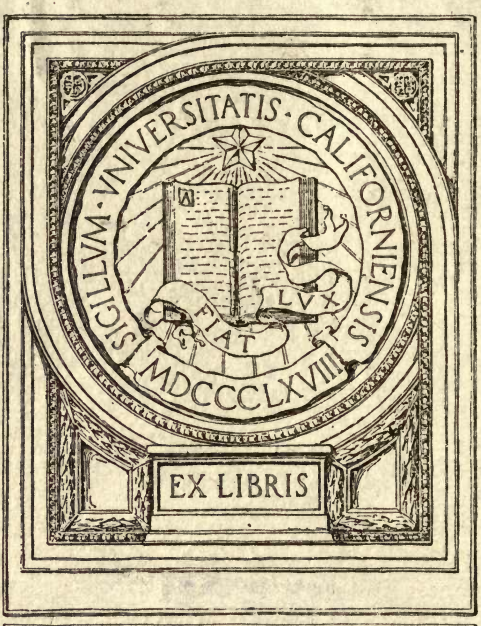
The Howe-Fuller Co.

FIRE BRICK.

CLEVELAND,
OHIO.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CATALOG

CONTAINING USEFUL INFORMATION AND TABLES APPERTAINING TO THE USE OF

FIRE BRICK

SILICA, MAGNESIA, CHROME, FIRE CLAY BRICK AND OTHER REFRACTORY MATERIALS

AS MANUFACTURED AND FURNISHED BY

The Stowe-Fuller Co.

CABLE ADDRESS:
STOWFULLER
CLEVELAND

GENERAL OFFICES
ROCKEFELLER BLDG.
CLEVELAND

PLANTS

STRASBURG, OHIO
Located on B. & O. R. R.

EMPIRE, OHIO
Located on Penna. Co. Ry.

LOCK HAVEN, PA.
Located on Penna. R. R.

ALEXANDRIA, PA.
Located on Penna. R. R.

HALDEMAN, KY.
Located on C. & O. Ry.

THE J. B. SAVAGE COMPANY.

INTRODUCTORY

In presenting this catalog to the trade, it is our purpose to make it explanatory of our full line of refractory materials, and to show a few of the various shapes which are ordinarily carried in stock at our different plants. It is also our aim to present a book which will contain information of value to the various consumers of refractories, and to prove an aid in the selection of proper materials for their particular requirements. While we have endeavored to cover the entire fire brick field, it is possible no mention has been made of brick adaptable for your needs. If so, correspondence or an interview will determine, according to circumstances, which is the most suitable brand for use. We manufacture brands suitable for every purpose where fire brick are required, and stand ready at all times to give you the benefit of knowledge gained by over thirty years' experience in the manufacture of all high grade brick.

We control a supply of the highest grade Styrian dead burned Magnesite produced in Europe.

We import direct from the Orient a Low Silica Chrome Ore which is superior to any coming to this country for Metallurgical purposes.

"When **'Quality'** is considered we are foremost in the field."

THE STOWE-FULLER CO.

INDEX

We are pioneers in the manufacture of high grade refractories, and by continually making improvements which embody features that make for greater uniformity and quality of output, and with important economies that will always permit us to meet the market price of fire brick and other refractory materials, we are prepared to figure on your requirements no matter how large or small they may be. From the raw material, which is the best obtainable, to the finishing of the product, the entire process is in the hands of trained men whose knowledge and actual experience enables us to produce the highest grade refractories.

Open Hearth Steel Furnaces.
Blast Furnaces—Hot Blast Stoves.
Puddling and Heating Furnaces.
Carbon Furnaces and Retorts.
Coke Ovens—By-Product Ovens.
Gas Producers, Gas Retorts and Settings.
Rotary Portland Cement Kilns.
Lime, Brick, Sewer-Pipe Kilns.
Copper, Nickel and Zinc Smelting Furnaces.
Soda Ash Kilns and Rotary Dryers.
Oil Furnaces and Checker Settings.
Glass House Work.
Pottery Kiln Shapes and Clays.

THE NATIONAL FIRE BRICK CO.

BRANDS

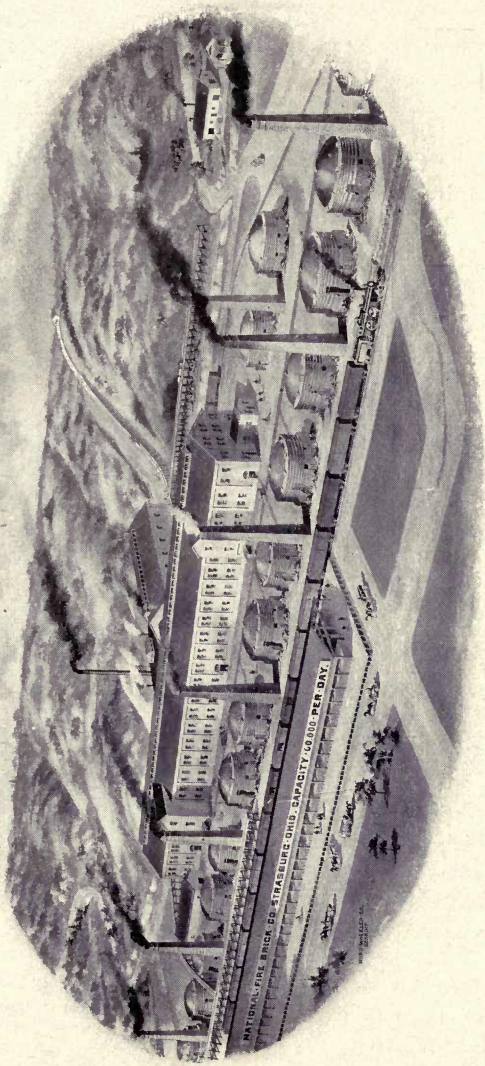
National—Standard—American—S. F. Co.

This plant is located at Strasburg, Ohio, and the company owns the largest body of flint and plastic clay in Ohio, the vein averaging from four to six feet in thickness. Analyses show the quality of these clays to compare favorably with any other clay in the country. Brick made from this clay has gained an enviable reputation all over the country. The brick are dried by our own waste heat process, thus cooling the kilns much better than by the old process. The large, modern kilns have a capacity from 90,000 to 125,000 brick each. The factory is located in close proximity to the clay mines, and the manufacture is under the careful supervision of trained and experienced men. Experts have examined the factory and pronounce it one of the most improved plants of its kind in the country.

The factory being designed with great floor and dryer capacity, the most difficult shapes in large quantities can be made up and shipped promptly.

The brands manufactured here are especially suitable for Blast Furnace Stoves, Open Hearth Checkers, or any place where brick are subjected to similar conditions.

This plant makes a specialty of Blast Furnace Stove Brick, Open Hearth Checkers and has the largest capacity in the country for that class of work.



NATIONAL PLANT

THE MINOR FIRE BRICK CO.

BRANDS
Minor—Empire

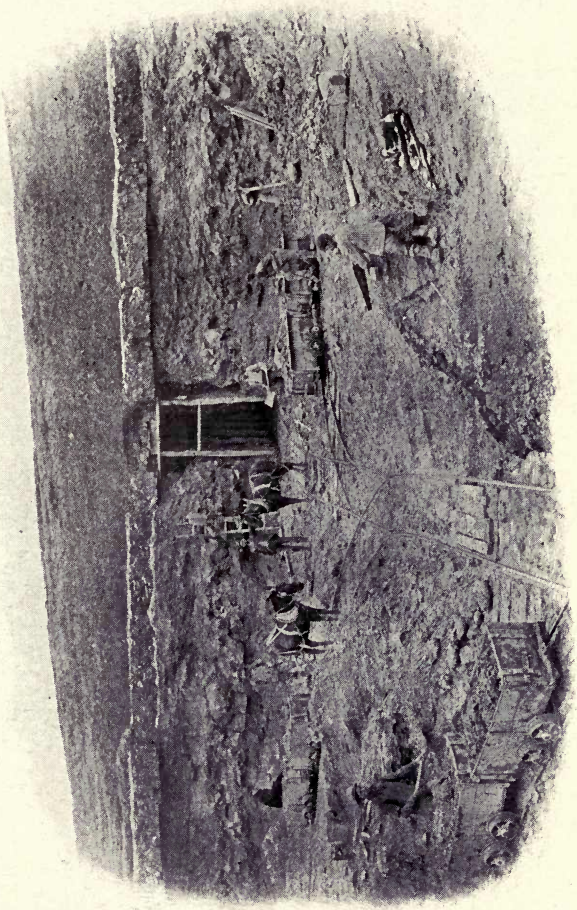
The first Minor plant was erected in 1869 at Empire, Ohio, with a capacity of 4,000 brick per day, the works enlarged and the output gradually increased and the sale of the product extended until most of the steel and iron manufacturers became acquainted with the brick and preferred them for many uses.

In January, 1900, this plant was destroyed by fire, but was rebuilt the same year on the most modern and improved plans, and today stands as a model in all that goes to make a perfect fire brick factory. The capacity of the plant is now 30,000 per day, and the brick are more perfect from standpoint of quality and workmanship than ever before.

The **"Minor"** brand have given excellent results in Boilers, Annealing Furnaces, Ladles, Hot Metal Cars, and give better service in Cupolas than any other brand on the market.

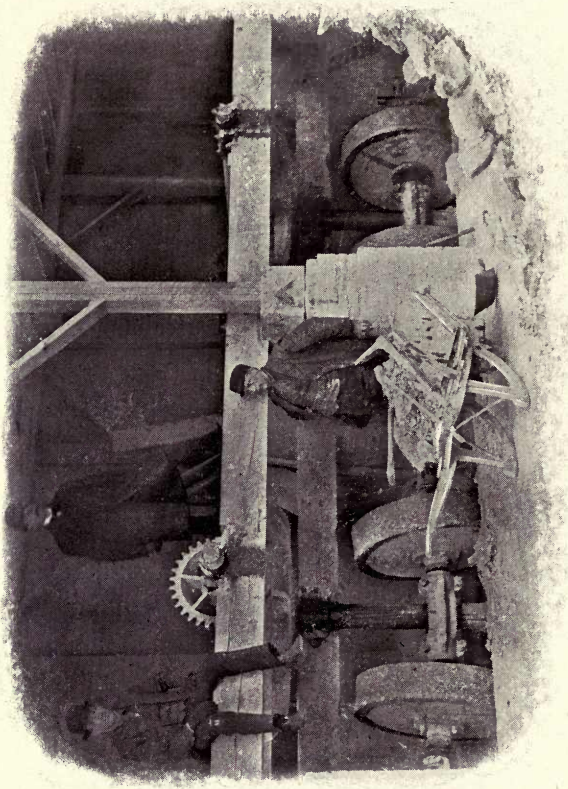
The **"Empire"** brand are hand made, repressed brick, and because of their extreme denseness are especially suitable for use in Blast Furnace upper linings, Blast Furnace connections, Lime Kiln Tops, and other places where a brick of this kind is required.

THE MANUFACTURE OF FIRE BRICK



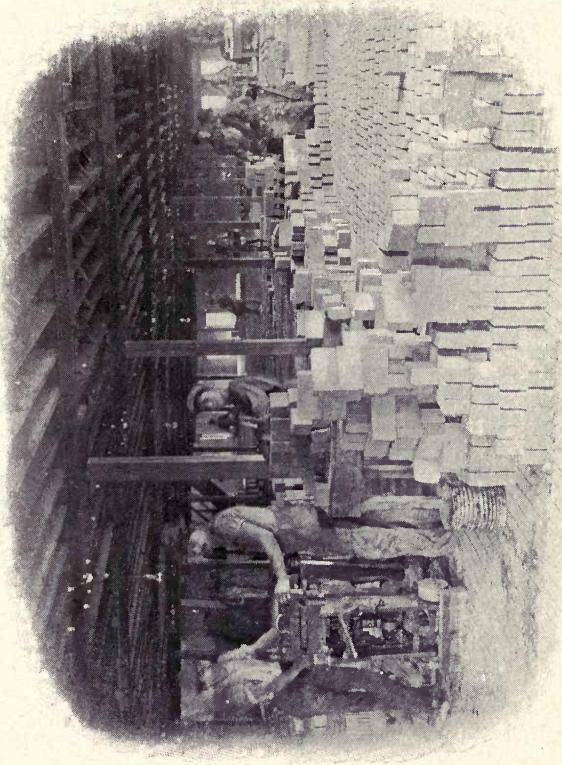
CLAY MINE

THE MANUFACTURE OF FIRE BRICK



PANS GRINDING CLAY

THE MANUFACTURE OF FIRE BRICK

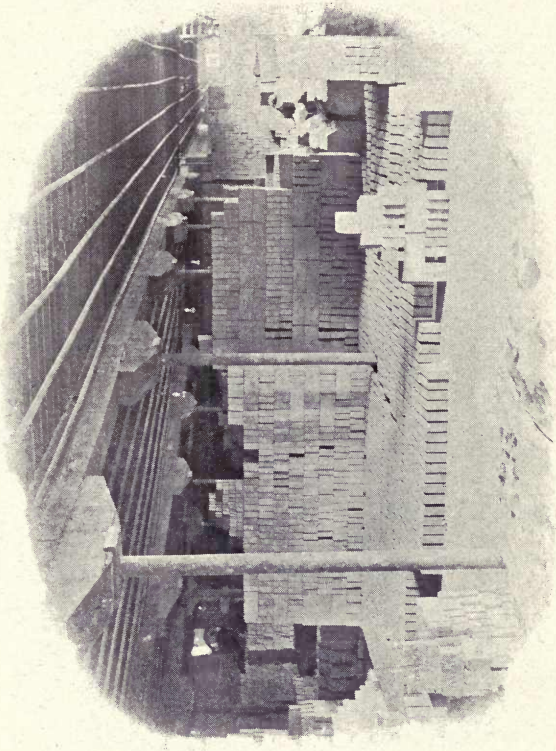


HAND MOULDING AND REPRESSING

THE MANUFACTURE OF FIRE BRICK

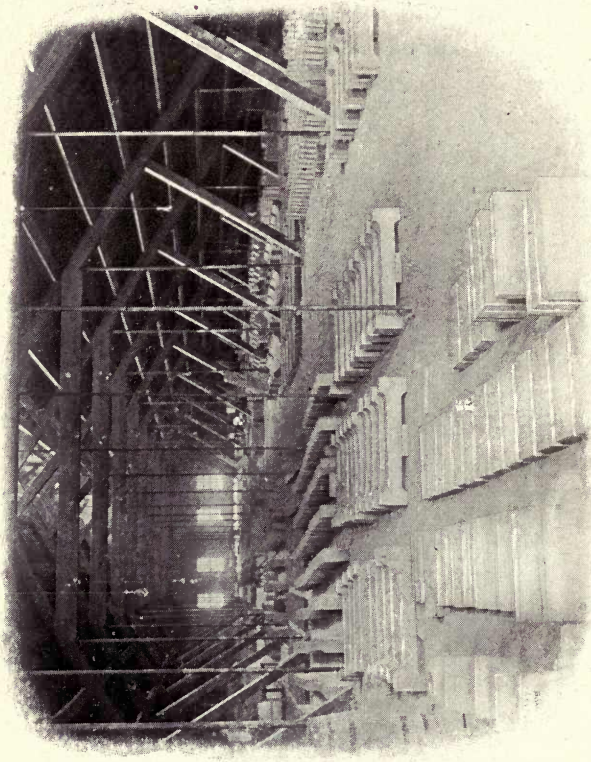
BRICK MACHINE—SEMI-DRY PROCESS

THE MANUFACTURE OF FIRE BRICK



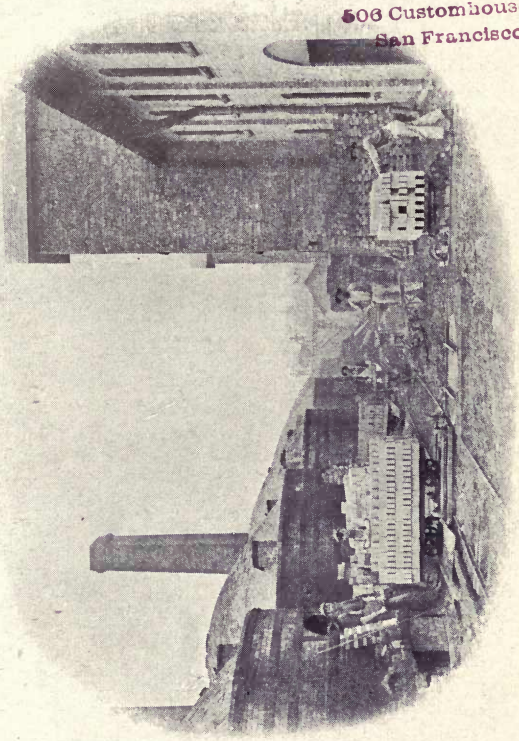
STONE DRYING FLOOR FOR STANDARD SHAPES

THE MANUFACTURE OF FIRE BRICK



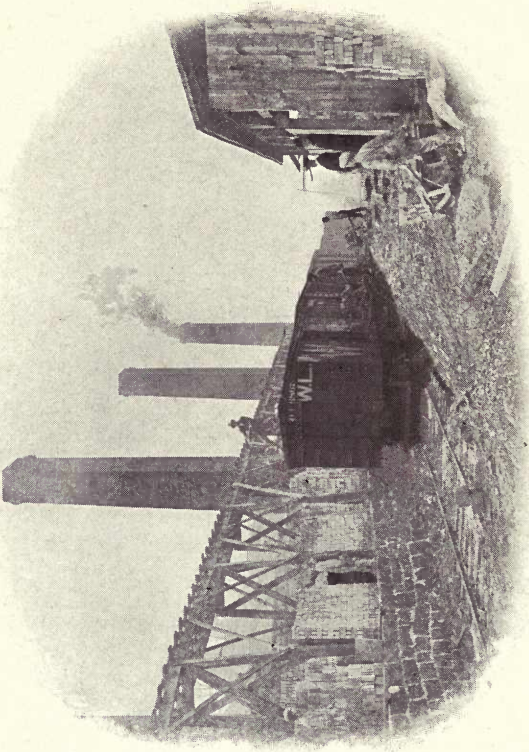
LARGE SHAPES AND LOCOMOTIVE TILE ON FLOOR

THE MANUFACTURE OF FIRE BRICK



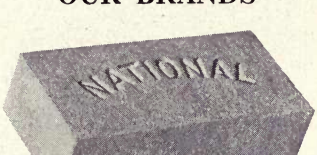
BRICK GOING TO KILN

THE MANUFACTURE OF FIRE BRICK



LOADING CARS

OUR BRANDS



"National" brand is manufactured from the highest grade of Ohio Flint Calcined Clay, together with selected plastic clay to form a good bond, giving a highly refractory brick, suitable for Heating Furnaces, Puddling Furnaces, Blast Furnace Stoves, Rolling Mill Furnaces, and furnaces requiring an open brick. It is a hand made, repressed brick.

"National" Kentucky Mix. Made from our best Calcined Flint Clay and a Kentucky Bond Clay. We find that the affinity of this Bond Clay with our own Flint Clays, a higher grade of brick for some purposes can be obtained than with either all Ohio Clays or all Kentucky Clay, and the clays are prepared by the "Wet Pan" process, insuring a perfect and intimate mixture. Special attention is paid to the chemical and mechanical mixture of the clays in this brick, making it one of the most desirable and regular Fire Brick produced in this country.

"National 2" brand is manufactured from the highest grade of Ohio Flint Clay with a larger portion of plastic clay to make a more dense and firm brick. By the manipulation and selection of clays, this plant has been able to make Brick and Shapes that have heretofore only been obtained abroad; and in quality and workmanship we have been able to surpass the Foreign Brick.

"Standard" brand is manufactured at our National plant, in both hand made and semi-dry pressed, for use in Gas Furnaces, Annealing Ovens, Sewer Pipe and Brick Kilns, Boiler Settings, etc. It is a well made brick of high heat resisting qualities, and uniformity of size, and will stand over 2,500° of heat without fluxing, and can be furnished in all shapes.

"S.-F. Co.—W."

This brand is manufactured to meet a demand for a pressed, smooth brick for general work, such as Boiler Settings, Brick and Sewer Pipe Kilns, Refuse Burners, Tanneries, Saw Mills. The brick are uniform in size and will stand work up to 2,500°.

"American"

ONE SIZE ONLY

This brand is the same in quality as the "Standard," but is in the West Virginia size, measuring $8\frac{1}{4} \times 2\frac{1}{2} \times 4\frac{1}{8}$. They are used for the same purposes as "Standard," and are a firm, smooth, true brick, suitable for mantel and grate work. These brick are well adapted for Crowns of Pressed Brick, Sewer Pipe and other Kilns. The size makes them desirable for dealers' trade as they weigh only 6 pounds each, whereas the full 9″ weigh 7 pounds each.

PERRY L. HOBBS, PH. D.
ANALYTICAL AND
CONSULTING CHEMIST.

Cleveland, Ohio.

The Stowe-Fuller Co.,
City.

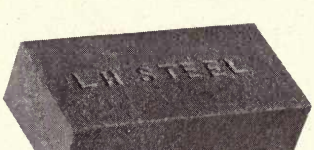
Gentlemen:—

The fire brick submitted for analysis gave the following results:

	National	Standard
Silica $Si O_2$, – – – –	61.36	62.20
Alumina $Al_2 O_3$, – – –	35.09	32.07
Lime Ca O, – – – –	.48	.70
Magnesia Mg O, – – –	.09	.65
Iron Peroxide $Fe_2 O_3$, Titanic Oxide Ti O, – –	2.91	4.01
	99.93	99.63

The above clays should make first-class brick, judging from their chemical composition.

Yours truly, PERRY L. HOBBS.



BRANDS
L. H. Steel—Penn—Aluminite

Since establishing our business we have always found it necessary to have a High Grade Pennsylvania Clay Brick. Finding that most all of the old brands were deteriorating, either from exhaustion of the good clays or because of the attempt to manufacture quantity instead of quality, we were obliged to establish our own factory in that State. After spending two years searching for the best Fire Clay property in Pennsylvania we selected Lock Haven as being the most desirable location on account of the deposits of high grade clay at that point.

With the erection of a new and improved factory, the latest and best machinery, and men of long experience to operate them, we placed on the market under the brand of **"Lock Haven Steel"** the best Fire Brick made in Pennsylvania. Recently improvements were added which facilitate the drying of large and difficult shapes. Brick are made here for use in Malleable Iron Furnaces, Open Hearth Furnaces, Blast Furnaces, Carbon Furnaces, or any other work where strictly No. 1 brick are required. The location of this plant is especially desirable for shipments to the great Iron and Steel centers of Pennsylvania and the East.

LOCK HAVEN FIRE BRICK COMPANY

BRANDS

"L. H. Steel." A Flint Clay Brick for Malleable Iron Furnaces, Bosh and Hearth of Blast Furnaces, Open Hearth Steel Furnaces, Carbon Furnaces and work requiring ability to withstand heats of the highest practical temperatures.

"Lock Haven." For Inwall linings of Blast Furnaces, Kilns and Cupolas, requiring them to stand intense heat and also friction.

"Penn." For friction as well as heat, for Tops of Blast Furnaces, Lime Kilns, etc., a brick to stand wear.

The remarkable purity and regularity of these clays as given by comparative analyses below verify our statements in regard to quality.

Lock Haven Fire Brick Company

	Flint Clay by P. L. Hobbs	Flint Clay by Crowell & Peck
Silica	44.00	43.52
Alumina	42.12	42.18
Oxide of Iron	.86	.42
Lime	.24	.25
Magnesia	.10	.16
Ignition Loss	14.20	14.31

"Minor" Brick have an enviable reputation where a brick is required to withstand great friction besides heat. These brick give perfect satisfaction in Malleable Iron and Steel Foundries, Ladles, Cupolas, Soaking Pits, Annealing Furnaces, Hot Blast Stoves, Hot Metal Cars, Boiler Settings, Gas Producers, Lime Kilns, etc.

"Empire" Brand. These brick are handmade, repressed brick of special function qualities. They are extremely dense, and, because of this feature, possess great abrasive as well as heat resisting qualities, and are especially suitable for top linings in Blast Furnaces and Lime Kilns.

The Kentucky Fire Brick Company has been manufacturing fire brick in the Olive Hill district of Kentucky since 1902. Its works are located at Haldeman, Kentucky, where it owns several thousand acres of famous Carter County clays. Its mines show a wonderful deposit of clay, and have been systematically developed until sufficient proven clay is in sight to furnish high grade material of uniform quality for over twenty-five years without any further development. The remarkable purity and regularity of this clay is shown by recent analyses of clay taken from sections of the mines nearly a mile apart.

Silica.....	45.38	45.58
Alumina.....	40.52	39.86
Lime.....	.....	.....
Magnesia.....	trace.	trace.
Alkalies.....	.94	.98
Iron Oxide.....	.60	.80
Loss in Ignition....	13.34	13.40
	100.78	100.62

The Kentucky Fire Brick Company manufactures a number of well-known brands of fire brick for distinctly different uses and services. The brands and service for which they are recommended are as follows:

K.F.B. Co. Hearth and Bosh,
K.F.B. Co. Inwall,
K.F.B. Co. Top,
for blast furnace linings.

K.F.B. Co. Stove No. 1,
K.F.B. Co. Stove No. 2,
first and second quality brick for hot blast stoves.

K.F.B. Co. Roof, first quality brick for malleable iron works and high grade mill work.

Imperial Steel, first quality brick for malleable iron works, open hearth, puddling furnaces, soaking pits, etc.

In order to insure prompt and satisfactory shipments to customers this company carries complete stocks of standard shapes necessary for the service for which the above brick are recommended.

STANDARD SHAPES CARRIED IN STOCK

Shapes	Page	Brands
9-inch Straight.	33	National
	33	Standard
	33	Empire
	33	Minor
	33	L. H. Steel
	33	Aluminite
	33	Penn
	33	Kentucky Roof
	33	Imperial Steel
	57	F. R. C. Silica
	68	F. R. C. Chrome
	74	F. R. C. Magnesia
8¼x2½x4⅛ Straight.....	18	American
Soap.....	33	National
	33	Standard
	33	Empire
	33	L. H. Steel
	33	Imperial Steel
	57	F. R. C. Silica
	74	F. R. C. Magnesia
No. 1 Split....	33	National
	33	Standard
	33	Empire
	33	L. H. Steel
	33	Imperial Steel
	58	F. R. C. Silica
	68	F. R. C. Chrome
	75	F. R. C. Magnesia
No. 2 Split....	33	National
	33	Standard
	33	Empire
	33	L. H. Steel
	33	Imperial Steel
	58	F. R. C. Silica
Large 9-inch..	33	National
	33	Standard
	33	Empire
	33	L. H. Steel
	33	Imperial Steel
	57	F. R. C. Silica
	74	F. R. C. Magnesia
Small 9-inch	33	National
	33	Standard
	33	Empire
	33	L. H. Steel
	33	Imperial Steel
	57	F. R. C. Silica
No. 1 Key....	34	National
	34	Standard
	34	Empire
	34	L. H. Steel
	34	Imperial Steel
	59	F. R. C. Silica
	75	F. R. C. Magnesia
No. 2 Key	34	National
	34	Standard
	34	Empire
	34	L. H. Steel
	34	Imperial Steel
	59	F. R. C. Silica
	75	F. R. C. Magnesia
No. 3 Key....	34	National
	34	Standard
	34	Empire
	34	L. H. Steel
	34	Imperial Steel
	59	F. R. C. Silica
No. 4 Key....	34	National
	34	Standard
	34	Empire
	34	L. H. Steel
	34	Imperial Steel
	59	F. R. C. Silica
No. 1 Wedge..	34	National
	34	Standard
	34	Empire
	34	L. H. Steel
	34	Imperial Steel
	58	F. R. C. Silica
	68	F. R. C. Chrome
	73	F. R. C. Magnesia
No. 2 Wedge..	34	National
	34	Standard
	34	Empire
	34	L. H. Steel
	34	Imperial Steel
	58	F. R. C. Silica
	75	F. R. C. Magnesia
No. 3 Bullhead or Wedge...	36	National
	36	Standard
	36	Empire
	36	L. H. Steel
	36	Imperial Steel
	58	F. R. C. Silica

STANDARD SHAPES CARRIED IN STOCK
—Continued

Shapes	Page	Brands
Large 9-inch No. 1 Wedge.	37	National
	37	Standard
	37	L. H. Steel
	37	Imperial Steel
	59	F. R. C. Silica
Large 9-inch No. 2 Wedge.	37	National
	37	Standard
	37	L. H. Steel
	37	Imperial Steel
	59	F. R. C. Silica
No. 1 Arch....	35	National
	35	Standard
	35	Empire
	35	L. H. Steel
	35	Imperial Steel
	57	F. R. C. Silica
	68	F. R. C. Chrome
	74	F. R. C. Magnesia
No. 2 Arch....	35	National
	35	Standard
	35	Empire
	35	L. H. Steel
	35	Imperial Steel
	57	F. R. C. Silica
	74	F. R. C. Magnesia
No. 3 Arch...	58	F. R. C. Silica
End Skew....	35	National
	35	Standard
	35	Empire
	35	L. H. Steel
	35	Imperial Steel
	60	F. R. C. Silica
Side Skew....	35	National
	35	Standard
	35	Empire
	35	L. H. Steel
	35	Imperial Steel
	60	F. R. C. Silica
Skew Back....	35	National
	35	Standard
	35	Empire
	35	L. H. Steel
	35	Imperial Steel
No. 1 Neck...	35	National
	35	L. H. Steel
	35	Imperial Steel
No. 2. Neck...	35	National
	35	Standard
	35	Empire
	35	L. H. Steel
	35	Imperial Steel
No. 3 Neck...	36	National
	36	Standard
	36	Empire
	36	L. H. Steel
	36	Imperial Steel
	60	F. R. C. Silica
Feather Edge.	36	National
	36	Standard
	36	Empire
	36	L. H. Steel
	36	Imperial Steel
	60	F. R. C. Silica
No. 1 Jamb...	36	National
	36	Standard
	36	Empire
	36	L. H. Steel
	36	Imperial Steel
	60	F. R. C. Silica
No. 2 Jamb...	36	National
	36	Standard
	36	L. H. Steel
	36	Imperial Steel
No. 3 Jamb...	36	National
	36	Standard
	36	Imperial Steel
Key Wedge...	60	F. R. C. Silica
9 x 3 x 3 Checker.....	36	National
	36	Standard
	36	L. H. Steel
Edge Arch....	37	National
	37	Standard
	37	Empire
	37	L. H. Steel
	37	Imperial Steel
No. 2 Side Skew...	60	F. R. C. Silica
12x6x2½ Straight.....	61	F. R. C. Silica
12x6x2 11/16 x2½ No. 1 Wedge.	61	F. R. C. Silica

STANDARD SHAPES CARRIED IN STOCK

—Continued

Shapes	Page	Brands
12x6x2 7/8x2 1/2 No. 2 Wedge.	61	F. R. C. Silica
12x9x2 1/2 Soap.....	61	F. R. C. Silica
12x9x2 1/8x2 1/2 No. 1 Wedge Soap.....	61	F. R. C. Silica
12x9x2 7/8x2 1/2 No. 2 Wedge Soap.....	61	F. R. C. Silica
12x6x3x2 1/2 No. 1 Arch...	62	F. R. C. Silica
12x6x2 1/2x2 No. 2 Arch...	62	F. R. C. Silica
12x9x3 Straight Soap	62	F. R. C. Silica
12x9x3x2 Wedge Soap	62	F. R. C. Silica
12x6x3 Straight.....	62	F. R. C. Silica
12x6x3x2 Wedge.....	62	F. R. C. Silica
12x4 1/2x3 Binder.....	63	F. R. C. Silica
12x3x3 Soap...	63	F. R. C. Silica
12x6x5x3 Key.	63	F. R. C. Silica
12x6x2x3 Skew	63	F. R. C. Silica
13 1/2x4 1/2x2 1/2 Binder.....	63	F. R. C. Silica
13 1/2x6x2 1/2 Straight.....	63	F. R. C. Silica
	42	National
	42	Standard
	42	L. H. Steel
	42	Imperial Steel
13 1/2x6x2 1/2x2 No. 1 Arch..	64	F. R. C. Silica
13 1/2x6x2 1/2x1 1/2 No. 2 Arch..	64	F. R. C. Silica
13 1/2x6x2 1/2x2 No. 1 Wedge	64	F. R. C. Silica
13 1/2x6x2 1/2x1 1/2 No. 2 Wedge.	64	F. R. C. Silica
13 1/2x9x2 1/2 Straight.....	64	F. R. C. Silica
"OA" 12-inch Orth Roof...	65	F. R. C. Silica
"OB" 12-inch Orth Roof...	65	F. R. C. Silica
"OC" 12-inch Orth Roof...	65	F. R. C. Silica
"08" 9-inch Orth Roof...	65	F. R. C. Silica
"09" 9-inch Orth Roof...	65	F. R. C. Silica
"10" 9-inch Orth Roof...	65	F. R. C. Silica
ORZ F Repair Shape	65	F. R. C. Silica
Mill Tile	41	National
18x6x3	41	Standard
20x6x3	41	Empire
24x6x3	41	L. H. Steel
No. 1 Circle...	38	National
	38	Standard
	38	Lock Haven
	38	Imperial Steel
No. 2 Circle...	38	National
	38	Standard
	38	Lock Haven
	38	Imperial Steel
No. 3 Circle...	38	National
	38	Standard
	38	Lock Haven
	38	Imperial Steel
No. 4 Circle ..	38	National
	38	Standard
	38	Lock Haven
	38	Imperial Steel

STANDARD SHAPES CARRIED IN STOCK

—Continued

Shapes	Page	Brands
No. 5 Circle...	38	National
	38	Standard
	38	Lock Haven
	38	Imperial Steel
No. 1 Cupola..	39	National
	39	Standard
	39	Empire
	39	Minor
	39	Imperial Steel
No. 2 Cupola..	39	National
	39	Standard
	39	Empire
	39	Minor
	39	Imperial Steel
No. 3 Cupola..	39	National
	39	Standard
	39	Empire
	39	Minor
	39	Imperial Steel
No. 4 Cupola..	39	National
	39	Standard
	39	Empire
	39	Minor
	39	Imperial Steel
No. 5 Cupola..	39	National
	39	Standard
	39	Empire
	39	Minor
	39	Imperial Steel
No. 6 Cupola..	39	National
	39	Standard
	39	Empire
	39	Minor
	39	Imperial Steel
Whiting Blocks..... Nos. 1 to 11	40	Empire
13½-inch 12-foot Key..	42	National
13½-inch 6-foot Key...	42	National
Standard Bottom Block...	42	National
Flat Back Straight.....	46	National
	46	Standard
Flat Back Arch.....	46	National
	46	Standard
Mill Block 18x9x6	41	National
		Standard
		Minor
		Empire
No. 1 Bridge Wall 13½x6½x6..	41	National
		Standard
		Minor
		Empire
No. 2 Bridge Wall 13½x6½x3	41	National
		Standard
		Minor
		Empire

LIST OF TILE CARRIED IN STOCK

Size	Brands
12 x 12 x 2.....	National Minor Lock Haven Imperial Steel
12 x 15 x 2.....	National Minor Lock Haven Imperial Steel
12 x 18 x 2.....	National Minor Lock Haven Imperial Steel
12 x 24 x 2.....	National Minor Lock Haven Imperial Steel
12 x 12 x 2½.....	National Minor Lock Haven
12 x 15 x 2½.....	National Minor Lock Haven
12 x 18 x 2½.....	National Minor Lock Haven
12 x 20 x 2½.....	National Minor Lock Haven
12 x 22 x 2½.....	National Minor Lock Haven
12 x 24 x 2½.....	National Minor Lock Haven Imperial Steel
12 x 30 x 2½.....	National Minor Lock Haven
12 x 12 x 3.....	National Minor Lock Haven Imperial Steel
12 x 15 x 3.....	National Minor Lock Haven
12 x 18 x 3.....	National Minor Lock Haven
12 x 20 x 3.....	National Minor Lock Haven
12 x 24 x 3.....	National Minor Lock Haven
12 x 36 x 3.....	National Minor Lock Haven
6 x 18 x 3.....	National Minor Lock Haven
6 x 20 x 3.....	National Minor Lock Haven
6 x 24 x 3.....	National Minor Lock Haven
9 x 18 x 3.....	National Minor Lock Haven
9 x 20 x 3.....	National Minor Lock Haven Imperial Steel
9 x 24 x 3.....	National Minor Lock Haven Imperial Steel
9 x 12 x 4.....	National Minor Lock Haven
9 x 18 x 4.....	National Minor Lock Haven

LIST OF TILE CARRIED IN STOCK—Continued

Size	Brands	Size	Brands
9 x 20 x 4.....	National Minor Lock Haven	15 x 36 x 4.....	National Lock Haven
12 x 12 x 4.....	National Minor Lock Haven Imperial Steel	12 x 24 x 4.....	National Lock Haven
12 x 30 x 4.....	National Lock Haven	20 x 20 x 4.....	National Lock Haven
12 x 36 x 4.....	National Lock Haven	9 x 27 x 4.....	National Lock Haven
15 x 30 x 4.....	National Lock Haven	9 x 36 x 4.....	National Lock Haven

SHOWING THE FUSION POINT OF SOME OF OUR VARIOUS BRICK

HEINRICH REIS, PH. D.
PROFESSOR OF ECONOMIC GEOLOGY
CORNELL UNIVERSITY

Stowe-Fuller Co. ITHACA N. Y., MAY 22, 1913
Cleveland, O.

Dear Sirs:

I beg to report the following fusion points for the five brick samples submitted by you:

		Degs. F.
Federal Silica Brick F. R. C. Brand	Cone 35 plus	3326
National Brand Kentucky Bond Clay	" 33	3254
Kentucky F. B. Co.—S. S. A. Brand	" 31	3182
Penna. L. H. Steel Brand	" 28 to 29	3074 to 3110
Minor Empire Brand	" 27	3036

I tested a sample of your Federal Silica Brick F. R. C. brand, and found that the same had a fusing point of over cone 35, the theoretical fusing point of this cone being 3326° F. This brick was tested by heating it up to this cone in a Deville Furnace. The fusing point was considered to have been reached when the brick began to lose its shape under the action of the heat. In the case of the silica brick it had not lost its shape at cone 35.

Yours truly,

Signed Heinrich Reis

Table of Analyses showing the Chemical Composition of "Minor" Fire Clay compared with some of the best known Clays of the World.

	Silica $Si\,0_2$	Alumina $Al_2\,0_3$	Ferrous Oxide $Fe_2\,0_3$	Lime $Ca\,0$	Magnesia $Mg\,0$
"Minor" Clay, Empire, Ohio.....	73.87	17.95	1.20	trace	.63
South Amboy, New Jersey.....	72.70	17.58	1.42	trace	.43
St. Louis, Mo.....	67.47	19.43	2.56	.41	.07
Stourbridge, England.....	73.82	15.88	2.95	trace	trace
Coblentz, Germany.....	71.38	15.66	1.19	....	.28
Woodbridge, New Jersey.....	71.80	18.92	.88	....	....
St. Ghislain, Belgium.....	81.08	13.94	2.18	.60	.52
Seilles' France.....	71.17	23.53	2.31	.34	.20
Diesdorf, Rhineland.....	73.71	18.33	.89	trace	.10

STANDARD 9″ SHAPES

The following cuts represent the principal nine-inch shapes that are used, and dimensions given are the long established standards adopted by Fire Brick manufacturers.

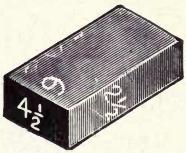
We keep large quantities in stock, and can make anything we do not have on short notice.

Please state what brand or for what purpose the brick are wanted.

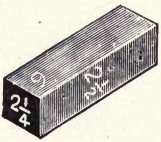
The standard nine-inch shapes require from three to four weeks to manufacture, but very large and difficult shapes require much longer to dry and handle, and from six to eight weeks is required to get them out in first-class shape. However, we are in position to make any and all shapes more promptly than other factories, as we have improved mechanical means for cooling kilns and drying brick.

A carload of brick can be made and shipped as quickly as a few brick, as the same process is required.

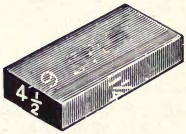
9 Inch.....
9x4½x2½



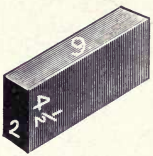
Soap.....
9x2½x2¼



No. 1 Split.....
9x4½x1¼

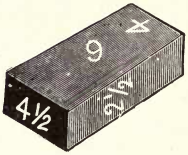


No. 2 Split.....
9x4½x2



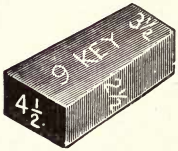
Large 9 Inch.....
9x6¾x2½

Small 9 Inch.....
9x3½x2½



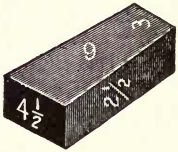
No. 1 Key.....

9x4½x4x2½
12 feet diameter inside.
112 brick to circle.



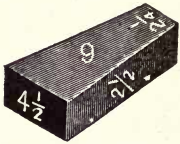
No. 2 Key.....

9x4½x3½x2½
6 feet diameter inside.
65 brick to circle.



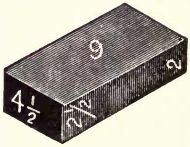
No. 3 Key Brick.....

9x4½x3x2½
3 feet diameter inside.
41 brick to circle.



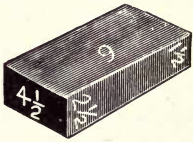
No. 4 Key Brick.....

9x4½x2½x2¼
18 inches diameter inside.
26 brick to circle.



No. 1 Wedge.....

9x4½x2½x2
5 feet diameter inside.
102 brick to circle.

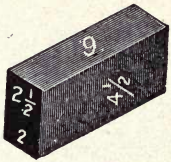


No. 2 Wedge.....

9x4½x2½x1½
2 feet 6 inches diameter inside.
63 brick to circle.

No. 1 Arch.....

9x4½x2½x2
4 feet diameter inside.
72 brick to circle.

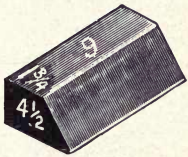


No. 2 Arch.....

9x4½x2½x1½
2 feet diameter inside.
42 brick to circle.

Side Skew.....

9x4½x1¾

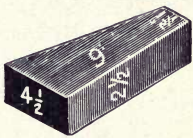


End Skew.....

9x7x4½x2½

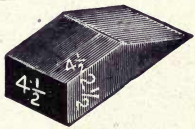
Skew Back.....

9x4½x2½x1½



No. 1 Neck.....

9x4½x2½

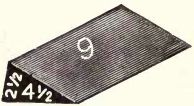


No. 2 Neck.....

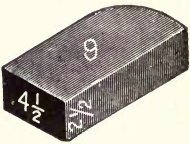
9x4½x2½x2

No. 3 Neck.....
9x4½x2½x⅝

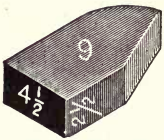
Feather Edge.....
9x4½x2½x⅛



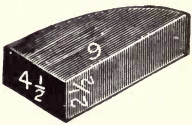
No. 1 Jamb.....
9x4½x2½



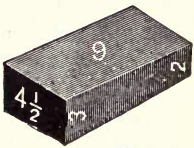
No. 2 Jamb.....
9x4½x2½



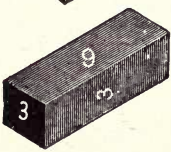
No. 3 Jamb.....
9x4½x2½



No. 3 Bullhead.....
9x4½x3x2
3 feet diameter inside.

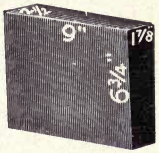


Checker.....
9x3x3



Large 9 Inch No. 1 Wedge...

102 brick to the circle.
5 feet inside, 6 ft. 6 in. outside diameter.

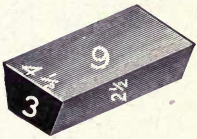


Large 9 Inch No. 2 Wedge...

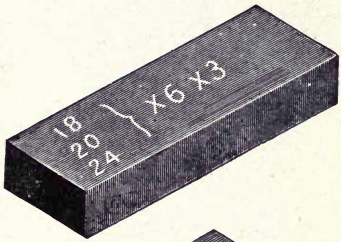
63 brick to the circle.
2 ft. 6 in. inside, 4 ft. outside diameter.

Edge Arch . . . . . .

9x4½x3x2½
Small Diameters, for Tuyere Stock Linings, and 2½ inch Pipe Linings.

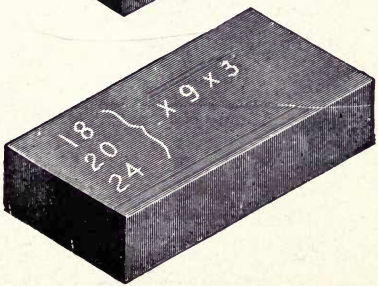


Checker Tile . . . . .

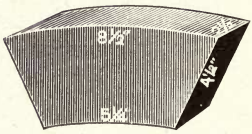


Checker Tile . .

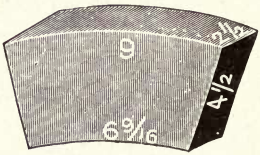
Mill Tile . . . . . .



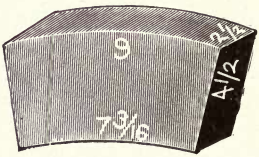
No. 1. 15 inch Circle..
Inside diameter.
9 brick to circle.



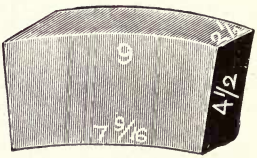
No. 2. 24 inch Circle..
Inside diameter.
11 brick to circle.



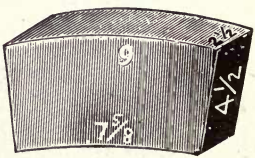
No. 3. 36 inch Circle..
Inside diameter.
14 brick to circle.



No. 4. 48 inch Circle..
Inside diameter.
20 brick to circle.



No. 5. 60 inch Circle..
Inside diameter.
24 brick to circle.



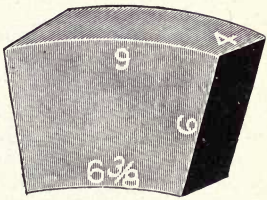
Also 72, 84 and 96 inch Circles.

CUPOLA BLOCKS

No. 1 Cupola Brick....

Diameter, {42 inches outside. 30 inches inside.

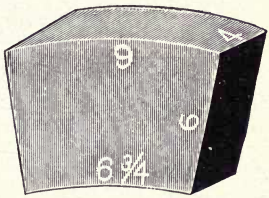
15 brick to the circle.



No. 2 Cupola Brick....

Diameter, {48 inches outside. 36 inches inside.

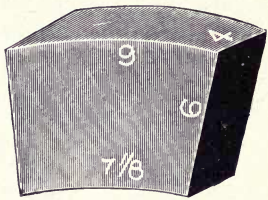
17 brick to the circle.



No. 3 Cupola Brick....

Diameter, {60 inches outside. 48 inches inside.

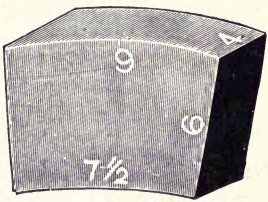
21 brick to the circle.



No. 4 Cupola Brick....

Diameter, {72 inches outside. 60 inches inside.

25 brick to the circle.



No. 5 Cupola Brick.

Diameter, {84 inches outside. 72 inches inside.

29 brick to the circle.

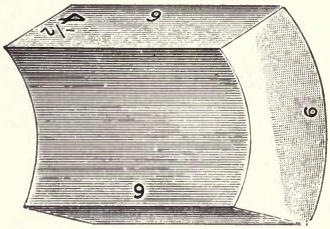
No. 6 Cupola Block.

Diameter, {96 inches outside. 84 inches inside.

33 brick to circle.

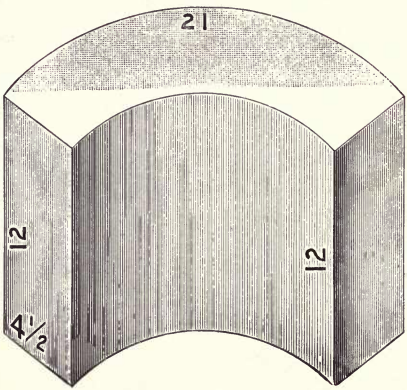
WHITING

CUPOLA BLOCKS



Size	Inside Diam.	Outside Diam.	Size	Inside Diam.	Outside Diam.
No. 1	23 inch	32 inch	No. 7	54 inch	63 inch
" 2	27 "	36 "	" 8	60 "	69 "
" 3	32 "	41 "	" 9	66 "	75 "
" 3½	37 "	46 "	" 9½	72 "	81 "
" 4	42 "	51 "	" 10	78 "	87 "
" 5	45 "	54 "	" 11	84 "	93 "
" 6	48 "	57 "			

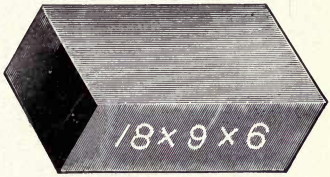
BRASS POT LINERS



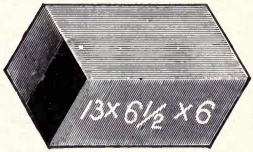
18 inches inside.
27 inches outside.
Other sizes made to order.

MILL BLOCKS

18 inch Block.....



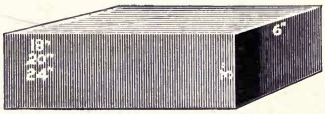
No. 1 Bridgewall.



No. 2 Bridgewall.

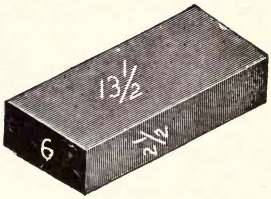
Mill Tile.....

18x6x3
20x6x3
24x6x3

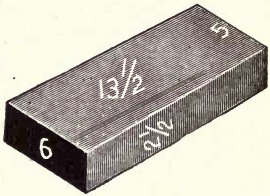


BLAST FURNACE SHAPES

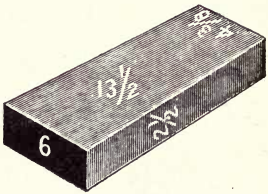
13½ inch Straight.....



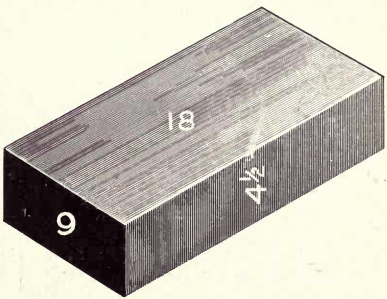
No. 1. 12 foot Key...
91 brick to circle.



No. 2. 6 foot Key....
53 brick to the circle.



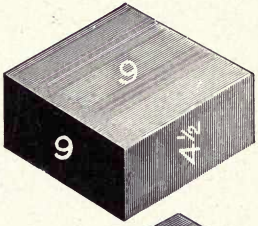
Standard
Bottom Block..



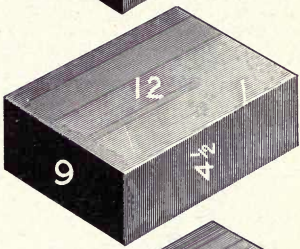
STANDARD BLOCK LININGS

To meet the demand for Block Lining, we get up a Standard Block in 3 Diameters of Circle, which with Straight Brick as per cuts below will line any diameter of furnace and break Joints for any thickness of lining.

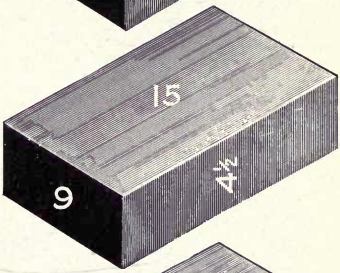
9x9x4½ Straight.
9x9x4½ Key, 5 ft. Radius.
9x9x4½ " 7½ " "
9x9x4½ " 10 " "



12x9x4½ Straight.
12x9x4½ Key, 5 ft. Radius.
12x9x4½ " 7½ " "
12x9x4½ " 10 " "

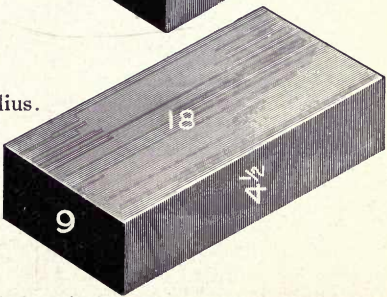


15x9x4½ Straight.
15x9x4½ Key, 5 ft. Radius.
15x9x4½ " 7½ " "
15x9x4½ " 10 " "

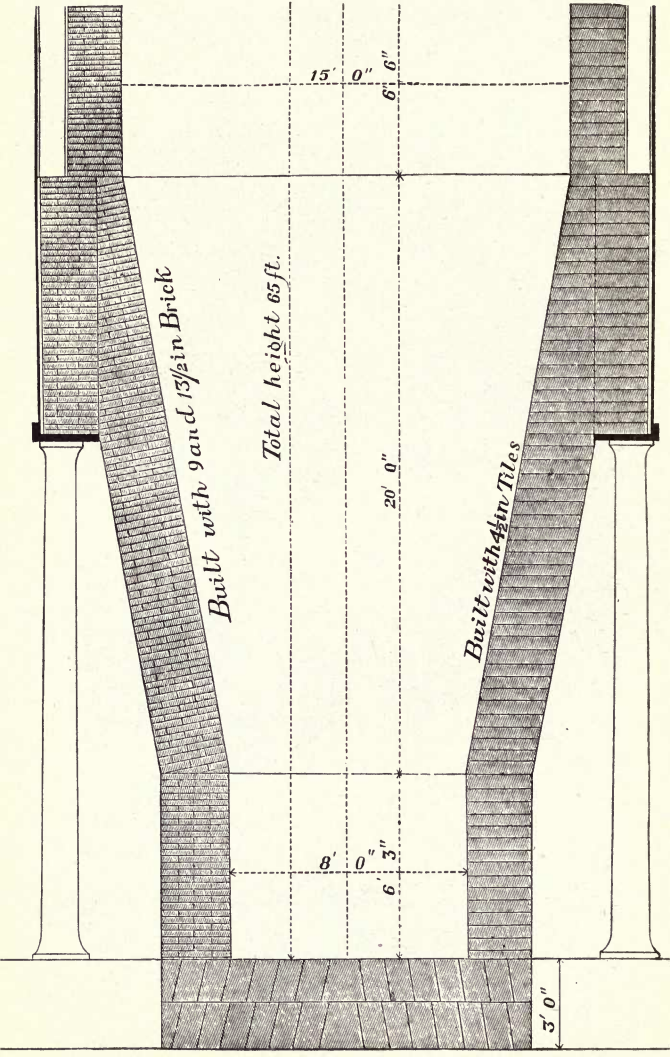


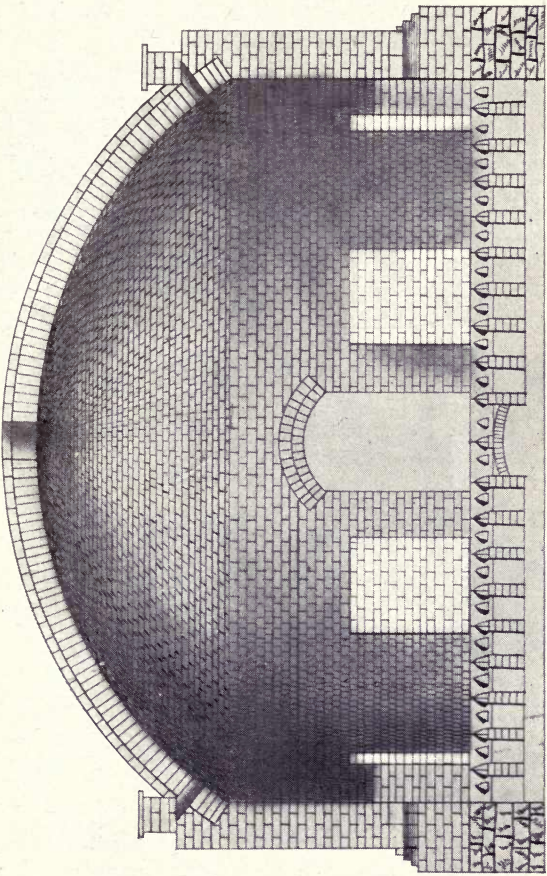
18x9x4½ Straight.
18x9x4½ Key, 5 ft. Radius.
18x9x4½ " 7½ " "
18x9x4½ " 10 " "

Standard Bottom Blocks 18x9x4½....



We also make above Blocks in 24 in. lengths.
All Blocks 9x4½ on inside face tapered for diameter. In three grades for Bosh and Hearth, Inwall and Top Lining, branded to designate their position in the furnace.


15' 0"
6' 6"
Total height 65 ft.
Built with 9 and 13½ in Brick
20' 0"
Built with 4½ in Tiles
8' 0"
6' 3"
3' 0"



NATIONAL KILN

POTTERY KILN BRICK

Our factories have been manufacturing brick for the Pottery trade for the last 25 years, and we aim to carry in stock Flat Backs and Flat Back Arch, besides the regular shapes for this trade.

Flat Back. . . . . .

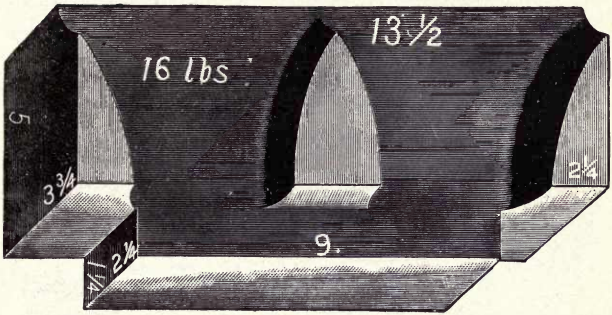
No. 1 Flat Back Arch. . . .
32 inches inside diameter
56 brick to circle

No. 2 Flat Back Arch. . . .
22 inches inside diameter
31 brick to circle

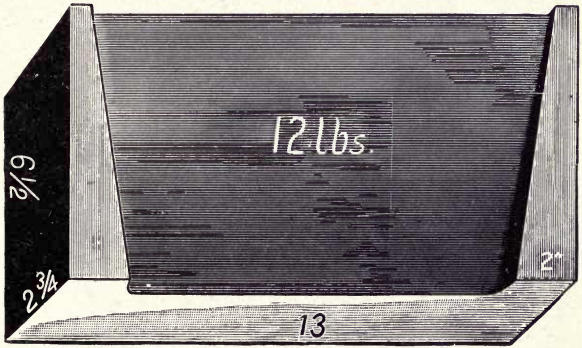
These brick are made up with special regard to standing the wear and constant heating and cooling of Kiln Arches. By the return to coal for the burning of these kilns, it will be found that the highest grade of brick will be required for this work.

We aim to make and supply these brick in the best quality known for this particular work.

KILN FLOOR BRICK



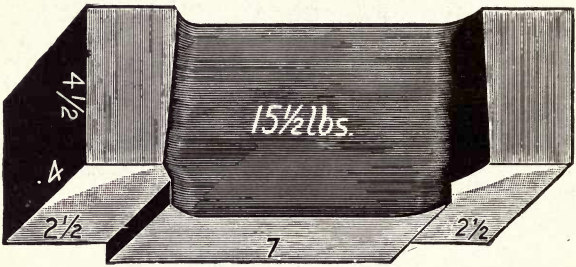
NATIONAL



CAMP

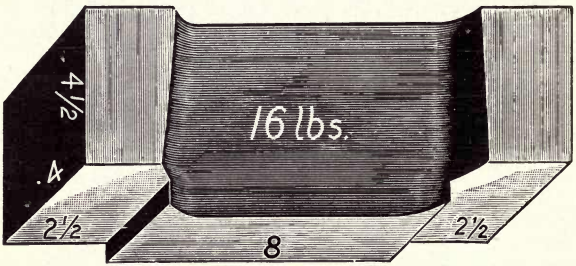
Other shapes made to order

KILN FLOOR BRICK



CROWN

Made 12 in. long.



METROPOLITAN

Made 13 in. long.

BALL AND SAGGER CLAYS

We furnish from Kentucky both Sagger and Ball clays. Our ground Sagger clays, used in conjunction with fatty Ball clays and grog, makes a tough Sagger that will stand great wear, heating and cooling without cracking.

Our Kentucky Ball clays are the best in this country. They are free from iron, and burn very white.

We use care in mining these clays, and strip each vein separately to insure a uniform shrinkage. They make an ideal body clay for Tile, Pottery or China manufacturers, or any similar use.

FIRE CLAY

We furnish High Grade Fire Clay for all work.

The following kinds are most in demand:

No. 1 Plastic.—Being of a very plastic nature is ground fine, this clay permits of a very thin joint, and one of the best clays for general work.

Blue and Yellow.—A mixture of blue and yellow clays in equal proportion, used mostly in Malleable Iron and Steel Foundries, where extreme plasticity is desired.

"A" Grade.—A high grade clay finely ground and prepared for laying all High Grade Fire Brick.

The mortar for good Brick work should be as good as the Brick and there is no better Fire Clay mined.

Minor Clay.—A clay which is almost entirely free from iron and other impurities, and high in silica contents.

Silica Cement.—To get the best results silica brick should always be set up with silica cement. We are able to furnish the best grade of this material in any quantity.

CEMENT KILN BRICK

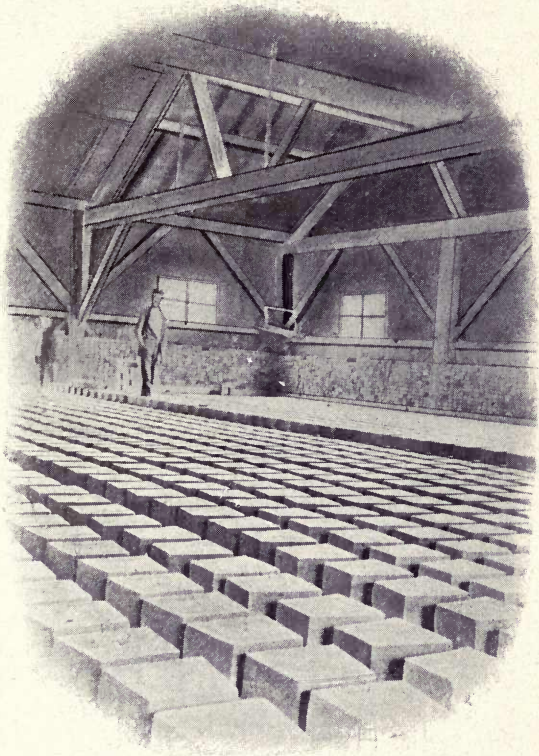
(Trade Mark Registered)

To meet the widespread demand for a brick which would give good results in Rotary Cement Kiln practice, we have developed our "Aluminite" brand. Ordinary fire brick cannot withstand the severe heat and friction to which they are subjected in these kilns, and to meet this action, we have prepared our clays in such manner as to result in a brick which combines both extreme hardness and high refractory qualities. Probably no other brick on the market today has given the excellent service in this particular work our "Aluminite" brand has given.

The following cuts show two designs for Rotary Linings, the Marl or Wet process and Stone or Dry process. The Wet process has a back lining or shelf brick made of a non-conducting mixture which prevents the loss of heat by radiation. In the Dry process this lining is not necessary, as the brick are made to retain the clinker coating in the hot zone, thereby serving to lengthen the life of the lining.

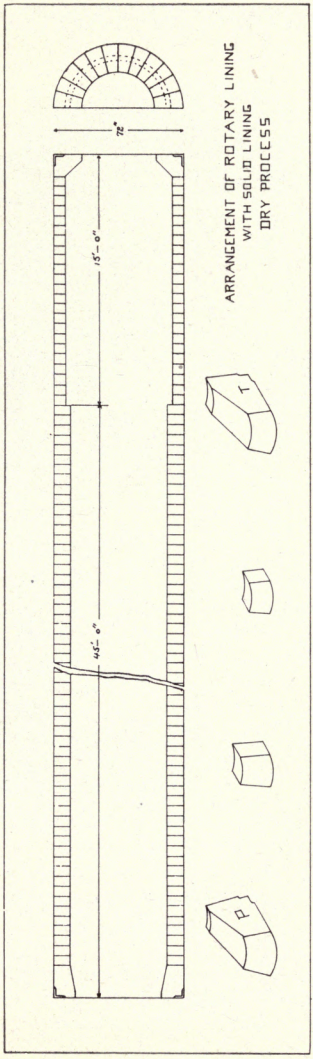
When ordering these blocks, always give diameter of shell and whether to be used for a Wet or Dry Process Kiln.

CEMENT KILN BRICK

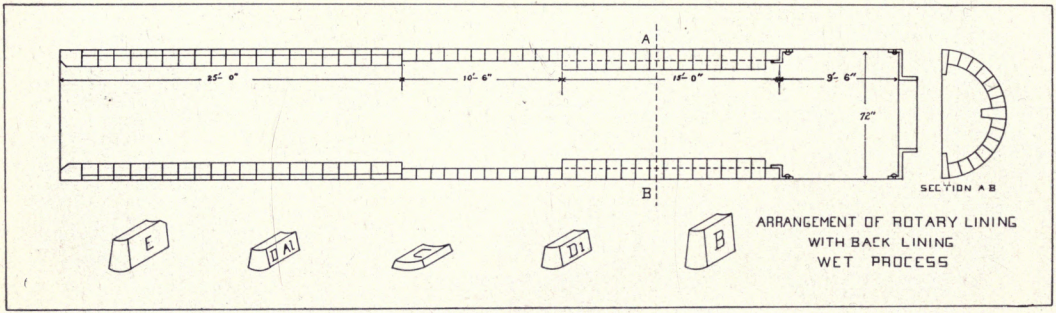


'ALUMINITE" ROTARY BLOCKS
ON DRY FLOOR

CEMENT KILN BRICK



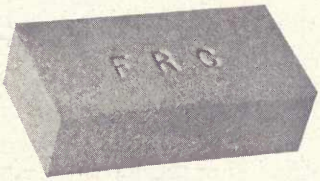
C AL 6—9″x 6″x 4″—66″ Diameter Outside
C AL 9—9″x 9″x 4″—72″ " "
P —Nose Brick
T —Tail Brick



D AL 1—9″x 6″x 6″—66″ Diameter Outside
D AL 2—9″x 6″x 6″—72″ " "
C —9″x 3″x 3″—72″ " "
E —Nose
B —Shelf

FEDERAL PLANT

FEDERAL REFRACTORIES CO.



BRANDS

F. R. C. Silica—F. R. C. Magnesia—F. R. C. Chrome

This plant is located at Alexandria, Pa., in close proximity to large tracts of Ganister owned and controlled by us. We operate our own quarries, the rock being delivered direct to the plant on our own tracks. Recent improvements in the way of added equipment has made it one of the most modern and best arranged plants of its kind in the country. The brick are all hand-made, and the capacity is kept to the point where strict attention can be paid to the quality of the output. Each process in the manufacture of these brick is under the personal supervision of men having years of experience in this particular line.

Our Magnesite and Chrome Brick are made from the highest grade of Dead Burned Magnesite and Chrome ores, which we import direct. Silica Brick manufactured here have given the best results in Open Hearth Steel Furnaces, Copper Reverberatories, etc.

List of shapes of the brick usually carried in stock are illustrated on the following pages, and we are prepared at all times to make promptly any shapes not found thereon.

SILICA DEPARTMENT

The production of the highest grade of Silica Brick is contingent on the careful selection of the Ganister Rock and the experience and care in the manufacture of the brick through every detail of the mixture and burning.

New methods for the handling and drying of the green product have been introduced at our plant, and the result is a brick possessing features not found in other makes. Frequent analyses of our brick aid us in maintaining a very uniform mixture.

Our Plant at Alexandria, Pa., has over 60,000 square feet of floor space for the drying of special shapes. We have furnished for some of the largest By-Product Coke Plants and Gas Retort Benches the most difficult Silica shapes made in this country.

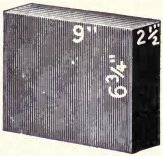
We give comparative analyses, taken from eight cars shipped from our plant, which was made by Chemists of one of the leading Steel Companies of America.

CAR No.	ANALYSES OF BRICK				
	Silica	Iron and Alum.	Lime	Mag.	Loss
E. L. 60511	96.15	1.10	2.00	.50	.25
P. B. & W. 952	95.55	1.70	2.00	.36	.15
P. Co. 559290	95.85	1.40	2.04	.40	.15
P. R. R. 96677	95.25	1.20	2.10	.50	.15
P. R. R. 18857	95.36	1.40	1.80	.66	.24
P. R. R. 70785	96.15	1.50	1.50	.41	.15
P. Co. 579029	96.25	1.55	1.70	.72	.20
P. F. W. 515446	95.07	1.60	1.85	.68	.13

F. R. C. SILICA SHAPES

F. R. C. Silica Straight.....
9x4½x2½

F. R. C. Silica Large 9 inch....
9x6¾x2½



F. R. C. Silica Small 9 inch....
9x3½x2½

F. R. C. Silica Soap.....
9x2½x2¼

F. R. C. Silica No. 1 Arch.....
9x4½x2½x2⅛
72 brick to the circle.
4 feet inside diameter.

F. R. C. Silica No. 2 Arch.....
9x4½x2½x1¾
42 brick to the circle.
2 feet inside diameter.

F. R. C. SILICA SHAPES

F. R. C. Silica No. 3 Arch.....
9x4½x2½x1
20 brick to the circle.
6½ inch inside diameter.

F. R. C. Silica No. 1 Split.....
9x4½x1¼

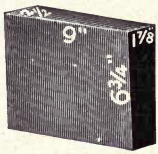
F. R. C. Silica No. 2 Split.....
9x4½x2

F. R. C. Silica No. 1 Wedge....
9x4½x2½x1⅞
102 brick to the circle.
5 feet inside, 6½ feet outside diameter.

F. R. C. Silica No. 2 Wedge ...
9x4½x2½x1½
63 brick to the circle.
2½ feet inside, 4 feet outside diameter.

F. R. C. Silica No. 3 Wedge ...
9x4½x3x2
56 brick to the circle.
3 feet inside, 4½ feet outside diameter.

F. R. C. SILICA SHAPES



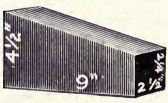
F. R. C. Silica Large 9 inch No. 1 Wedge.....
9x6¾x2½x1⅞
102 brick to the circle.
5 feet inside, 6½ feet outside diameter.

F. R. C. Silica Large 9 inch No. 2 Wedge.....
9x6¾x2½x1½
63 brick to the circle.
2½ feet inside, 4 feet outside diameter.

F. R. C. Silica No. 1 Key.....
9x4½x4x2½
112 brick to the circle.
12 feet inside, 13½ feet outside diameter.

F. R. C. Silica No. 2 Key.....
9x4½x3½x2½
65 brick to the circle.
6 feet inside, 7½ feet outside diameter.

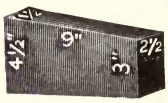
F. R. C. Silica No. 3 Key.....
9x4½x3x2½
41 brick to the circle.
3 feet inside, 4½ feet outside diameter.



F. R. C. Silica No. 4 Key.....
9x4½x2½x2¼
26 brick to the circle.
1½ feet inside, 3 feet outside diameter.

F. R. C. SILICA SHAPES

F. R. C. Silica Key Wedge.....
9x4½x3x2½x1½



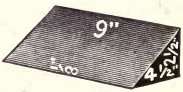
F. R. C. Silica No. 1 Jamb.....
9x4½x2½

F. R. C. Silica No. 2 Side Skew.
9x4½x2½x1¾
9x4½x2½x2½
9x4½x2½x2¾

F. R. C. Silica End Skew.....
9x7x4½x2½

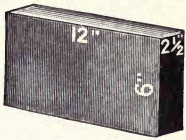
F. R. C. Silica No. 3 Neck or Point.....
9x4½x2½x⅝

F.R.C. Silica Feather Edge....
9x4½x2½x⅛



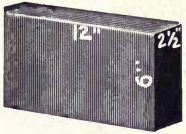
F. R. C. SILICA SHAPES

F. R. C. Silica 12 inch Straight.....
12x6x2½

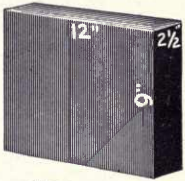


F. R. C. Silica 12 inch No. 1 Wedge.....
12x6x3x2½
10 feet inside diameter.

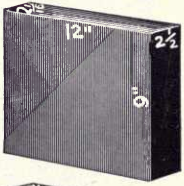
F. R. C. Silica 12 inch No. 2 Wedge.....
12x6x3x2
4 feet inside diameter.



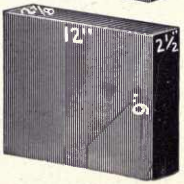
F. R. C. Silica 12 inch Soap....
12x9x2½



F. R. C. Silica 12 inch No. 1 Wedge Soap.....
12x9x2$\frac{1}{8}$x2½



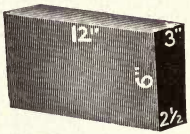
F. R. C. Silica 12 inch No. 2 Wedge Soap.....
12x9x2⅞x2½



F. R. C. SILICA SHAPES

F. R. C. Silica 12 inch No. 1 Arch.....

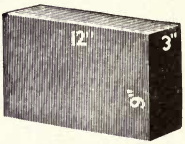
12x6x3x2½
75 brick to the circle.
5 feet inside, 6 feet outside diameter.



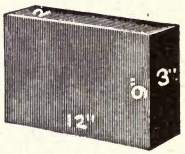
F. R. C. Silica 12 inch No. 2 Arch.....

12x6x2½x2
75 brick to the circle.
4 feet inside, 5 feet outside diameter.

F. R. C. Silica 12x9x3 inch Straight Soap.....

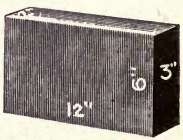


F. R. C. Silica 12x9x3x2 inch Wedge Soap .....



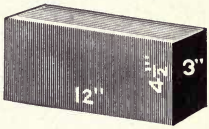
F. R. C. Silica 12x6x3 inch Straight.....

F. R. C. Silica 12x6x3x2 inch Wedge.....

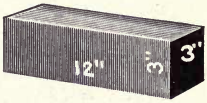


F. R. C. SILICA SHAPES

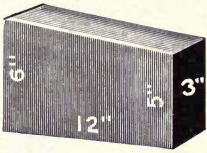
F. R. C. Silica 12x4½x3 inch Binder.....



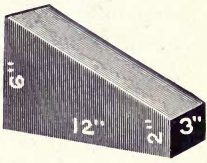
F. R. C. Silica 12x3x3 inch Soap.....



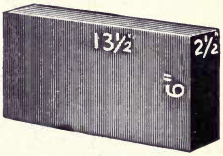
F. R. C. Silica 12x6x5x3 inch Key.....



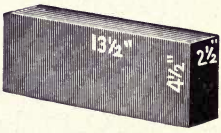
F. R. C. Silica 12x6x2x3 inch Skew .....



F. R. C. Silica 13½x6x2½ inch Straight.....

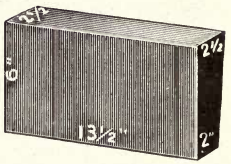


F. R. C. Silica 13½x4½x2½ inch Binder Brick.....

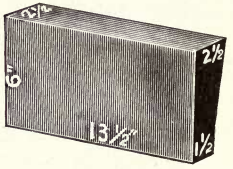


F. R. C. SILICA SHAPES

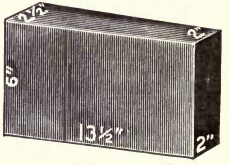
F. R. C. Silica 13½ inch
No. 1 Arch .....
13½x6x2½x2



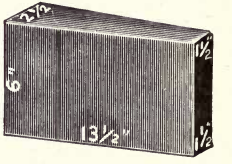
F. R. C. Silica 13½ inch
No. 2 Arch .....
13½x6x2½x1½



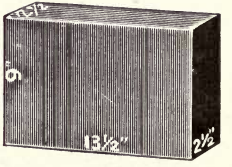
F. R. C. Silica 13½ inch
No. 1 Wedge .....
13½x6x2½x2



F. R. C. Silica 13½ inch
No. 2 Wedge .....
13½x6x2½x1½



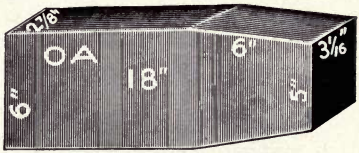
F. R. C. Silica
13½x9x2½ inch Straight..

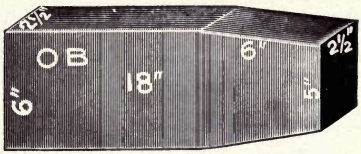


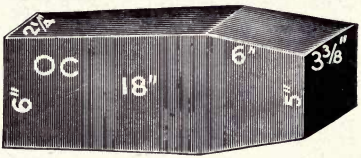
SILICA SHAPES

ORTH REINFORCED ROOF FOR OPEN HEARTH FURNACES

PATENTED







Shapes marked "OA" "OB" "OC" for 12 inch Orth Rib Roof Construction.

Shapes marked "O8" "O9" "O10" for 9 inch Orth Rib Roof Construction.

Shapes marked "ORZ" F are repair shapes for both 9 inch and 12 inch Roof when Ribs are spaced 24 inch centers.

CHROME DEPARTMENT

In this department the same personal supervision is used. Our Chrome Ore, which we supply either in lump or ground form, is far superior to any other imported ore. We carry all grades of Lump Chrome Ore and can furnish an ore best adapted to your use. In the ground form we have a mixture of our own which is peculiarly adapted to Open Hearth Practice and Copper Smelting Furnaces.

In Copper Furnace Roofs we have obtained remarkable results by the use of our Copper Furnace Cement which can not be duplicated by other manufacturers.

ANALYSES.

IMPERIAL CHROME ORE:	(Dry Ore Percent.)
Sesquioxide of Chromium	51.84
Protoxide of Iron	11.21
Peroxide of Iron	.68
Magnesia	16.88
Alumina	14.92
Silica	3.48
Oxide of Manganese	.60
Lime	-----
Sulphuric Acid	-----
Phosphoric Acid	.02
Combined water, etc	.55
	100.18
Moisture in sample as received	.09%

FEDERAL JAPANESE CHROME ORE: (Dry Ore Percent.)

Sesquioxide of Chromium	42.31
Silica	2.58
Oxide of Iron	15.53
Alumina	21.71
Magnesia	17.66
Moisture	0.21
	100.00

FEDERAL TURKISH CHROME ORE:

Sesquioxide of Chromium	44.55
Ferrous Oxide	15.25
Silica	5.40
Lime	.20
Magnesia	19.10
Alumina	15.20
Moisture	.30
	100.00

We use a combination of these ores in the manufacture of the Chrome Brick, which with our long experience produces the well known brand **F. R. C. Chrome Brick.**

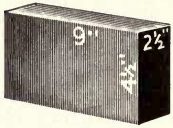
Our brick are noted for their hardness, which, with our superior workmanship and high-grade ores, produce a brick which cannot be surpassed either in this country or abroad.

On the following pages are found shapes which we carry in stock. Special shapes will be made to order.

CHROME DEPARTMENT

CHROME SHAPES IN STOCK

9 inch Straight.....
9x4½x2½

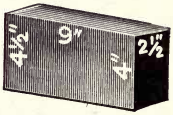


9 inch Wedge.....
9x4½x2½x1¾

9 inch Arch.....
9x4½x2½x1¾

9 inch Split.....
9x4½x1¼

No. 1 Key.....
9x4½x4x2½
12 feet inside diameter.
112 brick to circle.



No. 2 Key.....
9x4½x3½x2½
6 feet inside diameter.
65 brick to circle.

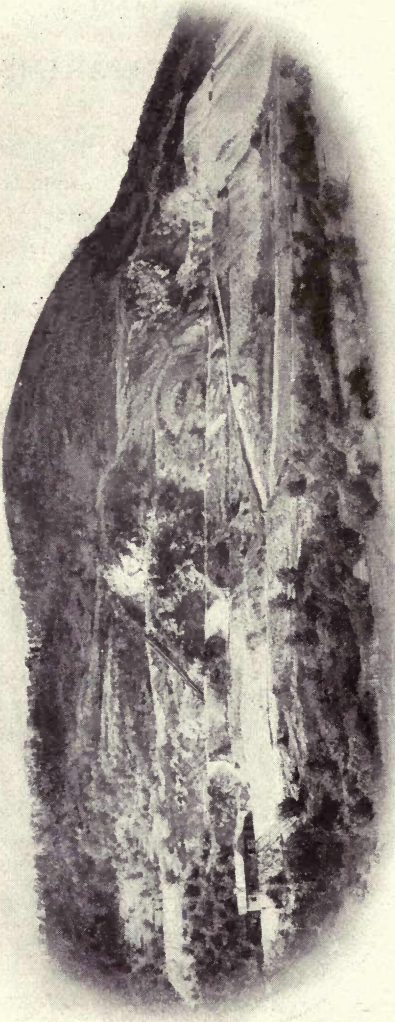
MAGNESITE DEPARTMENT

We import the highest grade of Dead Burned Magnesite from Europe, which is mined from the celebrated Magnesite deposits at Hisnyóviz, Hungary. This material is controlled and imported direct by ourselves and to insure nothing but high grade material we have our representative there at all times. As it comes from only one operation, which is analyzed daily, we can at all times maintain a very high standard. Our Magnesite is burned in the most modern Gas-fired Calcining Kilns and prepared by the best Magnetic Separator plant in Hungary. By the use of gas in the kiln, we keep **ashes** and all other **foreign material** from the Magnesite, thereby giving you nothing but clean material. In the old style of coal-fired kiln it is impossible to separate the ashes and foreign material from the Magnesite and you are compelled to buy a certain portion of ashes with your Magnesite.

By having only one operation we are assured of its uniformity and by the use of gas in burning we get cleanliness, thereby furnishing you with best Magnesite that can be produced.

We have made a very thorough examination of our deposit and know that we can maintain the same high standard for years to come.

We give on the following pages cuts of our plant and two average analyses of our material.



MAGNESITE MINE AT HISNYOVIZ, HUNGARY

BOOTH, GARRETT & BLAIR

CHEMISTS

PHILADELPHIA

Federal Refractories Co.,
307 Harrison Bldg.,
Philadelphia, Pa.

Gentlemen:—

In the sample of Federal Magnesite brick received from you on the 9th inst., we find

Silica	1.46%
Alumina	1.50%
Oxide of Iron	7.58%
Lime	3.14%
Magnesia	86.36%

Yours respectfully,

(Signed) BOOTH, GARRETT & BLAIR.

ÁLTALÁNOS MAGNESIT RÉSZVÉNYTÁRSASAG

F. sz. 700 Lapszám 640

Vegyelemzés.

A megvizsgált anyag neme: Szemcsés magnesit.
Szállittatott Ameriká. Nak.
Próbavétel ideje 1911, Augusztus, hó 30 án.

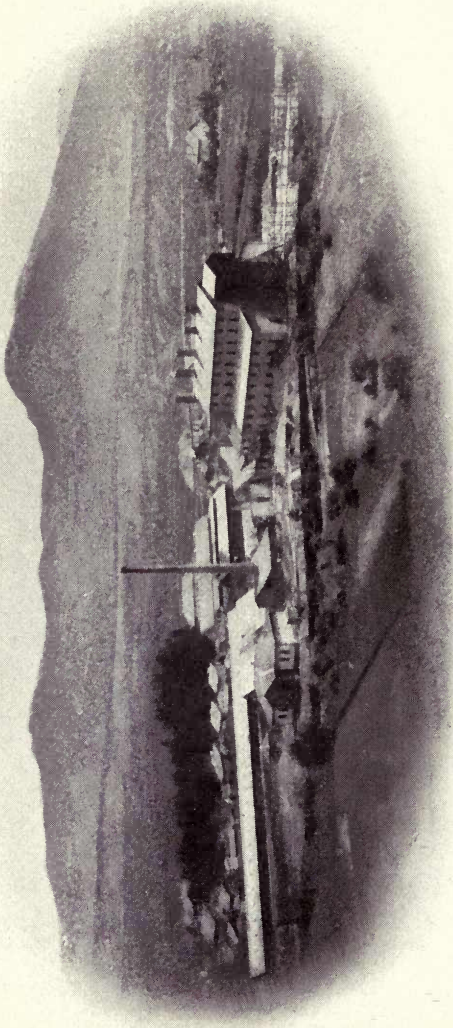
Elemzési eredmény:

1.58% $Si O_2$	Savban oldhatlan maradék *Rückstand*
8.93% $Fe_2 O_3$ $Al_2 O_3$	Vas- és Aluminium-oxyd *Eisenoxyd und Tonerde*
2.62% Ca O	Calcium-oxyd
86.73% Mg O	Magnesium-oxyd
0.14% CO+ HO+	Nedvesség *Feuchtigkeit*

Jegyzet. Napi productio, yjsli is nappali viálogatás.

Hisnyóviz, 1911, Szeptember, hó 1 én.

Látta: Az elemzést végezte:
I. ZENSDCL. HAVLINA ELEP.



MAGNESITE PLANT AT HISNYOVIZ, HUNGARY

MAGNESITE BRICK

Our Magnesite Brick are made from the material described in the foregoing pages. The brick are made at Alexandria, Pa., where we use every possible care in the manufacture of same. This with our long experience produces the famous

F. R. C. Brand of Magnesite Brick.

Excellent results are obtained from the use of Magnesite Brick in Open Hearth Steel Furnaces, Soaking Pits, Metal Mixers, Billet and Bar Heating Furnaces, Copper Reverberatories, Welding and Melting Furnaces, etc., and other places where they are subjected to continuous heat.

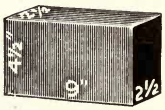
A list of the shapes which we carry in stock will be found on the following pages. Any special shapes will be made to order.

We imported the first Magnesite Brick we knew of in this country in 1890, since that time the use of these Brick has so increased that they are now manufactured at five different plants and the quality and workmanship of Federal Magnesite Brick is far better than those made abroad.

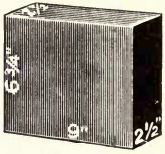
MAGNESITE DEPARTMENT

MAGNESITE SHAPES IN STOCK

9 inch size .....
9x4½x2½



Large 9 inch size.....
9x6¾x2½

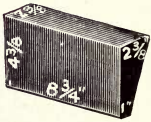


Straight, Standard Size.....
8¾x4⅜x2⅜

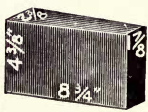
No. 1 Arch, Standard Size .....
8¾x4⅜x2⅜x2
86 brick to the circle.
58 inch inside diameter.

No. 2 Arch, Standard Size .....
8¾x4⅜x2⅜x1½
54 brick to the circle.
30 inch inside diameter.

No. 3 Arch, Standard Size.....
8¾x4⅜x2⅜x1



No. 1 Wedge, Standard Size ...
8¾x4⅜x2⅜x1⅞



MAGNESITE DEPARTMENT

MAGNESITE SHAPES IN STOCK

No. 2 Wedge, Standard Size . . .
8¾x4⅜x2⅜x1½
57 brick to the circle.
2 feet, 3 inches inside diameter.

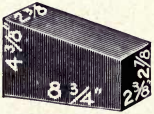
Soap, Standard Size. . . . . .
8¾x2⅜x2½

Split, Standard Size. . . . . .
8¾x4⅜x1¼

No. 1 Key, Standard Size. . . . . .
8¾x4⅜x4x2⅜
107 brick to the circle.
10 feet, 8 inches inside diameter

No. 2 Key, Standard Size . . . . . .
4⅜x8¾x2⅜x3¼

No. 3 Key, Standard Size. . . . . .
4⅜x8¾x2⅜x2⅞



No. 3 Neck, Standard Size . . . .
4⅜x8¾x2⅜x⅝

TABLE

Showing Number of Arch Bricks Required for Various Circles.

Diameter of Circle.		No. 2 Arch.	No. 1 Arch.	9-inch.	Total.
Ft.	In.				
2	0	42.	....	....	42.
2	6	10.	40.	...	50.
3	0	...	57.	....	57.
3	6	...	57.	7.	64.
4	0	...	57.	15.	72.
4	6	...	57.	22.	79.
5	0	...	57.	29.	86.
5	6	...	57.	37.	94.
6	0	...	57.	44.	101.
6	6	...	57.	52.	109.
7	0	...	57.	59.	116.
7	6	...	57.	67.	124.
8	0	...	57.	74.	131.
8	6	...	57.	82.	139.
9	0	...	57.	89.	146.
9	6	...	57.	97.	154.
10	0	...	57.	104.	161.
10	6	...	57.	112.	169
11	0	...	57.	119.	176.
11	6	...	57.	127.	184.
12	0	...	57.	134.	191.

TABLE

Showing Number of 9 inch Key Bricks Required for Various Circles.

Diam. of Circle.		No. 4.	No. 3.	No. 2.	No. 1.	9 Inch.	Total.
Ft.	In.						
1	6	25.	.....	.....	.....	.....	25.
2	0	17.	13.	.....	.....	.....	30.
2	6	9.	25.	.....	.....	.....	34.
3	0	.....	38.	.....	.....	.....	38.
3	6	.....	32.	10.	.....	.....	42.
4	0	.....	25.	21.	.....	.....	46.
4	6	.....	19.	32.	.....	.....	51.
5	0	.....	13.	42.	.....	.....	55.
5	6	.....	6.	53.	.....	.....	59.
6	0	.....	.....	63.	.....	.....	63.
6	6	.....	.....	58.	9.	.....	67.
7	0	.....	.....	52.	19.	.....	71.
7	6	.....	.....	47.	29.	.....	76.
8	0	.....	.....	42.	38.	.....	80.
8	6	.....	.....	37.	47.	.....	84.
9	0	.....	.....	31.	57.	.....	88.
9	6	.....	.....	26.	66.	.....	92.
10	0	.....	.....	21.	76.	.....	97.
10	6	.....	.....	16.	85.	.....	101.
11	0	.....	.....	11.	94.	.....	105.
11	6	.....	.....	5.	104.	.....	109.
12	0	.....	.....	.....	113.	.....	113.
12	6	.....	.....	.....	113.	4.	117.
13	0	.....	.....	.....	113.	9.	122.
13	6	.....	.....	.....	113.	13.	126.
14	0	.....	.....	.....	113.	17.	130.
14	6	.....	.....	.....	113.	21.	134.
15	0	.....	.....	.....	113.	26.	139.
15	6	.....	.....	.....	113.	30.	143.
16	0	.....	.....	.....	113.	34.	147.
16	6	.....	.....	.....	113.	38.	151.
17	0	.....	.....	.....	113.	42.	155.
17	6	.....	.....	.....	113.	46.	159.
18	0	.....	.....	.....	113.	51.	164.
18	6	.....	.....	.....	113.	55.	168.
19	0	.....	.....	.....	113.	59.	172.
19	6	.....	.....	.....	113.	63.	176.
20	0	.....	.....	.....	113.	67.	180.
20	6	.....	.....	.....	113.	72.	185.
21	0	.....	.....	.....	113.	76.	189.
21	6	.....	.....	.....	113.	80.	193.
22	0	.....	.....	.....	113.	84.	197.
22	6	.....	.....	.....	113.	88.	201.
23	0	.....	.....	.....	113.	93.	206.
23	6	.....	.....	.....	113.	97.	210.
24	0	.....	.....	.....	113.	101.	214.
24	6	.....	.....	.....	113.	105.	218.
25	0	.....	.....	.....	113.	109.	222.
25	6	.....	.....	.....	113.	113.	226.

TABLE

Showing Number of Wedge Bricks Required for Various Circles.

Diameter of Circle Inside.		No. 2 Wedge.	No. 1 Wedge.	9 Inch, or Square.	Total.
Ft.	In.				
2	6	60.	...	...	60.
3	0	48.	20.	...	68.
3	6	36.	40.	...	76.
4	0	24.	59.	...	83.
4	6	12.	79.	...	91.
5	0	...	98.	...	98.
5	6	...	98.	8.	106.
6	0	...	98.	15.	113.
6	6	...	98.	23.	121.
7	0	...	98.	30.	128.
7	6	...	98.	38.	136.
8	0	...	98.	46.	144.
8	6	...	98.	53.	151.
9	0	...	98.	61.	159.
9	6	...	98.	68.	166.
10	0	...	98.	76.	174.
10	6	...	98.	83.	181.
11	0	...	98.	91.	189.
11	6	...	98.	98.	196.
12	0	...	98.	106.	204.

TABLE

Showing Number of "13½ in." Key Bricks Required for Various Circles.

Diameter of Circle.		No. 2 Key.	No. 1 Key.	Straights.	Total.
Ft.	In.				
6	0	53.	...	...	53.
6	6	52.	5.	...	57.
7	0	48.	12.	...	60.
7	6	42.	21.	...	63.
8	0	36.	30.	...	66.
8	6	30.	40.	...	70.
9	0	24.	49.	...	73.
9	6	18.	58.	...	76.
10	0	12.	67.	...	79.
10	6	8.	74.	...	82.
11	0	6.	79.	...	85.
11	6	4.	84.	...	88.
12	0	...	91.	...	91.
12	6	...	91.	3.	94.
13	0	...	91.	6.	97.
13	6	...	91.	9.	100.
14	0	...	91.	13.	104.
14	6	...	91.	16.	107.
15	0	...	91.	19.	110.
15	6	...	91.	22.	113.
16	0	...	91.	25.	116.
16	6	...	91.	28.	119.
17	0	...	91.	31.	122.
17	6	...	91.	34.	125.
18	0	...	91.	37.	128.
18	6	...	91.	40.	131.
19	0	...	91.	43.	134.
19	6	...	91.	46.	137.
20	0	...	91.	49.	140.
20	6	...	91.	52.	143.
21	0	...	91.	56.	147.
21	6	...	91.	59.	150.
22	0	...	91.	62.	153.
22	6	...	91.	65.	156.
23	0	...	91.	68.	159.
23	6	...	91.	71.	162.
24	0	...	91.	74.	165.
24	6	...	91.	77.	168.
25	0	...	91.	81.	172.
25	6	...	91.	84.	175.

CIRCUMFERENCE OF CIRCLES

Diam.	Circum.	Diam	Circum.	Diam.	Circum.
1/8	.3926	12	37.69	32	100.5
1/4	.7854	1/2	39.27	33	103.6
3/8	1.178	13	40.84	34	106.8
1/2	1.570	1/2	42.41	35	109.9
5/8	1.963	14	43.98	36	113.0
3/4	2.356	1/2	45.55	37	116.2
7/8	2.748	15	47.12	38	119.3
1	3.141	1/2	48.69	39	122.5
1/8	3.534	16	50.26	40	125.6
1/4	3.972	1/2	51.83	41	128.8
3/8	4.319	17	53.40	42	131.9
1/2	4.712	1/2	54.97	43	135.0
5/8	5.105	18	56.54	44	138.2
3/4	5.497	1/2	58.11	45	141.3
7/8	5.890	19	59.69	46	144.5
2	6.283	1/2	61.26	47	147.6
1/4	7.068	20	62.83	48	150.7
1/2	7.854	1/2	64.40	49	153.9
3/4	8.639	21	65.97	50	157.0
3	9.424	1/2	67.54	51	160.2
1/4	10.21	22	69.11	52	163.3
1/2	10.99	1/2	70.68	53	166.5
3/4	11.78	23	72.25	54	169.6
4	12.56	1/2	73.82	55	172.7
1/2	14.13	24	75.39	56	175.9
5	15.70	1/2	76.96	57	179.0
1/2	17.27	25	78.54	58	182.2
6	18.84	1/2	80.11	59	185.3
1/2	20.42	26	81.68	60	188.4
7	21.99	1/2	83.25	61	191.6
1/2	23.56	27	84.82	62	194.7
8	25.13	1/2	86.39	63	197.9
1/2	26.70	28	87.96	64	201.0
9	28.27	1/2	89.53	65	204.2
1/2	29.84	29	91.10	66	207.3
10	31.41	1/2	92.68	67	210.4
1/2	32.98	30	93.24	68	213.6
11	34.55	1/2	95.82	69	216.7
1/2	36.12	31	97.38	70	219.9
		1/2	98.96		

WORKING TEMPERATURES

	°Cent	°F.
Blast furnace at tuyeres	2000	3632
Blast furnace tapping	1600	2912
Open hearth furnace during boil	1500	2732
Medium hard steel at tapping	1600	2912
Gas leaving producers	700	1292
Gas leaving regenerators	1200	2192
Air leaving regenerators	1100	2012
Waste gas at stack	300	572
Medium steel ready to roll	1050	1922
Glass pots working	1050	1922
Glass pots refining	1325	2417
Tanks for casting glass	1325	2417
Crucible steel furnace	1300	2372
Cement rotary clinkering	1684	3000
Shale drain tile burning	871	1600
Composition earthenware	1015	1860
Fire clay stoneware burning	1610	2922
Fire clay sewer pipe, hottest	1048	1920
Shale sewer pipe, "	1016	1862
Fire clay paving brick, "	1048	1920
Shale paving brick, "	1000	1800
Under a boiler, "	1257	2295
Ingot being rolled	1065	1950
Heating furnace	1150	2120

TEMPERATURES

Table of Melting Points

To convert Fahrenheit degrees to Centigrade, subtract 32° and multiply by 5/9.

To convert Centigrade degrees to Fahrenheit, multiply by 9/5 and add 32°

Tallow	92° F.	Silver (pure)	1830° F.
Spermaceti	120° F.	Copper	2050° F.
White Wax	154° F.	Gold (coin)	2156° F.
Sulphur	239° F.	Cast Iron	2000° F. to 2200° F.
Tin	455° F.	Steel	2350° F. to 2550° F.
Bismuth	518° F.	Wrought Iron	2700° F. to 2900° F.
Lead	630° F.		
Zinc	793° F.		
Antimony	810° F.		

The appearance of a fire affords a good indication of the temperature of a furnace.

(A little practice reduces the error of high temperatures to within 100° F.)

Red, just visible	977° F.— 525° C.
Red, dull	1290° F.— 700° C.
Red, dull cherry	1472° F.— 800° C.
Red, full	1657° F.— 900° C.
Red, clear	1832° F.—1000° C.
Orange, deep	2012° F.—1100° C.
Orange, clear	2192° F.—1200° C.
White	2272° F.—1300° C.
White, bright	2552° F.—1400° C.
White, dazzling	2732° F.—1500° C. 2912° F.—1600° C.

Above table gives the colors of Iron caused by heat.
(Pouillet.)

MENSURATION

LENGTH

Circumference of circle = diameter × 3.1416.

Diameter of circle = circumference × 0.3183.

Side of square of equal periphery as circle = diameter × 0.7854.

Diameter of circle of equal periphery as square = side × 1.2732.

Side of an inscribed square = diameter of circle × 0.7071.

Length of arc = No. of degrees × diam. × 0.008727.

AREA

Triangle = base × ½ altitude.

Parallelogram = base × altitude.

Trapezoid = ½ sum of parallel sides × altitude.

Trapezium—found by dividing into two triangles.

Circle = diam. squared × 0.7854; or = circumference squared × 0.07958.

Sector of circle = length of arc × half radius.

Side of square of equal area to circle = diameter × 0.8862, also = circumference × 0.2821.

Diameter of circle of equal area to square = side × 1.1284.

Parabola = base × ⅔ height.

Ellipse = long diam. × short diam. × 0.7854.

Regular polygon = sum of sides × ½ perpendicular distance from center to sides.

Surface of cylinder = circumference × height + area of both ends.

Surface of sphere = diam. squared × 3.1416; also = circumference × diameter.

Surface of right pyramid or cone = periphery or circumference of base × ½ slant height.

MENSURATION—Continued

SOLID CONTENTS

Prism, right or oblique, = area of base × perpendicular height.

Cylinder, right or oblique, = area of section at right angles to sides × length of side.

Sphere = diam. cubed × 0.5236, also surface × ⅙ diameter.

Pyramid or cone, right or oblique, regular or irregular, = area of base × ⅓ perpendicular height.

PRISMOIDAL FORMULA

A prismoid is a solid bounded by six plane surfaces only two of which are parallel.

To find the contents of a prismoid, add together the area of two parallel surfaces and four times the area of section taken midway between and parallel to them, and multiply the sum by ⅙ of the perpendicular distance between the parallel surfaces.

MISCELLANEOUS

A perch of masonry = 24.75 cubic feet.

A gallon (liquid measure) = 231 cubic inches.

One pound = 27.7 cubic inches of distilled water at its maximum density (39° Fahrenheit).

A Gunter's surveying chain = 66 feet, or 4 rods, 80 chains making a mile.

One barrel of Portland cement contains 3½ cubic feet and weighs 380 pounds.

One bushel contains 2150 cubic inches.

One gallon (dry measure) = 268.8 cubic inches.

One cubic foot of water weighs 62⅓ pounds and contains 7½ gallons.

WEIGHTS AND MEASURES

Avoirdupois

Gross Ton.	Cwts.	Pounds.	Ounces.
1.	20.	2240.	35840.
0.05	1.	112.	1792.
....	.0089	1.	16.
....	.....	0.0625	1.

Long Measure

Miles.	Rods.	Yards.	Feet.	Inches.
1.	320.	1760.	5280.	63360.
0.003125	1.	5.5	16.5	198.
0.000568	0.1818	1.	3.	36.
0.0001894	0.0606	0.3333	1.	12.
0.0000158	0.005051	0.02778	0.08333	1.

Square or Land Measure

Square Miles.	Acres.	Sq. Rods.	Sq. Yards.	Sq. Feet.	Sq. Ins
1	640.	102400.	3097600.	27878400.	.....
....	1.	160.	4840.	43560.	6272640.
....	....	1.	30.25	272.25	39204.
....	....	0.0331	1.	9.	1296.
....	....	.....	0.111	1.	144.
....	....	.....	.....	0.0069	1.

Cubic or Solid Measure

Cubic Yard.	Cubic Foot.	Cubic Inches.
1	27.	46656
..	1.	1728

Dry Measure

Struck Bu.	Pecks.	Quarts.	Pints.	Gallons.
1	4	32.	64.	8.
..	1	8.	16.	2.
..	..	1.	2.	0.25
..	..	0.5	1.	0.125
..	..	4.	8.	1.

SURVEYOR'S MEASURE

Sq. Mile.	Sq. Acre.	Sq. Chains.	Sq. Rods.
1	640	6400	102400
	1	10	160
		1	10

7.92 in. = 1 link. 25 links = 1 rod. 4 rods = 1 chain.

METRIC SYSTEM

Linear Measure

Denomination.	Abr.	Value.
Myriameter	.....	10000m
Kilometer	km..	1000m
Hectometer	.....	100m
Dekameter	.....	10m
Meter	m...	1m
Decimeter	dm..	.1m
Centimeter	cm ..	.01m
Millimeter	mm .	.001m

Measures of Surface

Denomination.	Abr.	Value.
Sq. Kilometer	km^2..	1000000m^2
Hectare	ha...	10000m^2
Are	a....	100m^2
Centare	.....	1m^2
Sq. Meter	m^2 ..	1m^2
Sq Decimeter	dm^2 .	.01m^2
Sq. Centimeter	cm^2..	.0001m^2
Sq. Millimeter	mm^2.	.000001m^2

Measures of Volume

Denomination.	Abr.	Value.
Kiloliter	.....	1000. 1.
Stere	s....	1000. 1.
Cubic meter	m^3 ..	1000. 1.
Hectoliter	hl ...	100. 1.
Dekaliter	dal...	10. 1.
Cu. Decimeter	dm^2..	1. 1.
Liter	1....	1. 1.
Deciliter	dl...	.1 1.
Centiliter	cl....	.01 1.
Cu. Centim.	cm^3..	.001 1.
Milliliter	ml...	.001 1.
Cu. Millimeter	mm^3.	.000001 1.
Microliter	2....	.001 ml.

Measures of Mass

Denomination.	Abr.	Value.
Millier	.....	1000 kg
Tonneau	.....	1000 kg
Metric Ton	t....	1000 kg
Quintal	q....	100 kg
Myriagram	.....	10 kg
Kilogram	kg...	1000 g
Kilo	.....	1000 g
Hectogram	.....	100 g
Dekogram	.....	10 g
Gram	g....	1 g
Decigram	dg...	.1 g
Centigram	cg...	.01 g
Milligram	mg...	.001 g
Microgram	y....	.001 mg

WEIGHT OF A CUBIC FOOT OF SUBSTANCES

	Pounds.
Aluminum	162
Anthracite, Solid	93
Anthracite, Loose	54
Ash, White, Dry	38
Asphaltum	87
Brass, Cast	504
Brass, Rolled	524
Brick, Best Pressed	150
Brick, Common, Hard	125
Brick, Soft, Inferior	100
Brick Work, Pressed	140
Brick Work, Ordinary	112
Brick, Fire	120
Cement, Hydraulic	50–56
Cement, Portland	100
Cherry, Dry	42
Chestnut, Dry	41
Clay, Potter's, Dry	119
Clay, in Lump, Loose	63
Coal, Bituminous, Solid	84
Coal, Bituminous, Broken	49
Coke, Loose	26.3
Copper, Cast	542
Copper, Rolled	548
Earth, Loam, Dry, Loose	76
Earth, Loam, Moderately Rammed	95
Earth, Soft Flowing Mud	108
Elm, Dry	35
Flint	162
Granite	170
Gravel	90–106
Plaster of Paris	142
Hemlock, Dry	25
Hickory, Dry	53
Ice	58.7
Iron, Cast	450
Iron, Wrought	485
Lead	711
Lime, Loose	53
Limestone	168
Oak, Live, Dry	59
Oak, White, Dry	50
Pine, White, Dry	25
Pine, Yellow, Dry, Northern	35
Pine, Yellow, Dry, Southern	45
Sand, Loose	90–106
Sandstone	151
Shale	162
Snow, Fresh Fallen	5–12
Snow, Wet by Rain	15–50
Water	62⅓
Water, Sea	64
Zinc	437

Green Timber, ⅛ to ½ more than dry

USEFUL INFORMATION

Linear Expansion of Substances by Heat

To find the increase in the length of a bar of any material due to an increase of temperature, multiply the number of degrees of increase of temperature by the coefficient for 100 degrees and by the length of the bar, and divide by 100.

NAME OF SUBSTANCE.	Coefficient for 100° Fahrenheit.	Coefficient for 180° Fahrenheit, or 100° Centigrade
Baywood, (in the direction of the grain, dry)	.00026 to .00031	.00046 to .00057
Brass, (cast)	.00104	.00188
Brass, (wire)	.00107	.00193
Brick, (fire)	.0003	.0005
Cement, (Roman)	.0008	.0014
Copper	.0009	.0017
Deal, (in the direction of the grain, dry)	.00024	.00044
Glass, (English flint)	.00045	.00081
Glass, (French white lead)	.00048	.00087
Gold	.0008	.0015
Granite, (average)	.00047	.00085
Iron, (cast)	.0006	.0011
Iron, (soft forged)	.0007	.0012
Iron, (wire)	.0008	.0014
Lead	.0016	.0029
Marble, (Carrara)	.00036 to .0006	.00065 to .0011
Mercury	.0033	.0060
Platinum	.0005	.0009
Sandstone	.0005 to .0007	.0009 to .0012
Silver	.0011	.002
Slate, (Wales)	.0006	.001
Water, (varies considerably with the temperature)	.0086	.0155

CHEMICAL ELEMENTS, THEIR SYMBOLS AND ATOMIC WEIGHTS

Aluminum	Al.	27.	Manganese	Mn.	55.
Antimony	Sb.	120.	Mercury	Hg.	200.
*Argon	A.	20.	Molybdenum	Mo.	95.9
Arsenic	As.	75.	Nickel	Ni.	58.6
Barium	Ba.	137.	Nitrogen	N.	14.
Bismuth	Bi.	208.	Osmium	Os.	191.
Boron	B.	11.	Oxygen	O.	16.
Bromine	Br.	80.	Palladium	Pd.	106.2
Cadmium	Cd.	112.	Phosphorus	P.	31.
Caesium	Cs.	133.	Platinum	Pt.	194.3
Calcium	Ca.	40.	Potassium	K.	39.
Carbon	C.	12.	Rhodium	Rh.	104.1
Cerium	Ce.	141.5	Rubidium	Rb.	85.
Chlorine	Cl.	35.4	Ruthenium	Ru.	103.5
Chromium	Cr.	52.3	Scandium	Sc.	44.
Cobalt	Co.	58.7	Selenium	Se.	79.
Columbium	Cb.	93.7	Silicon	Si.	28.
Copper	Cu.	63.2	Silver	Ag.	108.
Didymium	Di.	145.	Sodium	Na.	23.
Erbium	E.	166.	Strontium	Sr.	87.5
Flourine	F.	19.	Sulphur	S.	32.
Gallium	Ga.	69.9	Tantalum	Ta.	182.
Germanium	Ge.	72.3	Tellurium	Te.	125.
Glucinum	Gl.	9.	Thallium	Tl.	204.
Gold	Au.	196.7	Thorium	Th.	232.
*Helium	He.	2.	Tin	Sn.	118.
Hydrogen	H.	1.	Titanium	Ti.	48.
Indium	In.	113.7	Tungsten	W.	184.
Iodine	I.	127.	Uranium	U.	240.
Iridium	Ir.	192.5	Vanadium	V.	51.1
Iron	Fe.	56.	Ytterbium	Yt.	173.2
Lanthanum	La.	138.5	Yttrium	Y.	89.
Lead	Pb.	207.	Zinc	Zn.	65.
Lithium	Li.	7.	Zirconium	Zr.	90.4
Magnesium	Mg.	24.			

*The atomic weights of Argon and Helium are not accurately known.

SPECIFIC GRAVITY OF VARIOUS SUBSTANCES

Aluminum	2.60—2.75
Asphaltum	1.10—1.20
Brass	8.40—8.70
Brick, Hard Red	1.53—2.30
Aluminite Brick	2.65
Ordinary Fire Brick	1.40—2.00
Cement, ground, loose	1.85
Charcoal	.44
Clay, dry	1.80—2.60
Coal, bituminous	1.20—1.50
Coal, anthracite	1.40—1.70
Coke, loose	.55
Concrete	2.47
Copper	8.78—9.00
Earth	1.30—1.80
Glass, window	2.64
Granite	2.50—3.00
Iron	7.10—7.50
Iron, wrought	7.79
Lead	11.37
Lime	2.30—3.20
Lime, slaked	1.30—1.40
Limestone	2.46—2.84
Masonry, stone, dry	2.00—2.55
Masonry, brick, dry	1.50—1.60
Oak, dry	.69—1.03
Pine	.35— .60
Quartz	2.5 —2.80
Sand, fine, dry	1.40—1.65
Sand, wet	1.90—2.05
Sand, coarse	1.40—1.50
Sandstone	2.20—2.50
Steel	7.26—7.86
Slate	2.60—2.70
Tin	7.20—7.30
Water	1.
Zinc	6.90—7.20

USEFUL INFORMATION

A Standard Fire Brick (straight) weighs 7 lbs.

A Standard Silica Brick weighs $6\frac{2}{10}$ lbs.

A Standard Magnesia Brick weighs 9 lbs.

A Standard Chrome Brick weighs 10 lbs.

A Silica Brick expands about $\frac{1}{8}$ inch per foot, when heated to 2,500°.

Clay Brick expand or shrink, dependent upon the proportion Silica to Alumina contained in the brick; but most Fire Clay Brick contain Alumina sufficient to show some shrinkage.

One cubic foot of wall requires 17, 9-inch bricks; one cubic yard requires 460. Where Keys, Wedges and other "shapes" are used, add 10 per cent, in estimating the number required.

In ordering Blast Furnace Linings customers should send us a sketch showing outline of space to be occupied by brick work, or inside lines with thickness of walls desired, if possible.

Those ordering for Cupolas and Stacks should be careful to designate in order both inside and outside diameters with height.

Silica Brick should be laid in Silica Cement and with the smallest joint possible.

To secure the best results, Fire Brick should be laid in the same clay from which they are manufactured.

One ton of ground clay should be sufficient to lay 3,000 ordinary bricks.

Ground Fire Brick or old Cupola Blocks mixed with Fire Clay make the best Cupola Daub known.

Be careful of your Furnace Stays. Silica Brick expand. Fire Clay Brick shrink.

Cool your Furnaces slowly.

Cold air after extreme heat is the hardest test on good Fire Brick.

The minimum carload of brick or clay is 50,000 pounds.

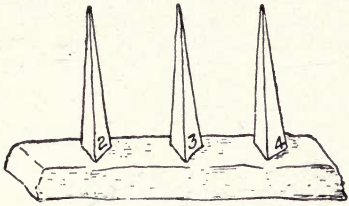
Clay or brick for shipment by boat must be sacked or barreled.

COMPARATIVE ANALYSES of Fire Clay used for the manufacture of different qualities of High Grade Fire Brick in this and foreign countries:

	Titanic Acid, TiO_2	Silica SiO_2	Alumina Al_2O_3	Combined Moisture H_2O	Moisture H_2O	Iron Fe_2O_3	Lime CaO	Magnesia MgO	Potash K_2O	Soda Na_2O	Total Impurities	Loss
Strasburg, O	.45	55.87	41.39	.....	.....	1.60	.40	.30	.29	.20	2.79	.....
Cumberland Co., Md	1.15	56.80	30.08	7.60	.09	1.67	.....	.....	2.30	.....	3.97	.....
Woodbridge, N. J	.....	67.84	21.83	5.90	.08	1.57	.28	.24	2.24	.....	4.33	.....
Carter Co., Ky	.....	68.01	24.09	3.03	.....	1.01	3.01	.....	.....	.....	4.02	.....
Clearfield Co., Pa	.....	48.35	36.37	10.56	.....	2.00	.07	.12	2.54		4.73	.....
Clinton Co., Pa	1.46	63.18	23.70	6.87	.....	1.20	.17	.47	2.52		4.55	SO_2 .19
Clarion Co., Pa	1.02	44.61	38.01	13.63	.....	1.25	.08	.41	1.74		3.47	.....
Farrandsville, Pa	.....	45.26	37.85	13.30	.....	2.03	.08	.02	1.26		3.59	0.20
St. Louis Co., Mo	.....	67.47	19.33	7.73	2.72	2.56	.41	.07	1.07		5.14	.....
Göttwerth, Austria	.....	65.60	20.75	11.00	.....	2.00	1.65	Tr	Tr	.....	3.65	.....
Stourbridge, England	.....	73.82	15.88	6.45	.....	2.95	Tr	Tr	0.90		3.85	.....
Glenboig, Scotland	1.33	65.41	30.55	.....	.....	1.70	.....	.....	.....		3.58	.....
La Bouchade, France	.....	53.40	26.40	12.00	.....	4.20	.69	.64	0.55		4.20	.....
Coblentz, Germany	.....	55.46	31.74	9.37	.....	.59	.19	.14	2.49	.68	4.09	...
Diesdorf, Rhineland	.....	73.71	18.33	5.17	.....	.89	Tr	.10	2.12	.24	3.85	....
Dowlair, Wales	.....	67.12	21.18	4.82	1.39	1.85	.32	.84	2.02	.....	5.93	Org..90

SEGER CONES

What they are. Seger cones are little pyramidal-shaped masses of mineral composition, which soften and deform when subjected to the action of the appropriate heat. They are made in series, each member of which requires a different amount of heat-work to produce deformation. The difference in softening point between any two adjoining members of the series is kept as nearly equal as is possible, so that when the whole series is arranged in the order of fusibility they make a kind of pyrometric scale.



BEFORE FIRING

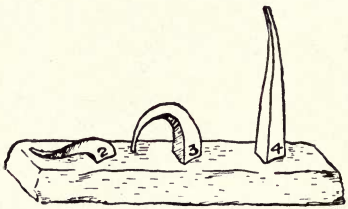
They were first produced in 1886 by Dr. Herman A. Seger, the foremost ceramic technologist of his time. They are not a patented article, as Dr. Seger gave his idea freely to the world, publishing his researches in full as he made them.

Where they are used. They find their chief use in the clay industry and allied industries, where the heat treatment is periodic, *i.e.*, where the kilns, starting at low temperature, progress gradually to the maximum, and then cool off for drawing the product. In industries like those of glass melting, cement manufacture or metallurgical operations, where the furnaces remain continuously at a high temperature, and where the materials are charged in and taken out continuously, the cones are not recommended for use.

What they are used for. They are used to reproduce in a kiln or furnace the same vitrification treatment in

consecutive operations. **Their softening or fusion is not wholly a matter of temperature.** The element of time enters in also. A longer exposure at a little lower temperature, or a shorter exposure at a little higher temperature, will accomplish the same amount of heat-work in the vitrification of clays or the fusion of silicates, provided the temperature is always above the critical point which is necessary for the chemical reactions to take place at all.

Both cones and clays are affected by heat in the same way, and under the same chemical laws. Hence, when cones and clays are heated in the same kiln, the melting of the cones gives the best way yet discovered to judge of the vitrification that has taken place in the clay.



AFTER FIRING

Temperature vs. Melting Point. For the fusion of any body of whatever nature, it is necessary not only that the critical point should be reached, but also that the temperature should be held a sufficient time to allow enough heat to be absorbed to convert the body from a solid to a liquid. This heat is called latent heat of fusion. For this reason cones, or any other device, depending upon the visible fusion of a mass of material, are not and cannot be an accurate mode of measuring temperature. Nevertheless, where the heat is applied at the same rate in consecutive burns, and the temperature is kept increasing steadily, the cones will melt at very uniform intervals, and may be used to measure temperatures with surprisingly consistent results.

For the convenience of users, a melting point expressed in degrees has been assigned to each cone number. This is fairly accurate for very rapid firing under closely controlled conditions in the laboratory, but in commercial clay burning the cones melt at lower temperatures than the printed table, depending upon the extent of divergence of the conditions. In extremely long firings, the difference between the assigned and the actual melting temperature may be 100° or even 150°C. This invalidates the cone as an accurate pyrometer, without at all affecting its reliability as a guide in clay burning.

The Different Series of Cones. The original cones, devised by Dr. Seger, covered a relatively narrow range of temperatures, and consisted of 20 different mixtures. There have been several series since devised by others, carrying the melting points higher and lower, until 56 different numbers are now being used. These are divided into four series.

The Hecht Series. For use only by china and glass decorators. This series is compounded of a very fusible lead-soda borate glass and kaolin, the glass alone making the softest cone, and successive additions of kaolin being used to raise the melting point of the higher members.

Symbol or Cone Number.	Approximate Melting Point.	
	Degrees Centigrade.	Degrees Fahrenheit.
022	590	1094
021	620	1148
020	650	1202
019	680	1256
018	710	1310
017	740	1364
016	770	1418
015	800	1472
012½	875	1607

These cones are very sensitive to reducing gases, owing to the lead used in their preparation.

The Cremer Series. Used for red-burning clays and for soft glazes, common bricks, sewer pipe, drain tiles, roofing tiles, flower pots, etc. Very few buff burning clays mature low enough for this series. It is compounded of a lime-soda borate glass, oxide of iron, feldspar, carbonate of lime, potters flint and kaolin, beginning with a large amount of glass for the softest cone and decreasing to almost none at the upper end.

Symbol or Cone Number.	Approximate Melting Point.	
	Degrees Centigrade.	Degrees Fahrenheit.
010	950	1742
09	970	1778
08	990	1814
07	1010	1850
06	1030	1886
05	1050	1922
04	1070	1958
03	1090	1994
02	1110	2030
01	1130	2066

These cones are somewhat sensitive to reducing gases or to very sulphury conditions, and to long firing. They work best in burns of short or moderate lengths, where clear fires can be maintained.

The Seger Series. Used for the harder red burning wares of the vitrified variety, and for all buff burning and white burning clay wares. This series is compounded of potters flint, feldspar, carbonate of lime and kaolin. In the lowest three, oxide of iron is used in addition. No glass is used. The proportion of kaolin and flint increases as the fusion temperature increases.

Symbol or Cone Number.	Approximate Melting Point.	
	Degrees Centigrade.	Degrees Fahrenheit.
1	1150	2102
2	1170	2138
3	1190	2174
4	1210	2210
5	1230	2246
6	1250	2282
7	1270	2318
8	1290	2354
9	1310	2390
10	1330	2426
11	1350	2462
12	1370	2498
13	1390	2534
14	1410	2570
15	1430	2606
16	1450	2642
17	1470	2678
18	1490	2714
19	1510	2750
20	1530	2786

Only the three lower members of this series are affected by reducing gases. All are less sensitive to sulphur fumes and endure long continued firing periods with less derangement than either of the preceding series.

High Temperature Series. Used for the testing of refractory materials, only. No clay wares are burned to such high melting points as this series. With the exception of the two lowest, only kaolin, potters flint and oxide of alumina are used in compounding, and the highest cone consists of pure oxide of alumina. No temperatures can be assigned with even approximate accuracy to this series, though 1850°C has been set as the melting point of No. 36. The melting points are therefore described by their effects on well known materials, instead of in degrees.

Symbol or Cone No.	RELATIVE ORDER OF FUSION.
26	Lowest grade for No. 2 refractory goods.
27	.....
28	.....
29	.....
30	Lowest grade for No. 1 refractory goods.
31	.....
32	Good quality No. 1 fire brick.
33	.....
34	Excellent quality No. 1 fire brick.
35	.....
36	Melting point of pure kaolin.
37	.....
38	Melting point of Bauxite of good quality.
39	.....
40	.....
41	.....
42	Melting point of pure alumina.

Where Cones are Obtained. The German government undertook the manufacture of Seger cones at the Royal Porcelain Factory at Charlottenburg, near Berlin, shortly after their discovery. They are distributed solely through the Tonindustrie Zeitung, a clayworkers journal of Berlin. They can be bought in the United States from Eimer & Amend, 205 Third avenue, New York, and other chemical supply houses.

Manufacture of cones in America began in Columbus, Ohio, by Professor Edward Orton, Jr., in 1896. They agree closely with the German article in all respects, and as they sell in America at a lower price than the German cones sell in Germany, they have secured the great bulk of the American trade. They can be procured at a uniform price of $1.00 per hundred, f.o.b., Columbus, Ohio, by addressing Prof. Edward Orton, Jr., Columbus, Ohio. They are not sold through agents or supply dealers.

TELEGRAPH CIPHER CODE

This Code is for the convenience and economy of our customers.

PRICES

Abacist.....At what price per M and how soon can you furnish **National** Brick.

Abner.....At what price per M and how soon can you furnish **Standard** Brick.

Abort.....At what price per M and how soon can you furnish **S. F. Co. W.** Brick.

Accident.....At what price per M and how soon can you furnish **Minor** Brick.

Accidental.....At what price per M and how soon can you furnish **Empire Brand Minor** Brick.

Accrue.....At what price per M and how soon can you furnish.....Brick.

Accrued.....At what price per M and how soon can you furnish.....**Carter Brand** Brick.

Accell.....At what price per M and how soon can you furnish **Federal Silica** Brick.

Accelled.....At what price per M and how soon can you furnish **Federal Magnesia** Brick.

Accellate.....At what price per M and how soon can you furnish **Federal Chrome** Brick.

Accellude.....At what price and how soon can you furnish **Federal Dead Burned Magnesite** in grain form.

Accelluded.....At what price and how soon can you furnish **Federal Dead Burned Magnesite** in dust.

Accent.....At what price per M and how soon can you furnish **Penn** Brick.

Accented.....At what price per M and how soon can you furnish **Aluminite** Brick.

Access.....At what price per M and how soon can you furnish **Lock Haven** Brick.

Account.....At what price per M and how soon can you furnish **Rotary Lining** Brick.

Accord.....At what price per ton and how soon can you furnish **Fire Clay.**

Acite.....At what price and how soon can you furnish **Federal Chrome Ore** in lump.

Acited.....At what price and how soon can you furnish **Federal Chrome Ore** ground fine.

Balance.....Can supply, in car lots, f. o. b. your city, **National** Brick per M at

Ballot.....Can supply, in car lots, f. o. b. your city. **Standard** Brick per M at

Baste.....Can supply, in car lots, f. o. b. your city, **S. F. Co. W.** Brick per M at

Battle.....Can supply, in car lots, f. o. b. your city, **Minor** Brick per M at

PRICES—Continued

Banter.....Brick per M at

Banner.....Can supply, in car lots, f. o. b. your city..... Brick per M at

Belfry.....Can supply, in car lots, f. o. b. your city, **Lock Haven** Brick per M at

Bank.....Can supply, in car lots, f. o. b. your city, **Aluminite** Brick per M, 9 in. count at

Banking.....Can supply, in car lots, f. o. b. your city, **Fire Clay** per ton in bulk at

Banish.....Can supply, in car lots, f. o. b. your city, **Penn** Brick per M at

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SHIPMENT

Band.....Can ship at once from stock if advised immediately.

Bane.....Can you furnish from stock. If not, how soon can you make and ship.

Brown.....Can you duplicate last shipment and at what price.

Burton.....We can duplicate last shipment at former price.

Boss.....We cannot duplicate last shipment at less than.

Cabbage.....What quantity can you ship, and how soon of.

Cabinet.....You must ship quickly.

Cachet.....Ship earliest possible moment.

Cart.....Ship by boat.....brick.

Cast.....Ship by boat.....barrels of clay in sacks.

Caddy.....Can you ship at once.....

Cactus.....Telegraph when you can ship and give route.

Case.....Trace by wire and give car number and route immediately, must have delivery.

Cadence.....Trace shipment by wire and send bill lading.

Cadger.....Your order will be shipped.....

Bant.....Can supply in car lots, f. o. b. your city, **Federal Silica** Brick per M at

Banter.....Can supply in car lots f. o. b. your city, **Federal Magnesia** Brick per M at

Bantered.....Can supply in car lots, f. o. b. your city, **Federal Chrome** Brick per M at

Bantel.....Can supply in car lots, f. o. b. your city, **Federal Dead Burned Grain Magnesite** Brick per M at

Banty.....Can supply in car lots, f. o. b. your city, **Federal Chrome Ore in Lump** at

Bast.....Can supply in car lots, f. o. b. your city, **Federal Chrome Ore Ground** at

SHIPMENT—Continued

Cafard.....Do not make shipment until advised.

Casting.....Ship.....**National** for heating furnace.

Carriage.....Ship.....**National** for puddling furnace.

Casse.....Ship.....**National** for boiler setting.

Cascade.....Ship.....**Standard** for boiler setting.

Cashbox.....Ship.....**Standard** for annealing furnaces.

Cashier.....Ship.....**Minor** for annealing furnaces.

Casino.....Ship.....**Lock Haven** for malleable iron furnace.

Caster.....Ship.....**Aluminite** Blocks for Rotary same as before.

Castrel.....Ship.....**Minor** Blocks for cupola lining, outside diameter is.

Castril.....Ship.....**Federal Silica** Brick for Open Hearth Furnace.

Castrilled.....Ship.....**Federal Silica** Cement for laying Silica Brick.

Castro.....Ship.....**Federal Magnesite** Brick.

Castrod.....Ship.....**Federal Chrome** Brick.

Castrum.....Ship.....**Federal Chrome** Ore Lump Low Silica.

Castruet.....Ship.....**Federal Chrome** Ore Ground Low Silica.

Castut.....Ship.....**Federal Magnesite** in Grain form for Bottoms.

Castur.....Ship.....**Federal Magnesite** in Dust for laying brick.

Casual.....Ship ½ each car brick and clay.

Catcall.....Ship.....Tons **No. 1 Ground Fire Clay.**

Canon.....Ship.....Tons **Common Ground Fire Clay.**

Candle.....Ship.....barrels of fire clay.

Caulker.....Ship.....carload fire clay in bulk.

Crarat.....Ship.....carload fire clay in barrels.

Calk.....Ship balance carload square brick.

Cork.....Ship balance carload fire clay.

Cow.....Ship balance minimum carload square brick.

Cat.....Ship balance minimum carload fire clay.

Count.....Do not ship material until further notice on our order number.....

Cable.....If rate is same, route shipment via.....

Capable.....Give us specifications longest time possible before shipments are required.

SHIPMENT—Continued

Calyt.....What quantity of order.....have you ready for shipment.

Calfskin.....Telegraph date of shipment with car number and route.

Calico.....What date will you ship our order No. .....

Carius.....40,000 pounds is minimum capacity of carload shipment.

ANSWERS

Child.....Brick in kiln now burning, will be cool enough to handle in.....

Chilly.....Brick in kiln now loading, will ship.....

Chime.....Brick loading, wire route and shipping instructions.

Choir.....We have shipped you to-day and will trace car number.....

Choke.....Cars will be shipped.....will trace.

Chink.....Wire car numbers on order number.

Cheval.....Wire car numbers and route order number.

Chess.....Cannot get cars, shipments delayed on account of railroad.

Chamois.....Factory badly crippled for want of cars.

Chasm.....Cannot get cars for your route, can we ship via

Chat.....Railroad promises cars for shipment.

Chapel.....Can ship as soon as we can obtain cars.

Chaos.....Have in stock in our warehouse here only.

Chalet.....If able to get better rate will wire you.

Chapter.....If better rate is secured will give you benefit of same.

Cherry.....Wire us if you can get better rate of freight.

ANALYSIS

Hack.....Quote price delivered and send analysis of Aluminite brick.

Hato.....Quote price delivered and analysis of Chrome Ore.

Hata.....Quote price delivered and analysis of Magnesite.

Hand.....What percentage of Alumina does analysis of .....brick show.

Heart.....What percentage of Silica does analysis of .....brick show.

Hate.....brick shows by analysis to contain Alumina to a percentage of.....

Hat.....brick shows by analysis to contain Silica to a percentage of.....

High.....Analysis gives only a trace of.....

Help.....For your work what analysis do you require.

TELEGRAPH

Marble.....Telegraph at our expense.

Market.....Telegram received and will have prompt attention.

Mast.....Telegram not understood. Please make it clear.

Maze.....Telegram can be read by code but do not understand it.

Mark.....Telegram received too late to

Milk.....Telegraph when you will be in.....

Main.....Telegraph whether quotation is accepted or not.

Man.....Please reply immediately by telegraph.

Mall.....Please answer our letter of.....

SHAPES OF BRICK

Faculty.....9 in. Fire Brick.
Facutel.....Large 9 in. Brick.
Facial.....No. 1 Key.
Faction.....No. 2 Key.
Fagging.....No. 3 Key.
Faggot.....No. 4 Key.
Failless.....No. 1 Wedge.
Fainted.....No. 2 Wedge.
Fairhood.....No. 3 Wedge.
Fairness.....No. 1 Arch.
Fairy.....No. 2 Arch.
Fallacy.....Side Skew.
Fallow.....End Skew.
Falsetto.....Skew Back.
False.....No. 1 Neck.
Falsehood.....No. 2 Neck.
Fameless.....No. 3 Neck.
Fanatic.....No. 1 Jamb.
Fantacy.....No. 2 Jamb.
Fame.....No. 3 Jamb.

Farce.....outside diameter Circle Stack Liners.
Farming.....inch outside diameter Circle Brick.
Fardel.....inch outside diameter Cupola Block.

SIZES OF TILE

Fanlight.....12 x 12 x 2
Farcical.....12 x 15 x 2
Farenell.....12 x 18 x 2
Farfadet.....12 x 12 x 2½
Fairibole.....12 x 14 x 2½
Farsh.....12 x 15 x 2½
Fashion.....12 x 16 x 2½
Fastner.....12 x 18 x 2½
Fastnet.....12 x 20 x 2½
Fastening.....12 x 22 x 2½
Fastness.....12 x 24 x 2½
Fatalist.....12 x 30 x 2½
Fawn.....12 x 18 x 3
Fealty.....12 x 20 x 3
Feast.....12 x 24 x 3
Feaze.....12 x 30 x 3
Febrite.....12 x 36 x 3
Feeble.....12 x 18 x 4
Federal.....12 x 33 x 4
Feetless.....15 x 30 x 4
Feline.....15 x 36 x 4
Fullness.....20 x 20 x 4
Fellow.....3 x 6 x 17
Feldspar.....3 x 6 x 18
Felling.....3 x 6 x 19
Felt.....3 x 6 x 20
Female.....3 x 6 x 24

RATES

Reform.....What is lowest rate of freight you can obtain to.....

Regard.....Give through rate of freight, carload lots to....

Relax.....Give through rate of freight, in less than carload lots to.....

Scoff.....f. o. b. cars our works.

RATES—Continued

Scoop.....f. o. b. cars your city.
Silk.....We cannot obtain through rate to.....
Sigh.....Freight rate by rail in carloads to.....
Signal.....Freight rate by rail in less than carloads to....
Signet.....Freight rate by rail and water.
Signat.....Freight rate, all water, f.o.b. dock your city.
Signow.....Freight rate including handling brick.
Calf.....Have raised your order to minimum carload.
Caw.....Can we raise your order to minimum carload.
Crafish.....It will require.....more brick to make minimum carload.
Candor.....It will require.....tons clay to make minimum carload.

MONEY

Dab	One	dollars.
Dad	Two	"
Date	Three	"
Dare	Four	"
Daw	Five	"
Day	Six	"
Dale	Seven	"
Daisy	Eight	"
Daft	Nine	"
Dart	Ten	"
Dark	Eleven	"
Done	Twelve	"
Dog	Thirteen	"
Dyre	Fourteen	"
Disgust	Fifteen	"
Duty	Sixteen	"
Dare	Seventeen	"
Dine	Eighteen	"
Doctor	Nineteen	"
Docile	Twenty	"
Dodger	Twenty-one	"
Dogma	Twenty-two	"
Doleful	Twenty-three	"
Docket	Twenty-four	"
Divorce	Twenty-five	"
Ditty	Twenty-six	"
Diran	Twenty-seven	"
Divide	Twenty-eight	"
Distaff	Twenty-nine	"
Dogrel	Thirty	"
Distance	Thirty-one	"
Disrobe	Thirty-two	"
Diuretic	Thirty-three	"
Dizzy	Thirty-four	"
Dirt	Thirty-five	"
Dive	Thirty-six	"
Dire	Thirty-seven	"
Distress	Thirty-eight	"
Dissect	Thirty-nine	"
Dispute	Forty	"
Diverge	Fifty	"
Dispel	Twenty-five	Cents.
Displease	Fifty	"
Disdain	Seventy-five	"

DRAFTS

Dropsy.....I (we) have to-day drawn on you, and expect you to protect draft for.....

Dross.....Will make draft on you for amount of your account, if we do not hear from you before the.....

Drover.....Why do you not protect our draft?

ORDERS

Depose.....Cancel order unless you can fill it at once.

Deport.....Cannot cancel order on account of brick being made up.

Depict.....Do not fill our order until you receive full instructions by mail.

Density.....Cannot fill order for.....brick at once. Can we substitute something else of equal quality.

NUMBERS

Earn..... 500
Eater..... 1000
Ebbing..... 2000
Ebony..... 3000
Ecaille..... 4000
Ecbatic..... 5000
Echelon..... 6000
Echo..... 7000
Eclair..... 8000
Eclat..... 9000
Ecoiler.....10000
Ecurie.....11000
Edacity.....12000
Eddy.....13000
Edge.....14000
Edict.....15000
Edifice.....16000
Edify.....17000
Editor.....18000
Efface.....19000
Effete.....20000
Emply.....21000
Employ.....22000
Embark.....23000
Eider.....24000
Either.....25000
Effort.....26000
Efflux.....27000
Early.....28000
Effect.....29000
Elegance.....30000
Elder.....31000
Elicit.....32000
Elegy.....33000
Eloud.....34000
Effigy.....35000
Enforce.....36000
Engage.....37000
Elbow.....38000
Egotist.....39000
Elixir.....40000
Elvan.....50000
Ember.....60000
Emblem.....70000
Embassy.....80000
Emfat.....90000
Emperor....100000

DATES AND TIME

	Ultimo	Instant	Proximo
1st	Vacant.	Wable.	Weary.
2nd	Vacation.	Wad.	Weasel.
3rd	Vade.	Wadded.	Web.
4th	Vail.	Wag.	Weed.
5th	Valid.	Wager.	Weigh.
6th	Valise.	Wagon.	Wend.
7th	Valley.	Wail.	Whack.
8th	Valor.	Wain.	Whale.
9th	Vamp.	Wave.	Whang.
10th	Van.	Wake.	Wharf.
11th	Vandal.	Walk.	Wheat.
12th	Vanish.	Wall.	Wheel.
13th	Vapor.	Walnut.	Whelp.
14th	Varlet.	Wampum.	Whiff.
15th	Varnish.	Wander.	Whig.
16th	Vary.	Wane.	Whim.
17th	Vase.	Wanton.	Whine.
18th	Vat.	Warble.	Whip.
19th	Vault.	Warfare.	Whisk.
20th	Vein.	Warm.	Whit.
21st	Velvet.	Wary.	Whoop.
22nd	Vender.	Wash.	Wicked.
23rd	Venom.	Waste.	Widow.
24th	Vent.	Watch.	Wife.
25th	Venture.	Water.	Wig.
26th	Verbal.	Wattle.	Wild.
27th	Verdant.	Wavering.	Win.
28th	Verdure.	Wax.	Winch.
29th	Verge.	Weak.	Wind.
30th	Verse.	Wealth.	Wine.
31st	Vesper.	Wean.	Window.

CONCLUSION

To give a complete list of cuts would make this catalogue too bulky and cumbersome for reference, and the aim has been to enumerate only enough to represent the extent and variety of goods we manufacture. We make everything and anything in the line of fire brick.

The manufacture of clay products is a science and an art, and it takes years of practical experience to learn the nature of the material, the tests to which fire brick are subjected, and much other necessary knowledge, together with the most careful selection of clays and great skill in mixing, moulding and burning.

We own and mine our raw materials and coal, which, together with over 30 years experience, gives us a decided advantage in the manufacture of refractories.

We invite correspondence, and are pleased to give any information in our power that will help our customers in the proper selection of material adapted to their special work.

In conclusion we desire to thank our many customers for past favors, and shall hope to continue our pleasant relations, and at the same time to add new patrons to make our business even more successful in future.

Yours truly,

The Stowe-Fuller Co.

MEMORANDA

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