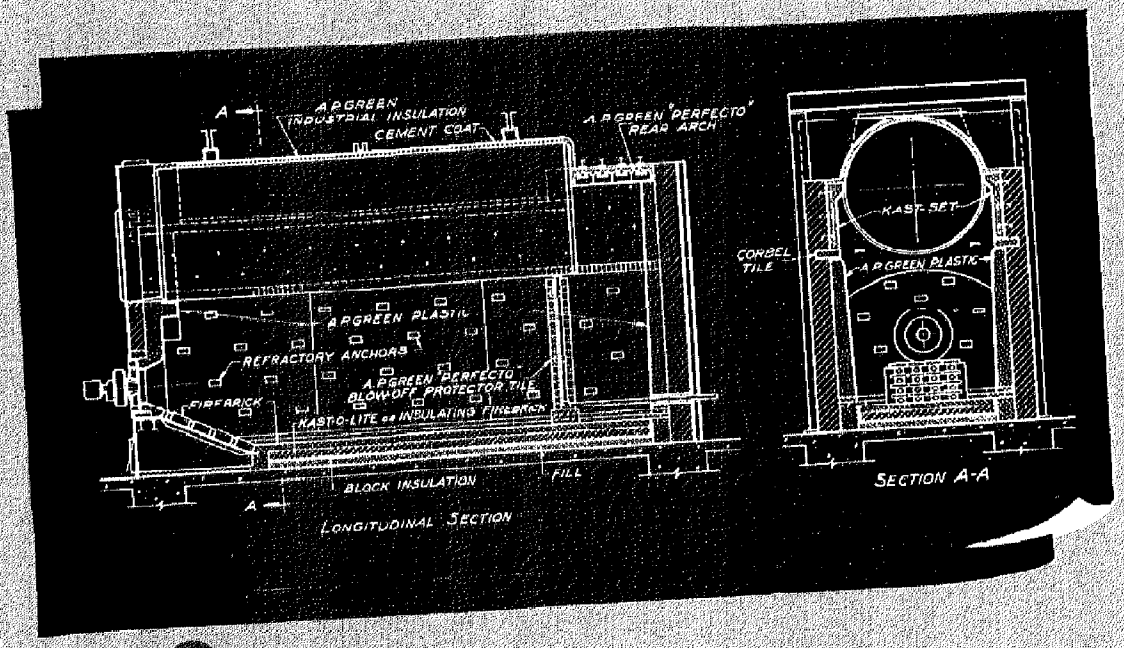
ns to H. R. T. Settings . . .



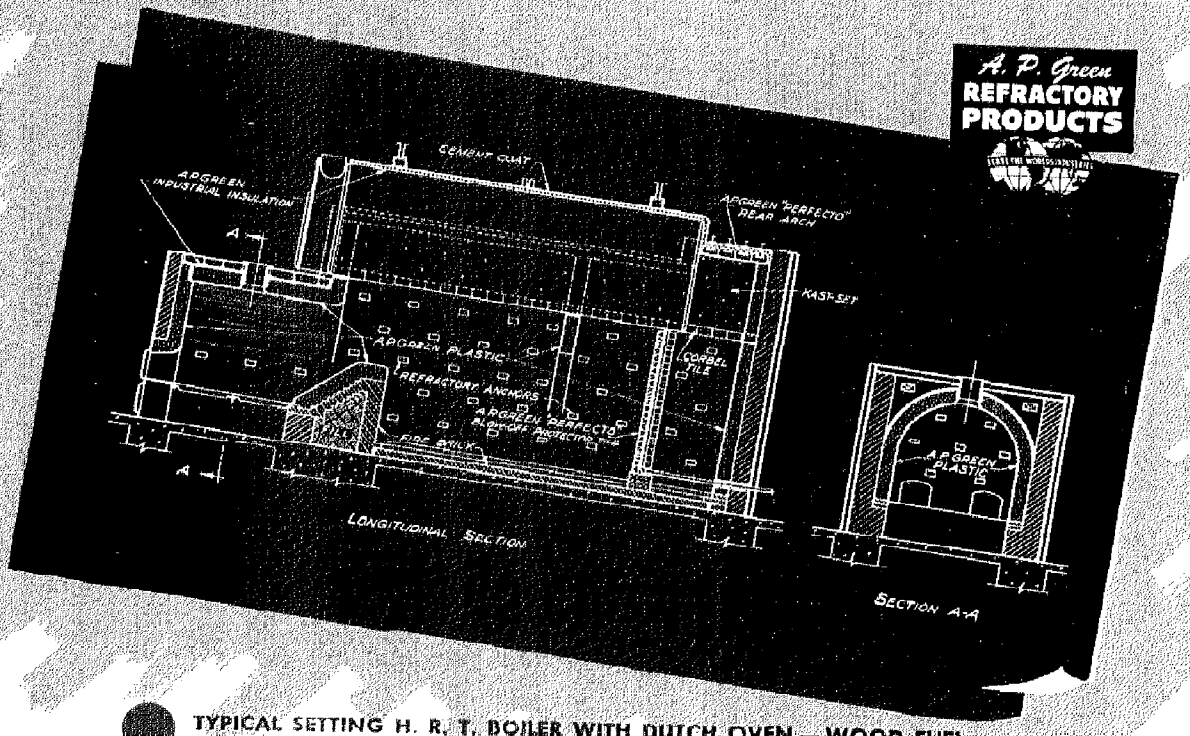
TYPICAL SETTING H. R. T. BOILER WITH EXTENDED FRONT — SPREADER STOKER



TYPICAL SETTING H. R. T. BOILER WITH FLUSH FRONT — PNEUMATIC TYPE SPREADER STOKER

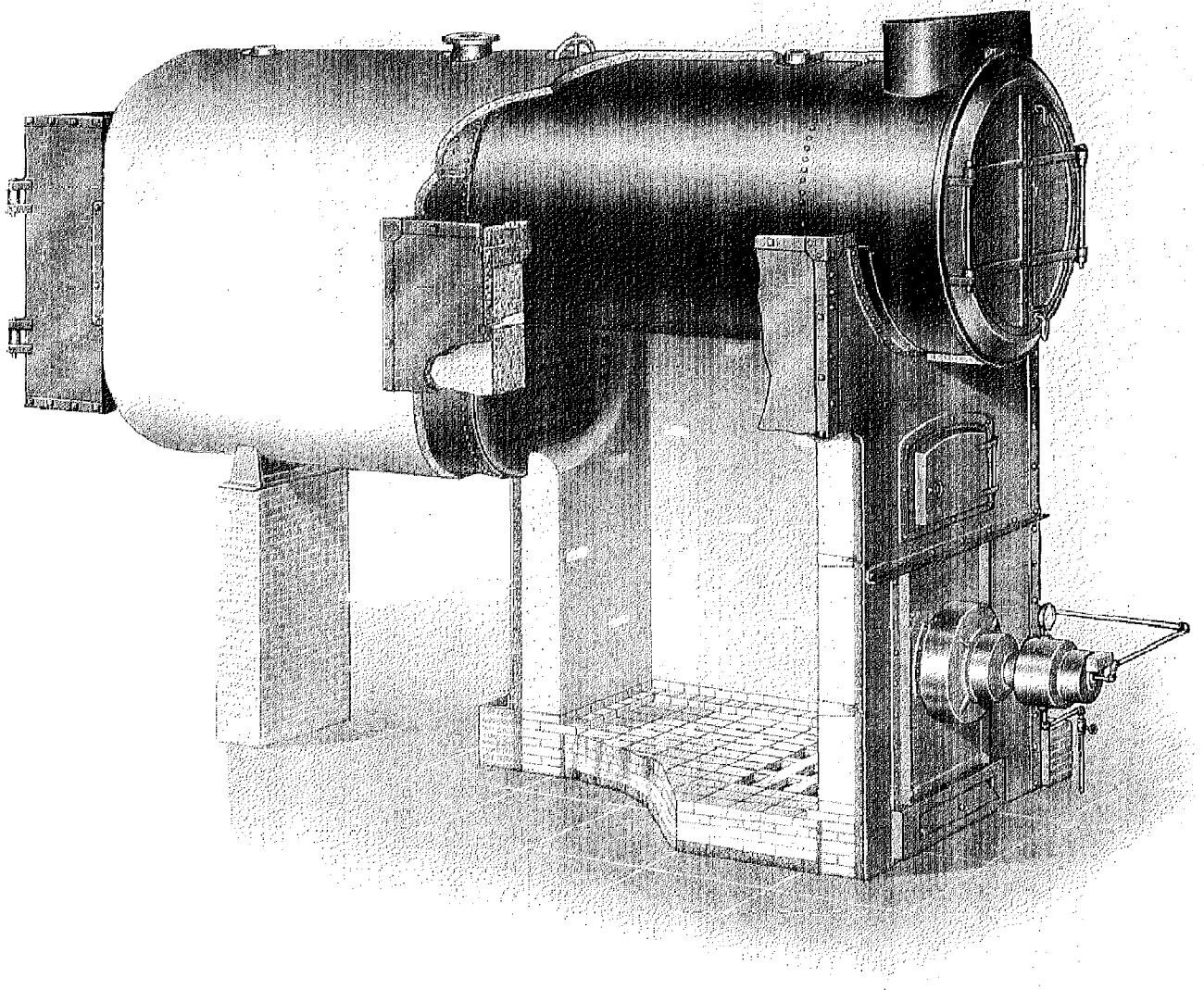


TYPICAL SETTING H. R. T. BOILER WITH FLUSH FRONT — OIL FIRED



TYPICAL SETTING H. R. T. BOILER WITH DUTCH OVEN — WOOD FUEL

two-pass boiler



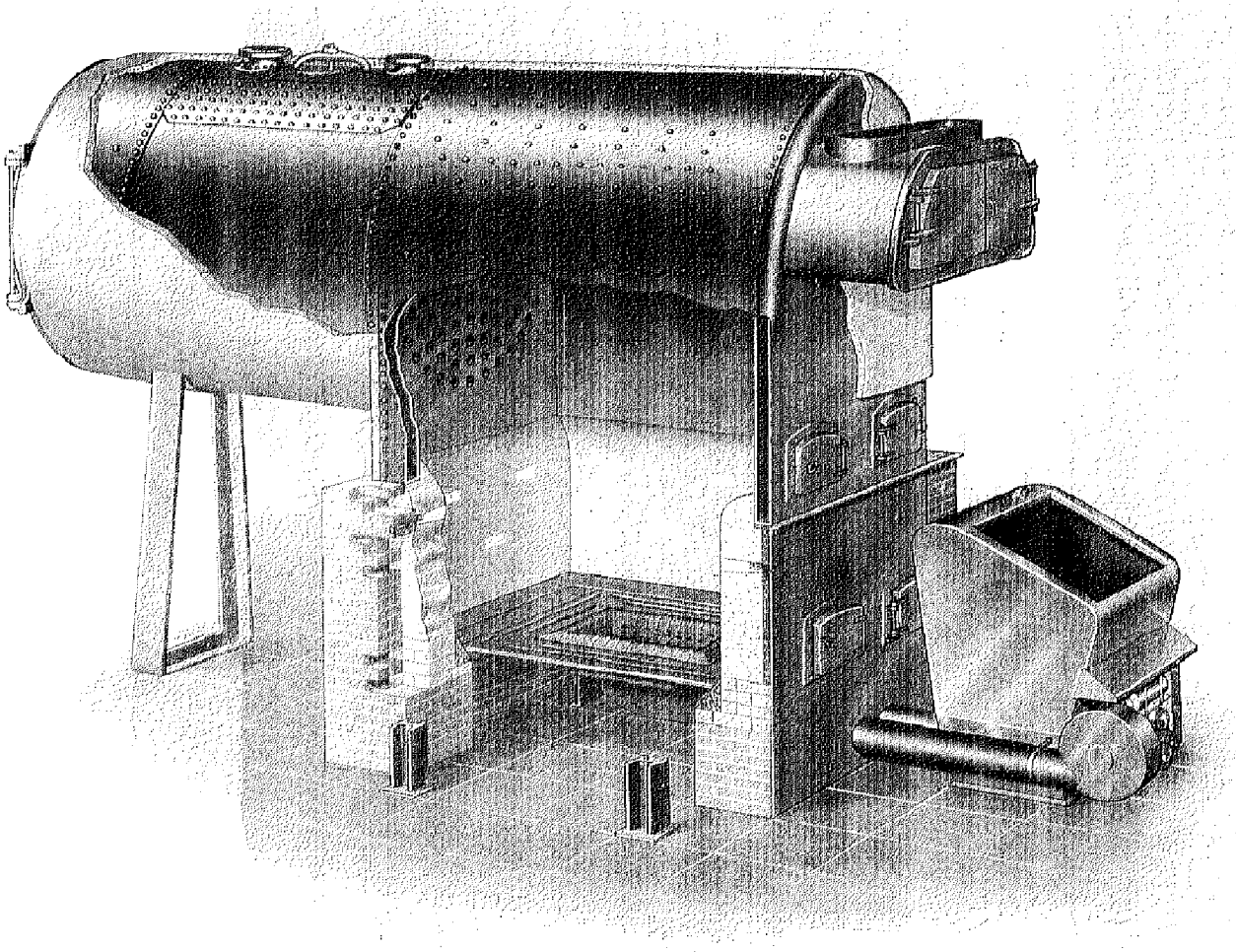
An A. P. Green complete monolithic plastic lining is highly recommended for two-pass fire tube boiler settings when installed as the original lining or as replacement for firebrick or special shaped refractory tile linings.

Joint-free except for the important expansion joints located in the corners where walls meet, this setting provides an airtight, securely anchored unit that resists flame impingement and gives greatly increased service life.

Burner openings may be constructed as an integral part of the lining—special shapes are eliminated.

Easily and quickly installed—"down time" is reduced to a minimum.

fire-box boiler

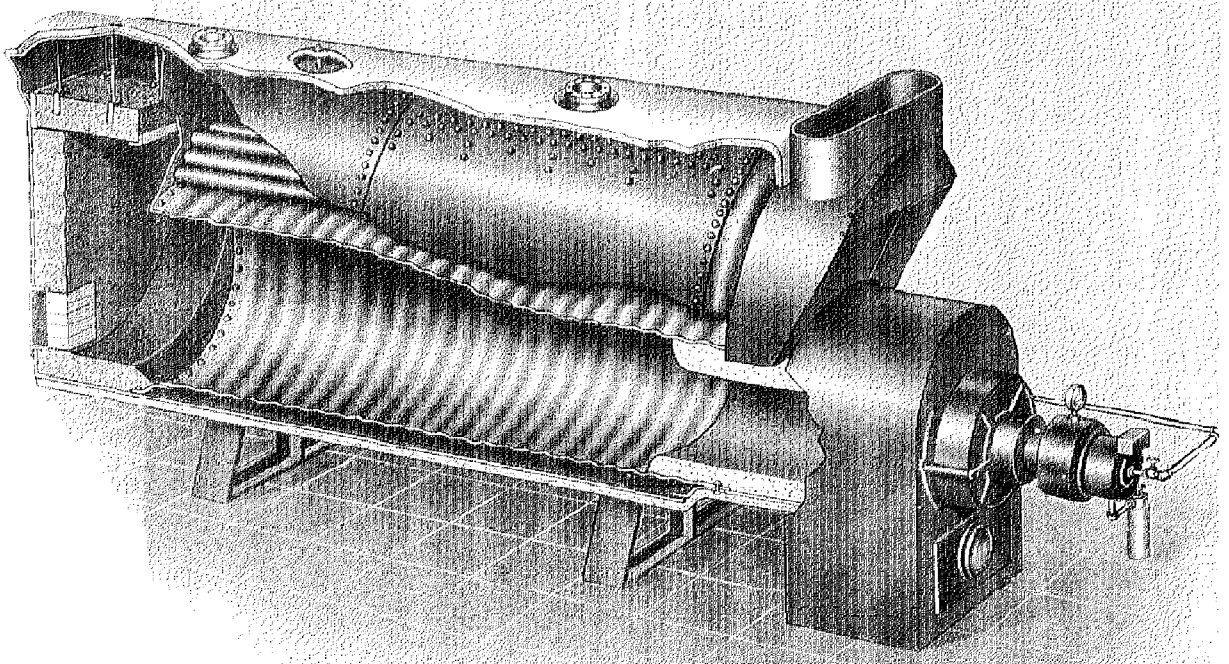


A. P. Green plastic refractory linings are used extensively for lining fire-box boilers regardless of size or method of firing. Two means of support may be employed when setting fire-box boilers — supporting columns for high set, larger units and a common brick base for low set, smaller units. This common brick base in smaller units also serves as backing for the refractory lining.

"Floating" anchored construction stabilizes the refractory lining in larger units with high walls. In smaller units "floating" anchored construction is preferred because it eliminates the difficulty of tying the solid header construction of a firebrick lining to the common brick base.

Changes in furnace construction are easily and economically made with A. P. Green plastic refractories when adapting mechanical firing equipment to existing settings.

scotch marine boiler



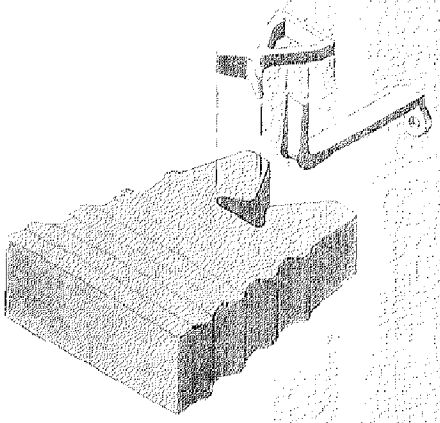
A. P. Green plastic refractories are ideally suited for lining the extended firing chamber of Scotch Marine Boilers.

The monolithic lining eliminates brick joints and is adaptable to any size unit—no special shapes are required for burner openings.

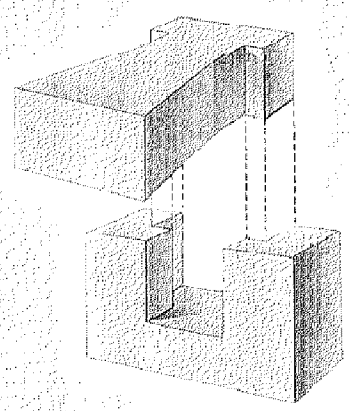
KAST-O-LITE forms an excellent lining for the rear combustion chamber walls and for the rear arch. KAST-O-LITE is a lightweight monolithic refractory having high insulating qualities.

A.P.Green — THE NAME IN

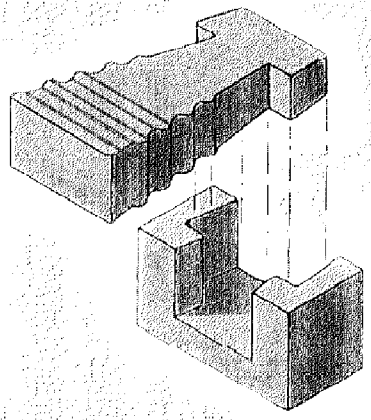
A. P. Green "FLOATING" ANCHORS, BRACKETS AND SUPPORTS



660—Refractory anchor universally used for anchoring plastic walls to either brick or steel cased settings. Equipped with high temperature alloy or gray iron attachment clips.



S-1114-A&B—All-refractory anchor used in castable section of H. R. T. Battery Walls or with plastic linings not exceeding 5½" in thickness.



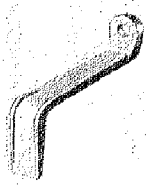
S-540-A&B—All-refractory anchor for use in standard plastic wall construction for linings up to 9" in thickness, including solid battery wall construction.



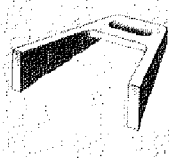
CL—Gray Iron Clip used with #660 anchors in lower temperature zones. For higher temperature zones the XL Alloy Clip is recommended.



HTC—Alloy Clip generally used in connection with steel encased settings where plastic lining is backed up with insulation.



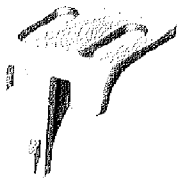
AC & AC-72 — Alloy attachment clip used in combination with #660 refractory anchor. AC-72 Gray Iron Clips of same design used in lower temperature zones.



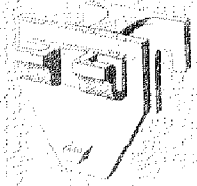
HTA & S-238 — "A" type anchor used as alternate in combination with refractory anchors or for special thin wall construction, also employed in flat suspended arch construction.



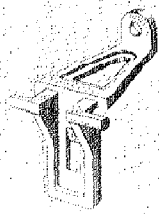
S-239-A—Gray Iron Anchor Clip installed with holding bolt through either brick or steel casing.



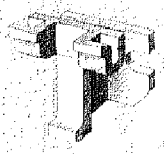
SP—High temperature alloy plate used to sectionally support plastic walls.



AIB—Air Lane Brackets to support SP plates for air-cooled wall construction.



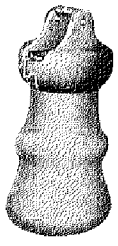
WB — Alloy Bracket to support SP plates on brick outer walls.



APG-4 — Supporting Bracket for SP plates where 2" of insulation is required.



APG-5 — Flush Mounting Bracket for attachment of SP Supporting Plate.



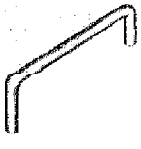
2966 & TC-2 — Refractory Anchor and Casting for flat suspended plastic arch construction.



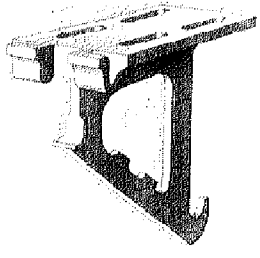
PH-2—Curtain wall support for use with flat suspended plastic arch construction.



PH-1 — Castings to support anchors suspended from pipes in flat suspended arch construction.

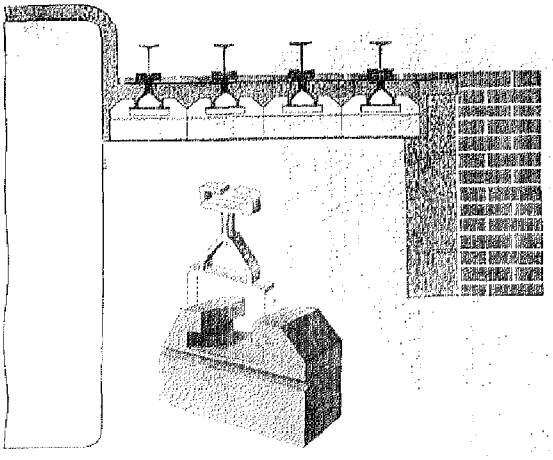


Metal rod anchor for castable refractory construction.



AB—Arch Bracket used for suspending anchors in "spreader stoker arch" construction.

Perfecto REAR ARCH BLOCKS . . .



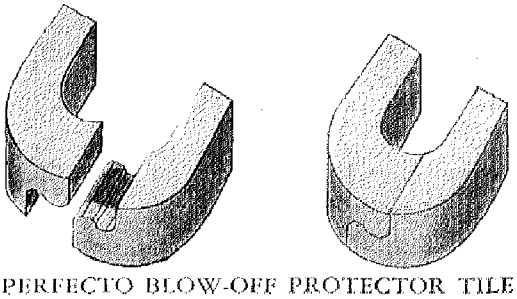
A. P. Green *PERFECTO REAR ARCH BLOCKS* provide perfect fitting, gastight rear arches for H. R. T. Boilers. Because gas leakage, air infiltration and draft loss are eliminated, more effective combustion control is attained.

PERFECTO REAR ARCH BLOCKS also eliminate thrust against the back wall since the entire weight of the arch is suspended from standard 3 or 4 inch I-beams resting on the outside wall of the installation. Cast iron clips, furnished with the blocks, are strung on the I-beam and the blocks are suspended from these clips.

Easily installed and easily removed, these blocks provide ready access to the rear end of the boiler. To remove a block just slip the supporting clip into the adjacent block and the block to be removed can easily be lifted out.

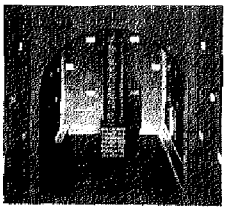
Over-all dimensions of *PERFECTO REAR ARCH BLOCKS* are 10" x 6" x 4".

Perfecto BLOW-OFF PROTECTOR TILE



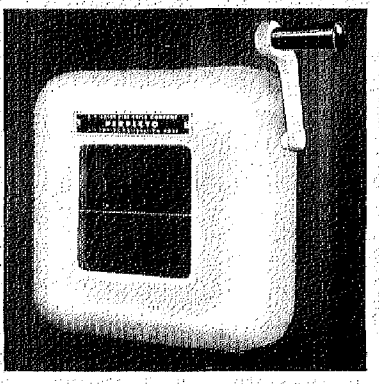
PERFECTO BLOW-OFF PROTECTOR TILE protect blow-off or blow-down pipes at the rear of horizontal return tubular boilers from flame action. Designed to encase the pipe, their use eliminates solid bulky firebrick piers. Each set consists of two standard interlocking shapes, as illustrated above. A pier of PERFECTO TILE is only 10½ inches wide.

Approved by insurance companies, they have three outstanding advantages over brick or plastic piers: (1) narrow construction permitting the free flow of hot gases, (2) as no mortar is used, removal and replacement makes boiler inspection easy, (3) lower cost.



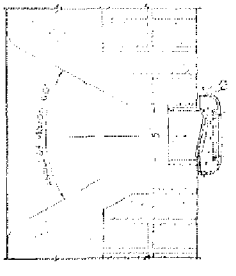
Inspection of the pipe is simplified. Repair consists merely of substituting new tile for any damaged in service.

Perfecto OBSERVATION PORT

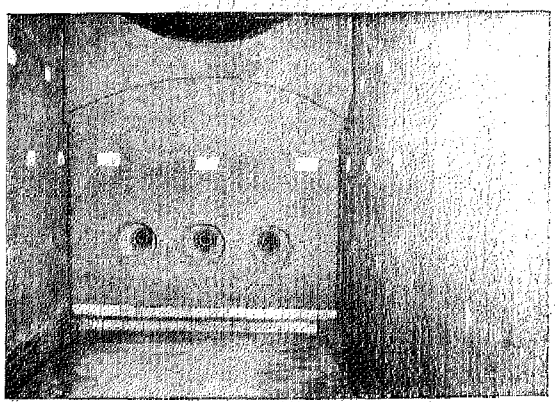


The A. P. Green OBSERVATION PORT combines four new features to achieve easier observation of interior furnace conditions during operation—air cooled, ribbed shutter, two-piece heat resistant glass window and concealed anchorage.

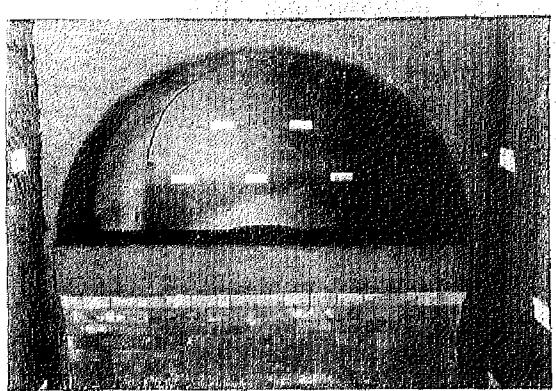
Simplicity in design makes it superior to the average furnace port. Though strong and sturdy, the PERFECTO OBSERVATION PORT weighs only 14 pounds. It has air vents at the top and bottom of the exterior cover. The ribbed shutter adds strength, reduces the possibility of warpage and channels the flow of air through the vents.



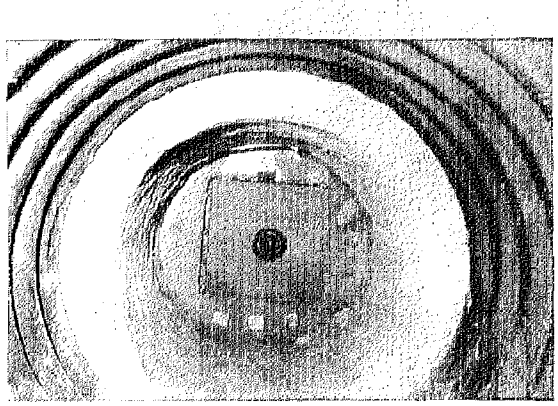
A. P. Green REFRACTORIES ON THE JOB



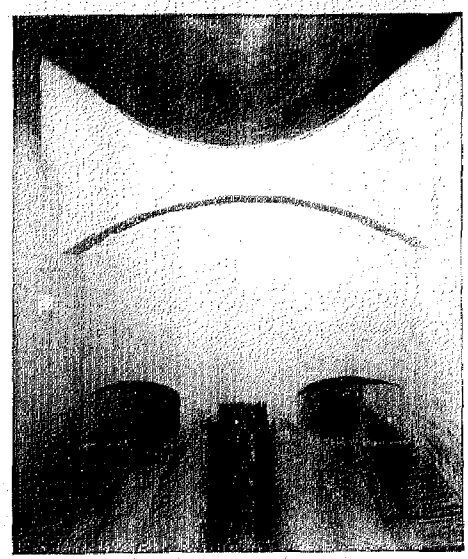
Airtight construction and low heat conductivity of A. P. Green plastic linings give increased efficiency and economy in gas-fired settings.

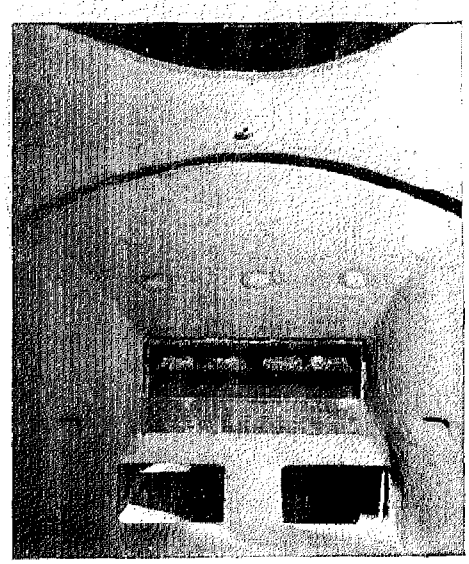


Dutch Oven of wood refuse fired H. R. T. boiler setting lined with A. P. Green SUPER-PLASTIC. Good ignition of fuel and increased efficiency due to the low heat conductivity of SUPER-PLASTIC and its resulting high reflection of heat in the burning zone makes SUPER-PLASTIC the recommended material for this service.



The above photograph illustrates the extended oil burner combustion chamber of a 200 H. P. Scotch Marine Boiler lined with A. P. Green Plastic. Plastic is easily installed to form a one piece lining of proper contour in what is normally a difficult application requiring special firebrick shapes.





A. P. Green plastic refractories are readily adaptable to settings being changed from one method of firing to another. The photographs above illustrate plastic linings adapted to different types of stoker settings. Note suspended arch construction for overfeed (spreader) stoker.

COAST-TO-COAST

WAREHOUSE STOCKS AND SERVICE AT...

ALABAMA
Birmingham
Mobile

CALIFORNIA
Los Angeles
San Francisco

COLORADO
Denver

CONNECTICUT
Bridgeport
Hartford

DISTRICT OF COLUMBIA
Washington

FLORIDA
Orlando
Tampa

GEORGIA
Atlanta

ILLINOIS
Chicago
Peoria

INDIANA
Evansville
Fort Wayne
Indianapolis

IOWA
Davenport
Des Moines
Sioux City

KENTUCKY
Louisville

LOUISIANA
New Orleans

MARYLAND
Baltimore
Hagerstown

MASSACHUSETTS
Boston (Everett)
Springfield

MICHIGAN
Detroit
Kalamazoo
Saginaw

MINNESOTA
Minneapolis

MISSISSIPPI
Jackson

MISSOURI
Kansas City
Mexico
St. Louis
Springfield

NEBRASKA
Omaha

NEW JERSEY
Kearny

NEW YORK
Albany
Brooklyn
Buffalo
New York City
Rochester
Syracuse

NORTH CAROLINA
Asheville
Charlotte
Raleigh

NORTH DAKOTA
Bismarck

OHIO
Canton
Cincinnati
Cleveland
Columbus
Toledo

OKLAHOMA
Tulsa

OREGON
Portland

PENNSYLVANIA
Erie
Harrisburg
Philadelphia
Pittsburgh
Scranton

RHODE ISLAND
Providence
(West Warwick)

SOUTH CAROLINA
Greenville

TENNESSEE
Bristol
Chattanooga
Memphis
Nashville

TEXAS
Dallas
Houston

UTAH
Salt Lake City

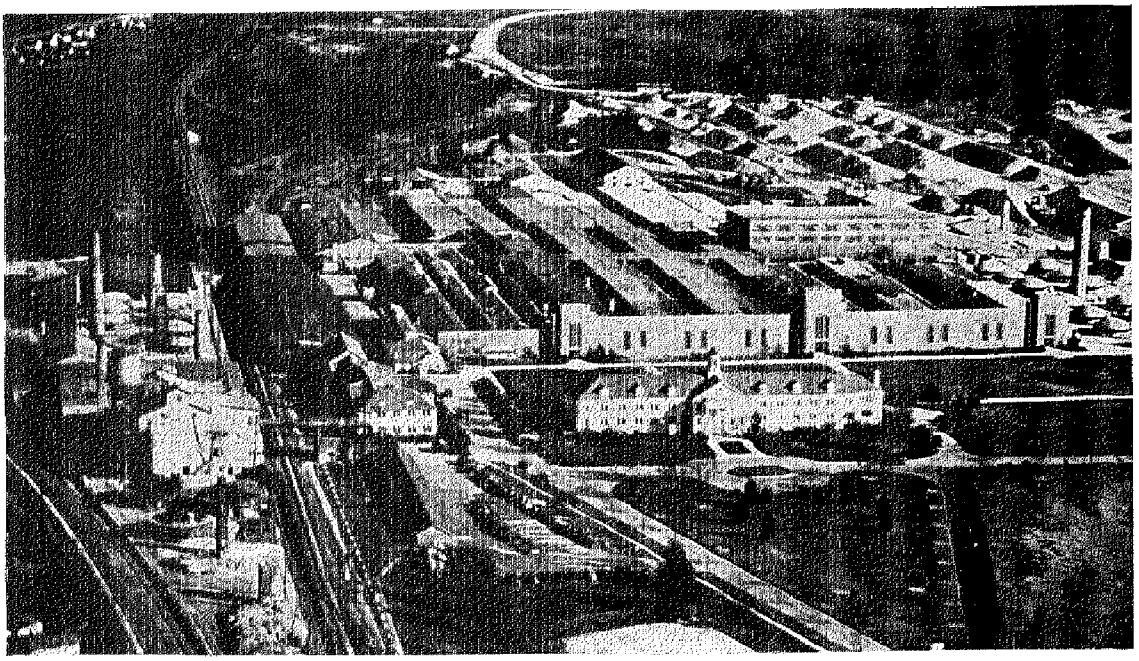
VIRGINIA
Bristol
Lynchburg
Norfolk
Richmond

WASHINGTON
Seattle
Spokane
Tacoma

WISCONSIN
Appleton
Madison
Milwaukee

Prompt **DELIVERY FROM LOCAL STOCKS**

Printed in U. S. A.



A. P. Green
REFRACTORY
PRODUCTS

THE *First* NAME IN *Refractories*