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ARBISON-WALKER
FRACTORIES COMPANY
PITTSBURGH, PA



FIRE BRICK AND
REFRACTORIES



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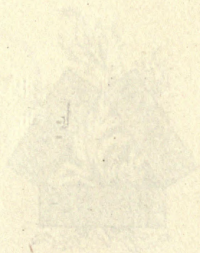
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CATALOGUE


containing useful
information in con-
nection with the use of

SILICA MAGNETITE
CHROME AND
FIRE CLAY BRICK
and various
REFRACTORIES



as furnished by the
HARRISON-WALKER
REFRACTORIES CO
Pittsburgh Pa

CATALOGUE

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information in con-
nection with the use of

*SILICA, MAGNESIA
CHROME AND
FIRE CLAY BRICK
and various
REFRACTORIES*



*as furnished by the
HARBISON-WALKER
REFRACTORIES CO
Pittsburgh — Pa.*

TN677
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DAILY CAPACITY, 1,100,000 BRICK

gwr

FIRE BRICK DEPARTMENT

GOOD material is the factor of supreme importance in all manufacturing business. During the growth and expansion of the fire brick business from small beginnings to the present output—corresponding to the growth and demands of the iron and steel industries—it has been the aim of this company to maintain the lead in supplying all demands for high grade fire brick and refractory material. To this end, all clay deposits, seemingly worthy of investigation, have been core drilled, the best experts employed and record maps placed on file, enabling the Company to open mines in the irregular formations of fire clay with exact knowledge of what will be opened. This work has been going on systematically for over thirty years. The results, with the association of a few of the most experienced and successful brick manufacturers, enable us to offer the following unrivaled list of well known brands of fire brick. Some of the brands are specially fitted for special work, as the “Benezet” for blast furnace linings. Some are similar in character to others, but owing to location of works one brand may obtain a more favorable freight rate in a given case. Correspondence or an interview will determine, according to circumstances, which is the most suitable brand to use. With a wide range of records on hand, the broadest experience in

the business, and the good will of over seven thousand patrons to maintain, it is reasonable for customers to assume that they will get reliable advice and careful attention to orders, however large or small.

The brands included carry the world's record for output of metal per furnace lining, blast furnace stove brick that neither disintegrate nor become vitrified with the severe changes of temperature and blast that occur in furnace stoves incident to conditions connected therewith, the best of brick for cupolas, rotary cement kilns, lime kilns, open hearth steel furnaces, copper smelting, boiler settings, continuous glass furnaces and general purposes where high temperatures are in use.

The brick intended for different parts of a blast furnace lining are branded "Hearth and Bosh," "Inwall" and "Top" to prevent the mason from making mistakes. The records held by these brands are the result of careful observation over a long period, and selection from the best Pennsylvania clays. Our Gansister rock used in making "Star" Silica brick is selected from decidedly the finest deposits of this rock to be found anywhere. "Star" Silica holds the best continuous records in open hearth steel, Talbot and continuous glass furnaces.

FIRE CLAY SHAPES IN STOCK

Shapes	Page	Brands	Shapes	Page	Brands		
9" Straight	20	Benezet	No. 1 Arch	20	Top Benezet		
	20	Hearth and Bosh		20	Woodland		
		Benezet		20	Hearth and Bosh		
	20	Inwall Benezet			Woodland		
	20	Top Benezet		20	Top Woodland		
	20	Woodland		20	H.-W. Special		
	20	Hearth and Bosh		20	Tyrone		
		Woodland		20	Quartzite		
	20	Inwall Woodland		No. 2 Arch	21	Benezet	
	20	Top Woodland			21	Hearth and Bosh	
	20	H.-W. Special				Benezet	
	20	Tyrone			21	Top Benezet	
	20	C.-Tyrone			21	Woodland	
	20	No. 2 Star			21	Hearth and Bosh	
	20	Quartzite				Woodland	
	20	Widemire			21	Top Woodland	
20	Pipe Benezet	21	H.-W. Special				
		21	Tyrone				
No. 1 Key	22	Benezet	21	Quartzite			
	22	Hearth and Bosh	No. 1 Split	21	Benezet		
		Benezet		21	Woodland		
	22	Inwall Benezet		21	H.-W. Special		
	22	Top Benezet		21	Tyrone		
	22	Woodland		21	Quartzite		
	22	Hearth and Bosh		No 2 Split	21	Benezet	
		Woodland			21	Woodland	
	22	Inwall Woodland			21	Quartzite	
	22	Top Woodland			No. 1 Wedge	21	Benezet
22	H.-W. Special	21				Woodland	
22	Tyrone	21	Tyrone				
22	C.-Tyrone	21	H.-W. Special				
22	Quartzite	21	Quartzite				
No. 2 Key	22	Benezet	No. 2 Wedge			21	Benezet
	22	Hearth and Bosh				21	Woodland
		Benezet		21		H.-W. Special	
	22	Top Benezet		21		Quartzite	
	22	Woodland		No. 3 Wedge		22	Benezet
	22	Hearth and Bosh			22	Woodland	
		Woodland			22	Quartzite	
	22	Top Woodland			No. 1 Jamb	22	Benezet
	22	H.-W. Special				22	Woodland
	22	Tyrone				No. 1 Circle	23	Benezet
22	C.-Tyrone	23	Woodland				
22	Quartzite	23	Hearth and Bosh				
No. 3 Key	22	Benezet					Woodland
	22	Woodland					
	22	C.-Tyrone					
No. 4 Key	22	Quartzite					
	22	Woodland					
No. 1 Arch	20	Benezet					
	20	Hearth and Bosh					
		Benezet					

FIRE CLAY SHAPES IN STOCK
 CONTINUED

Shapes	Page	Brands	Shapes	Page	Brands
No. 2 Circle	23	Benezet	13½" No. 4	32	Hearth and Bosh
	23	Woodland	Key	32	Benezet
	23	Hearth and Bosh		32	Top Benezet
		Woodland		32	Hearth and Bosh
No. 3 Circle	24	Woodland			Woodland
	24	Hearth and Bosh		32	Top Woodland
		Woodland			
No. 4 Circle	24	Woodland	9 x 6"	33	Hearth and Bosh
Soap	20	Benezet	Straight	33	Benezet
	20	Woodland		33	Inwall Benezet
	20	Tyrone		33	Top Benezet
	20	Quartzite			
Checker	38	Woodland	9 x 6" Key	33	Hearth and Bosh
No. 3 Neck	23	Woodland		33	Benezet
No. 2 Side Skew	22	Benezet		33	Inwall Benezet
	22	Woodland		33	Top Benezet
Large 9"	20	Benezet	Liner Brick	35	Coke—H.-W.
	20	Woodland	Bottom Tile	35	Co. Clay
Small 9"	20	Benezet	Trunnel	35	H.-W. Co. Clay
	20	Woodland			
No. 1 Cupola	24	Woodland	Bridge Block	25	Woodland
No. 2 Cupola	24	Woodland	Stock Hole	25	Woodland
No. 3 Cupola	25	Woodland	Regenerator	38	Inwall Benezet
No. 4 Cupola	25	Woodland	Tile	38	Tyrone
13½" Straight	32	Hearth and Bosh	101 Special	24	Woodland
	32	Benezet	Cover		
	32	Inwall Benezet	102 Special	24	Woodland
	32	Top Benezet	Cover		
	32	Hearth and Bosh	Bevel Cover	36	Woodland
	32	Woodland	Square Cover	36	Woodland
	32	Inwall Woodland	Arch Cover	36	Woodland
	32	Top Woodland	Hearth Block	51	Hearth and Bosh
13½" No. 2 Key	32	Hearth and Bosh		51	Benezet
	32	Benezet			Hearth and Bosh
	32	Inwall Benezet			Woodland
	32	Top Benezet	Bung Arch	21	Woodland
	32	Hearth and Bosh	No. 66	39	H.-W. Special
	32	Woodland	No. 72	39	H.-W. Special
	32	Inwall Woodland	No. 78	39	H.-W. Special
	32	Top Woodland	No. 84	39	H.-W. Special
Siemens Steel	68	Woodland	No. 12	40	H.-W. Special
Furnace Blocks			No. 13	40	H.-W. Special
Our Plan	70	Woodland			
Siemens Blocks					
Featheredge	27	Woodland			

SILICA SHAPES IN STOCK

Shapes	Page	Brands	Shapes	Page	Brands
9" Straight	20	Star	No. 2 Key	22	Star
	20	XX Sand		22	XX Sand
	20	XX Silica		22	XX Silica
Large 9"	20	Star	No. 3 Key	22	Star
	20	XX Sand		22	XX Sand
	20	XX Silica		22	XX Silica
Small 9"	20	Star	No. 4 Key	22	XX Sand
	20	XX Sand		22	XX Silica
	20	XX Silica			
Soap	20	Star	Key Wedge	—	Star
	20	XX Sand	No. 1 Jamb	22	Star
	20	XX Silica			
No. 1 Arch	20	Star	No. 2 Skew	22	Star
	20	XX Sand	No. 3 Neck	23	Star
	20	XX Silica			
No. 2 Arch	21	Star	Featheredge	27	Star
	21	XX Sand	12 x 6" Straight	27	Star
	21	XX Silica			
No. 3 Arch	27	Star	12" No. 1 Wedge	27	Star
No. 1 Split	21	Star	12" No. 2 Wedge	28	Star
	21	XX Sand	12" Soap	28	Star
	21	XX Silica			
No. 2 Split	21	Star	12" No. 1 Wedge Soap	28	Star
	21	XX Sand	12" No. 2 Wedge Soap	28	Star
	21	XX Silica			
No. 1 Wedge	21	Star	12" No. 1 R. Wedge	30	Star
	21	XX Sand	12" No. 1 R. Wedge Soap	30	Star
	21	XX Silica			
No. 2 Wedge	21	Star	12" No. 1 Arch	28	Star
	21	XX Sand	12" No. 2 Arch	28	Star
	21	XX Silica			
No. 3 Wedge	22	Star	12 x 6 x 3" Straight	29	Star
	22	XX Sand	12 x 9 x 3" Straight	29	Star
	22	XX Silica	13½ x 4½ x 2½"	29	Star
Large 9" No. 1 Wedge	27	Star	13½" Straight	29	Star
Large 9" No. 2 Wedge	27	Star	12" No. 1 Key	30	Star
No. 1 Key	22	Star	Siemens Steel Fur-	35, 37	Star
	22	XX Sand	nace Blocks		
	22	XX Silica	Coke Oven Crown	29	XX Silica



MAGNESIA AND CHROME DEPARTMENT

IN this department we manufacture one brand of chrome brick specially adapted for use where chemical action destroys other brick, and two brands of magnesia brick for use in basic open hearth steel furnaces or other places where basic material is required.

ORES USED IN MAGNESIA AND CHROME BRICK

MAGNESIA OR CALCINED MAGNESITE

OUR supplies of calcined magnesite are drawn from the best quarries known. These quarries have supplied the bulk of the calcined magnesite used in the steel trade, and the product is decidedly more uniform and satisfactory than that from any other source of supply.

For forming bottoms in open hearth steel furnaces we furnish a special calcined magnesite running low in silica.

CHROME ORE

Oxide of chromium, or, commercially, chrome ore, is the least responsive to chemical action of all refractory material obtainable at a price permitting of use in the arts. For this reason it is invaluable where chemical action prevents the use of ordinary material. The ore is used by many for special purposes. After experimenting with practically all of the known deposits of chrome ore in this country and abroad, we have adopted exclusively for our use and for the wants of our trade, two qualities which we consider superior to anything on the market. These are as follows:

First—"Special" low silica ore, which we recommend for practically everything in connection with basic open hearth steel practice.

Second—Fifty per cent. ore, which we recommend for chemical manufacturers and other special work.

Consumers will be supplied with the above ores, either ground or in lump form, on short notice.

MAGNESIA BRICK

THE material used in magnesia brick is watched carefully, the analysis being kept at a point that insures the highest standard as to refractoriness, and the ingredients are combined so that the brick excel in physical properties.

“Magnesia” are made from carefully selected calcined magnesite, of a quality that has been found most satisfactory and uniformly reliable for all work connected with steel manufacturing.

CHROME BRICK

CHROME BRICK are used as a neutral course to separate the fire clay brick used in lower courses of open hearth steel furnace hearths from the magnesite brick used for the inner and upper courses. Also for paving floors of gas ports as far from hearth as slag is liable to splash onto silica brick, and for quick repairs while furnace is at working heat, being specially suited for the latter purpose, as they are not affected by sudden changes of temperature. A few courses of chrome brick will be found useful in lower portions of soaking pits, or wherever slag or cinder is apt to cut out ordinary fire brick.

In copper furnaces chrome brick are used with marked success for lining the bosh of the furnace from the tuyere line down, also for lining the settlers. In both cases the scouring and chemical action that occurs with the slag and matte acting on clay brick does not occur with chrome brick.

In the side walls of matte and refining reverberatory copper furnaces, chrome brick will last from four to six times as long as clay or silica brick.

MAGNESIA SHAPES IN STOCK

Shapes	Page of Illustrat'n	
Straight, Standard Size.....	44	Magnesia
No. 1 Arch, Standard Size.....	44	Magnesia
No. 2 Arch, Standard Size.....	44	Magnesia
No. 1 Wedge, Standard Size.....	—	Magnesia
No. 2 Wedge, Standard Size.....	44	Magnesia
Soap, Standard Size.....	44	Magnesia
Split, Standard Size.....	44	Magnesia
No. 1 Key, Standard Size.....	44	Magnesia
No. 2 Key, Standard Size.....	—	Magnesia

CHROME SHAPES IN STOCK

Shapes	Page of Illustrat'n	
Straight, 9-inch.....	45	Chrome
No. 1 Wedge, 9-inch.....	45	Chrome
No. 2 Wedge, 9-inch.....	45	Chrome
No. 1 Key.....	45	Chrome
No. 2 Key.....	45	Chrome

REESE CLAY AND SILICA BRICK WORKS

THE Isaac Reese & Sons Company have been favorably known to the consumers of fire brick for a long period. The brands shown in table are made from high grade material, and are well suited for general mill work, pottery kilns, etc. The Reese brand of Silica brick has an enviable reputation for both open-hearth steel and continuous glass tank furnaces, backed up by some remarkable records.

The table on following page shows the shapes and brands made, with page of illustration.



REESE FIRE CLAY BRICK

Shapes	Page	Brands	Shapes	Page	Brands	
9-inch Straight .	20	Phoenix	No. 3 Wedge.....	22	Phoenix	
	20	Valley		22	Wallace	
	20	Wallace	No. 1 Key	22	Phoenix	
	20	W. F. B.		22	Wallace	
Large 9-inch	20	Phoenix		22	W. F. B.	
	20	Wallace	No. 2 Key	22	Phoenix	
Small 9-inch.....	20	Phoenix		22	Wallace	
	20	Wallace		22	W. F. B.	
Soap.....	20	Phoenix	No. 3 Key	22	Phoenix	
	20	Wallace		22	Wallace	
	20	W. F. B.	No. 4 Key	22	Phoenix	
Checker.....	38	Phoenix		22	Wallace	
	No. 1 Arch.....	20	Phoenix	No. 1 Jamb.....	22	Phoenix
20		Valley	22		Wallace	
20		Wallace	No. 2 Side Skew..	22	Phoenix	
20		W. F. B.		22	Wallace	
No. 2 Arch	21	Phoenix	Featheredge	27	Phoenix	
	21	Valley		No. 2 Neck.....	23	Phoenix
	21	Wallace	23		Wallace	
	21	W. F. B.	No. 3 Neck	23	Phoenix	
No. 1 Split	21	Phoenix		23	Wallace	
	21	Wallace	Stock Hole.....	25	Phoenix	
	21	W. F. B.		Boiler Tile 12 x 12 x 2 inch.. 26 15 x 12 x 2 inch. 26 18 x 12 x 2 inch.. 26		
No. 2 Split	21	Phoenix	Other sizes made to order			
	21	Wallace				
No. 1 Wedge....	21	Phoenix				
	21	Valley				
	21	Wallace				
	21	W. F. B.				
No. 2 Wedge....	21	Phoenix				
	21	Valley				
	21	Wallace				
	21	W. F. B.				

SILICA BRICK

Shapes	Page	Brands	Shapes	Page	Brands
9-inch Straight ...	20 20	Reese Basic	No. 1 Jamb.....	22	Basic
Large 9-inch.....	20 20	Reese Basic	No. 2 Skew.....	22 22	Reese Basic
Small 9-inch	20 20	Reese Basic	No. 3 Neck.....	23 23	Reese Basic
Soap	20 20	Reese Basic	Featheredge	27 27	Reese Basic
No. 1 Arch	20 20	Reese Basic	Large 9-inch Featheredge ...	—	Reese
No. 2 Arch	21 21	Reese Basic	12 x 6 x 3-inch Straight.....	29	Reese
No. 1 Split	21 21	Reese Basic	12-inch No. 1 R. Wedge	30	Reese
No. 2 Split	21 21	Reese Basic	12-inch No. 2 R. Wedge	30	Reese
No. 1 Wedge.....	21 21	Reese Basic	12 x 9 x 3-inch Large Soap.....	29	Reese
No. 2 Wedge.....	21 21	Reese Basic	12 x 3 x 3-inch Small Soap.....	30	Reese
No. 3 Wedge.....	22 22	Reese Basic	12-inch No. 1 R. Large Wedge Soap.....	30	Reese
Large 9-inch..... No. 1 Wedge ...	27 27	Reese Basic	12-inch No. 2 R. Large Wedge Soap.....	30	Reese
Large 9-inch..... No. 2 Wedge....	27 27	Reese Basic	12-inch No. 1 Arch	28	Reese
No. 1 Key	22 22	Reese Basic	12-inch No. 1 Key	30	Reese
No. 2 Key.....	22 22	Reese Basic	12-inch No. 2 Key	30	Reese
No. 3 Key.....	22 22	Reese Basic			

CLEARFIELD FIRE BRICK WORKS

THE trade of the Clearfield Fire Brick Company (Ltd.) extends over a wide territory and the brands of brick made are favorably known for steel purposes, malleable iron works, blast furnaces, puddling furnaces, lime kilns, for general mill purposes and other places where brick made from high grade clay are required. The clays used are all selected flint clays.

On following page is a list of brands and shapes made, giving page of illustration.

CLEARFIELD FIRE BRICK WORKS

Shapes	Page	Brands	Shapes	Page	Brands
9" Straight	20	Clearfield	No. 3 Key	22	Clearfield S
	20	Clearfield S	No. 4 Key	22	Clearfield S
	20	Hearth and Bosh Clearfield	No. 1 Circle	23	Clearfield S
	20	Inwall Clearfield Top Clearfield	No. 2 Circle	23	Clearfield S
Large 9"	20	Clearfield S	No. 1 End Skew	23	Clearfield S
Small 9"	20	Clearfield S	No. 2 Side Skew	22	Clearfield S
Soap	20	Clearfield S	No. 3 Edge Skew	23	Clearfield S
Checker	38	Clearfield S	No. 1 Neck	23	Clearfield S
No. 1 Arch	20	Clearfield S	No. 2 Neck	23	Clearfield S
	20	Hearth and Bosh Clearfield	No. 3 Neck	23	Clearfield S
	20	Top Clearfield	No. 1 Jamb	22	Clearfield S
No. 2 Arch	21	Clearfield S	No. 2 Jamb	—	Clearfield S
	21	Hearth and Bosh Clearfield	No. 3 Jamb	—	Clearfield S
	21	Top Clearfield	Featheredge	27	Clearfield S
No. 1 Split	21	Clearfield S	13½" Straight	32	Hearth and Bosh Clearfield
No. 2 Split	21	Clearfield S		32	Inwall Clearfield
No. 1 Wedge	21	Clearfield S		32	Top Clearfield
No. 2 Wedge	21	Clearfield S	13½" No. 2 Key	32	Hearth and Bosh Clearfield
No. 3 Wedge	22	Clearfield S		32	Inwall Clearfield
No. 1 Key	22	Clearfield S		32	Top Clearfield
	22	Hearth and Bosh	13½" No. 4 Key	32	Hearth and Bosh Clearfield
	22	Inwall Clearfield		32	Top Clearfield
	22	Top Clearfield	Velvetry Tile	26	Clearfield S
No. 2 Key	22	Clearfield S			
	22	Hearth and Bosh Clearfield			
	22	Top Clearfield			

PHILIPSBURG FIRE BRICK WORKS

The Philipsburg Fire Brick Works make the following brands from choice Clearfield County flint clays :

“WIGTON STEEL” is specially recognized as good for pottery kilns, general mill work, etc.

“HEARTH AND BOSH WIGTON,” “INWALL WIGTON,” “TOP WIGTON” are specially made for blast furnace linings.

FIRE CLAY BRICK

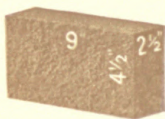
Shapes	Page	Brands	Shapes	Page	Brands
9" Straight	20	Wigton Steel	No. 1 Jamb	22	Wigton Steel
	20	Hearth and Bosh	No.2 Side Skew	22	Wigton Steel
	20	Wigton	No. 2 Neck	23	Wigton Steel
	20	Inwall Wigton Top Wigton	No. 3 Neck	23	Wigton Steel
Large 9"	20	Wigton Steel	12 x 12 x 2"	26	Wigton Steel
Small 9"	20	Wigton Steel	15 x 12 x 2"	26	Wigton Steel
Soap	20	Wigton Steel	18 x 12 x 2"	26	Wigton Steel
No. 1 Arch	20	Wigton Steel	Bung Arch	21	Wigton Steel
No. 2 Arch	21	Wigton Steel	Featheredge	27	Wigton Steel
No. 1 Split	21	Wigton Steel	Flatback Arch	26	Wigton Steel
No. 2 Split	21	Wigton Steel	Flatback Straight	26	Wigton Steel
No. 1 Wedge	21	Wigton Steel	13½" Straight	32	Hearth and Bosh Wigton
No. 2 Wedge	21	Wigton Steel		32	Inwall Wigton
No. 3 Wedge	22	Wigton Steel		32	Top Wigton
No. 1 Key	22	Wigton Steel	13½" No.2 Key	32	Hearth and Bosh Wigton
	22	Hearth and Bosh		32	Inwall Wigton
	22	Wigton		32	Top Wigton
	22	Inwall Wigton Top Wigton			
No. 2 Key	22	Wigton Steel	13½" No.4 Key	32	Hearth and Bosh Wigton
	22	Hearth and Bosh		32	Top Wigton
	22	Wigton			
	22	Top Wigton			
No. 3 Key	22	Wigton Steel	13½" x 4½" x 2½" Straights	29	Wigton Steel
No. 4 Key	22	Wigton Steel			

TABLE OF SHAPES
MADE AT CLINTON COUNTY WORKS

With Page of Illustration

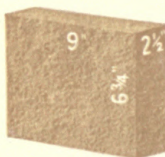
Shapes	Page	Brands	Shapes	Page	Brands
9-inch Straight ...	20	Munro	No. 2 Key.....	22	Munro
	20	Eureka		22	Eureka
	20	Clinton		22	Clinton
Large 9-inch.....	20	Munro	No. 3 Key.....	22	Munro
	20	Eureka		22	Eureka
Small 9-inch	20	Munro	No. 4 Key.....	22	Munro
	20	Eureka			
Soap.....	20	Munro	No. 1 Jamb.....	22	Munro
	20	Eureka	No. 2 Side Skew.	22	Munro
	20	Clinton	No. 3 Neck.....	23	Munro
No. 1 Arch.....	20	Munro	No. 1 Circle.....	23	Munro
	20	Eureka			
	20	Clinton	No. 2 Circle.....	23	Munro
No. 2 Arch.....	21	Munro	No. 3 Circle.....	24	Munro
	21	Eureka			
	21	Clinton	No. 4 Circle.....	24	Munro
No. 1 Split	21	Munro	No. 1 Cupola....	24	Munro
	21	Eureka			
	21	Clinton	No. 2 Cupola....	24	Munro
No. 2 Split	21	Munro	No. 3 Cupola....	25	Munro
	21	Eureka			
	21	Clinton	No. 4 Cupola....	25	Munro
No. 1 Wedge.....	21	Munro	Stock Hole	25	Munro
	21	Eureka	Boiler Tile	26	12 x 12 x 2"
	21	Clinton		26	15 x 12 x 2"
No. 2 Wedge.....	21	Munro		26	18 x 12 x 2"
	21	Eureka			
	21	Clinton			
No. 3 Wedge.....	22	Munro	Rotary Kiln		
Bung Arch.....	21	Munro	Shapes:		
Featheredge.....	27	Munro	No. 66.....	39	Alusil
No. 1 Key.....	22	Munro	No. 72.....	39	Alusil
	22	Eureka	No. 78.....	39	Alusil
	22	Clinton	No. 84.....	39	Alusil
			No. 17.....	40	Alusil

SHAPES IN STOCK



9-INCH STRAIGHT

9 x 4 1/2 x 2 1/2"



LARGE 9-INCH

9 x 6 3/4 x 2 1/2"



SMALL 9-INCH

9 x 3 1/2 x 2 1/2"



SOAP

9 x 2 1/4 x 2 1/2"



CHECKER

9 x 2 3/4 x 2 3/4"



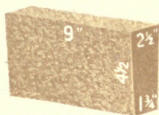
NO. 1 ARCH

72 Brick to the Circle

4' Inside Diameter

9 x 4 1/2 x 2 1/2 x 2 1/8"

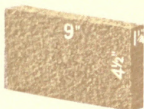
SHAPES IN STOCK



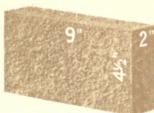
NO. 2 ARCH
42 Brick to the Circle
2' Inside Diameter
 $9 \times 4\frac{1}{2} \times 2\frac{1}{4} \times 1\frac{3}{4}$ "



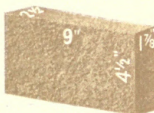
BUNG ARCH
 $9 \times 4\frac{1}{2} \times 2\frac{1}{2} \times 2\frac{3}{8}$ "



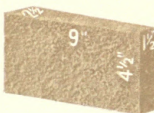
NO. 1 SPLIT
 $9 \times 4\frac{1}{2} \times 1$ "



NO. 2 SPLIT
 $9 \times 4\frac{1}{2} \times 2$ "



NO. 1 WEDGE
102 Brick to the Circle
5' Inside, 6' 6" Outside Diam.
 $9 \times 4\frac{1}{2} \times 2\frac{1}{2} \times 1\frac{7}{8}$ "



NO. 2 WEDGE
63 Brick to the Circle
2' 6" Inside, 4" Outside Diam.
 $9 \times 4\frac{1}{2} \times 2\frac{1}{2} \times 1\frac{1}{2}$ "

SHAPES IN STOCK



No. 3 WEDGE

56 Brick to the Circle
3' Inside, 4' 6" Outside Diam.
 $9 \times 4\frac{1}{2} \times 3 \times 2"$



No. 1 KEY

112 Brick to the Circle
12' Inside, 13' 6" Outside Diam.
 $9 \times 4\frac{1}{2} \times 4 \times 2\frac{1}{2}"$



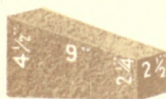
No. 2 KEY

65 Brick to the Circle
6' Inside, 7' 6" Outside Diam.
 $9 \times 4\frac{1}{2} \times 3\frac{1}{2} \times 2\frac{1}{2}"$



No. 3 KEY

41 Brick to the Circle
3' Inside, 4' 6" Outside Diam.
 $9 \times 4\frac{1}{2} \times 3 \times 2\frac{1}{2}"$



No. 4 KEY

26 Brick to the Circle
1' 6" Inside, 3' Outside Diam.
 $9 \times 4\frac{1}{2} \times 2\frac{1}{4} \times 2\frac{1}{2}"$



No. 1 JAMB

$9 \times 4\frac{1}{2} \times 2\frac{1}{2}"$



No. 2 SIDE SKEW

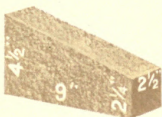
$9 \times 4\frac{1}{2} \times 2\frac{1}{2} \times 1\frac{3}{4}"$

SHAPES IN STOCK



No. 1 END SKEW

9 x 6 1/8 x 4 1/2 x 2 1/2"



No. 3 EDGE SKEW

~~NO. 1 NECK~~

9 x 4 1/2 x 2 1/4 x 2 1/2"



~~NO. 1 NECK~~

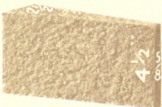
~~NO. 3 EDGE SKEW~~

9 x 4 1/2 x 3 1/2 x 2 1/2"



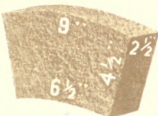
No. 2 NECK

9 x 4 1/2 x 2 1/2 x 1 1/2 x 5/8"



No. 3 NECK OR POINT

9 x 4 1/2 x 2 1/2 x 5/8"



No. 1 OR 33-INCH CIRCLE BRICK

12 Brick to the Circle

24" Inside, 33" Outside Diam.

9 x 6 1/2 x 4 1/2 x 2 1/2"



No. 2 OR 45-INCH CIRCLE BRICK

14 Brick to the Circle

36" Inside, 45" Outside Diam.

9 x 7 3/16 x 4 1/2 x 2 1/2"

SHAPES IN STOCK

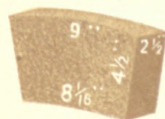


No. 3 OR 51-INCH CIRCLE BRICK

18 Brick to the Circle

42" Inside, 51" Outside Diam.

$9 \times 7\frac{7}{16} \times 4\frac{1}{2} \times 2\frac{1}{2}$ "



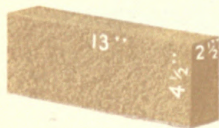
No. 4 OR 78-INCH CIRCLE BRICK

31 Brick to the Circle

78" Inside, 87" Outside Diam.

(For Cahall Boilers)

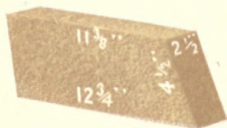
$9 \times 8\frac{1}{16} \times 4\frac{1}{2} \times 2\frac{1}{2}$ "



No. 101 SPECIAL COVER

Used in Malleable Furnaces

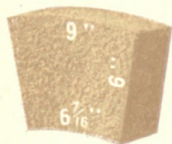
$13 \times 4\frac{1}{2} \times 2\frac{1}{2}$ "



No. 102 SPECIAL COVER

Used in Malleable Furnaces

$12\frac{3}{4} \times 11\frac{3}{8} \times 4\frac{1}{2} \times 2\frac{1}{2}$ "



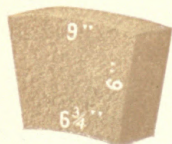
No. 1 CUPOLA BRICK

15 Brick to the Circle

30" Inside, 42" Outside Diam.

$9 \times 6\frac{7}{16} \times 6 \times 3$ "

$9 \times 6\frac{7}{16} \times 6 \times 4$ "



No. 2 CUPOLA BRICK

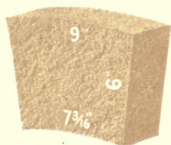
17 Brick to the Circle

36" Inside, 48" Outside Diam.

$9 \times 6\frac{3}{4} \times 6 \times 3$ "

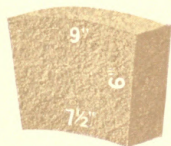
$9 \times 6\frac{3}{4} \times 6 \times 4$ "

SHAPES IN STOCK



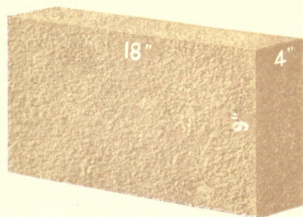
**No. 3
CUPOLA BRICK**

21 Brick to the Circle
48" Inside
60" Outside Diameter
 $9 \times 7\frac{3}{16} \times 6 \times 3"$
 $9 \times 7\frac{3}{16} \times 6 \times 4"$



**No. 4
CUPOLA BRICK**

25 Brick to the Circle
60" Inside
72" Outside Diameter
 $9 \times 7\frac{1}{2} \times 6 \times 3"$
 $9 \times 7\frac{1}{2} \times 6 \times 4"$



STOCK HOLE TILE

$18 \times 9 \times 4"$

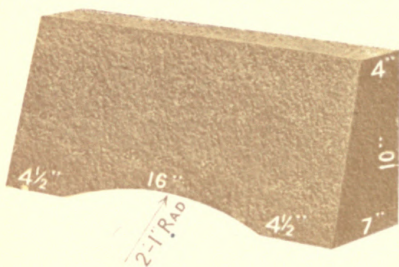


BRIDGE BLOCK

$13 \times 6\frac{1}{2} \times 3"$

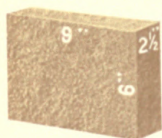


SHAPES IN STOCK



VELVETRY TILE

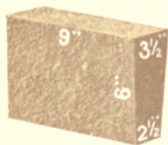
25 x 10 x 7 x 4 x 4 1/2
16 x 4 1/2"



**POTTERY KILN
TILE**

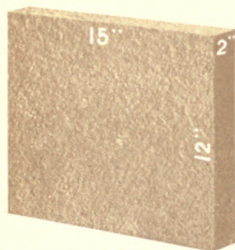
FLATBACK

9 x 6 x 2 1/2"



**FLATBACK
ARCH**

9 x 6 x 3 1/2 x 2 1/2"



BOILER TILE

12 x 12 x 2"

15 x 12 x 2"

18 x 12 x 2"

Regular boiler tile carried in stock.

Special tile for any type of boiler made on request.

SHAPES IN STOCK



No. 3 ARCH

9 x 4 1/2 x 2 1/2 x 1"



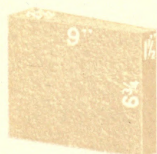
FEATHER EDGE

9 x 4 1/2 x 2 1/2 x 1 1/8"



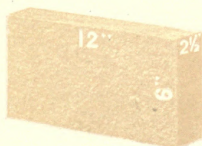
LARGE 9-INCH No. 1 WEDGE

9 x 6 3/4 x 2 1/2 x 1 1/8"



LARGE 9-INCH No. 2 WEDGE

9 x 6 3/4 x 2 1/2 x 1 1/2"



12-INCH STRAIGHT

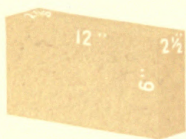
12 x 6 x 2 1/2"



12-INCH No. 1 WEDGE

12 x 6 x 2 1/8 x 2 1/2"

SILICA SHAPES

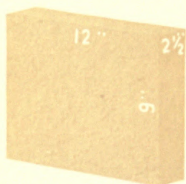


12-INCH No. 2 WEDGE

181 Brick to the Circle

12' Inside Diameter

$12 \times 6 \times 2\frac{1}{2} \times 2\frac{1}{2}$ "



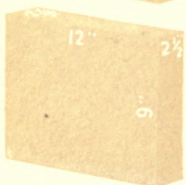
12-INCH SOAP

$12 \times 9 \times 2\frac{1}{2}$ "



12-INCH No. 1 WEDGE SOAP

$12 \times 9 \times 2\frac{1}{8} \times 2\frac{1}{2}$ "



12-INCH No. 2 WEDGE SOAP

$12 \times 9 \times 2\frac{3}{4} \times 2\frac{1}{2}$ "



12-INCH No. 1 ARCH

75 Brick to the Circle

5' Inside, 6' Outside Diam.

$12 \times 6 \times 3 \times 2\frac{1}{2}$ "



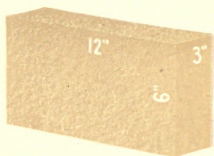
12-INCH No. 2 ARCH

75 Brick to the Circle

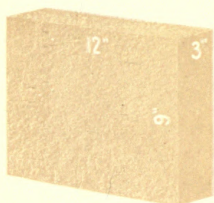
4' Inside, 5' Outside Diam.

$12 \times 6 \times 2\frac{1}{2} \times 2$ "

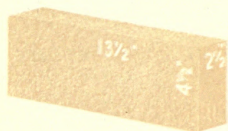
SILICA SHAPES



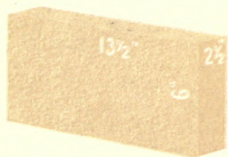
12x6x3 INCH STRAIGHT



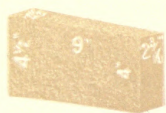
**12x9x3 INCH STRAIGHT
SOAP**



13½-INCH BINDER BRICK
 $13\frac{1}{2} \times 4\frac{1}{2} \times 2\frac{1}{2}$ "

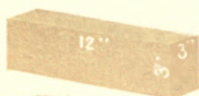


13½-INCH STRAIGHT
 $13\frac{1}{2} \times 6 \times 2\frac{1}{2}$ "



COKE OVEN CROWN BRICK
 $9 \times 4\frac{1}{2} \times 4 \times 2\frac{1}{2} \times 2\frac{3}{16}$ "

SILICA SHAPES



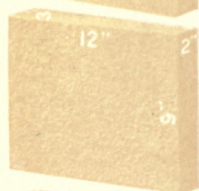
12 x 3 INCH SOAP

12 x 3 x 3"



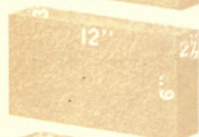
**12 x 9 INCH No. 1 R. SOAP
WEDGE**

12 x 9 x 3 x 2 1/2"



**12 x 9 INCH No. 2 R. SOAP
WEDGE**

12 x 9 x 3 x 2"



12-INCH No. 1 R. WEDGE

12 x 6 x 3 x 2 1/2"



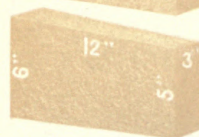
12-INCH No. 2 R. WEDGE

12 x 6 x 3 x 2"



12-INCH No. 1 KEY

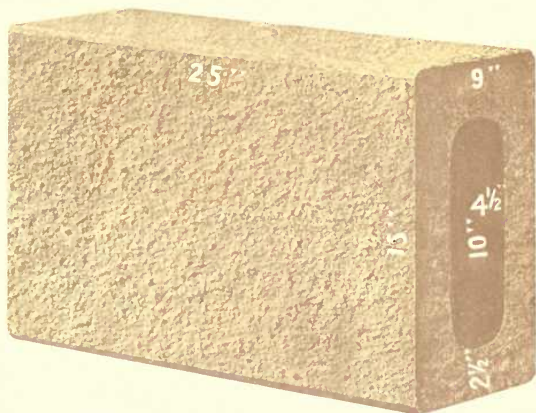
12 x 6 x 5 1/2 x 3"



12-INCH No. 2 KEY

12 x 6 x 5 x 3"

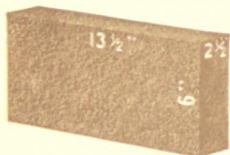
RECUPERATOR FLUE
BRICK



Shapes similar to the above cut are largely used in various kinds of gas, melting and heating furnaces and recuperators, where a high grade of brick is required.

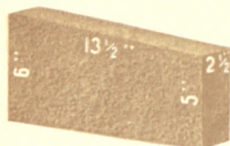
We are well equipped for doing such work, and where a large quantity are needed can get them out in the best possible shape and at a reasonable cost.

SHAPES IN STOCK
BLAST FURNACE LINING BRICK



13 1/2-INCH STRAIGHT

13 1/2 x 6 x 2 1/2"



13 1/2-INCH No. 2 KEY

90 Brick to the Circle

12' Inside Diameter

13 1/2 x 6 x 5 x 2 1/2"



13 1/2-INCH No. 4 KEY

52 Brick to the Circle

6' Inside Diameter

13 1/2 x 6 x 4 3/8 x 2 1/2"



9-INCH STRAIGHT

9 x 4 1/2 x 2 1/2"



9-INCH No. 1 KEY

112 Brick to the Circle

12' Inside Diameter

9 x 4 1/2 x 4 x 2 1/2"



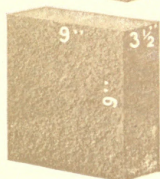
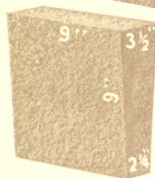
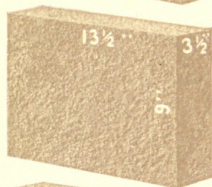
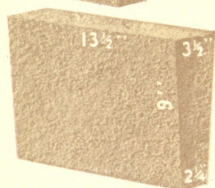
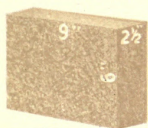
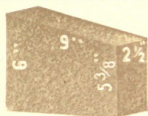
9-INCH No. 2 KEY

65 Brick to the Circle

6' Inside Diameter

9 x 4 1/2 x 3 1/2 x 2 1/2"

SHAPES IN STOCK
BLAST FURNACE LINING BRICK



9 x 6 INCH KEY

For 12' Circle

85_Brick to the Circle

9 x 6 x 5 3/8 x 2 1/2"

9 x 6 INCH STRAIGHT

For enlarging above circles

9 x 6 x 2 1/2"

**BLAST FURNACE ARCH
BRICK FOR GAS FLUES**

13 1/2 x 9 INCH ARCH

For 3, 4, 5' Inside Diameter

13 1/2 x 9 x 3 1/2 x 2 1/4"

13 1/2 x 9 INCH STRAIGHT

For enlarging above circles

13 1/2 x 9 x 3 1/2"

9 x 9 INCH ARCH

For 3, 4, 5' Inside Diameter

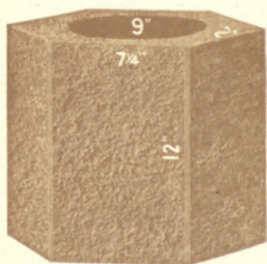
9 x 9 x 3 1/2 x 2 1/4"

9 x 9 INCH STRAIGHT

For enlarging above circles

9 x 9 x 3 1/2"

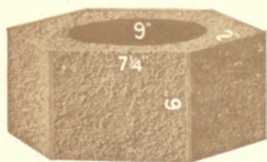
HEXAGON STOVE SHAPES



12x13 INCH HEXAGON

9" Diameter Flue

12 x 7 1/4 x 9"



6x13 INCH HEXAGON

For Breaking Joints

6 x 7 1/4 x 9"



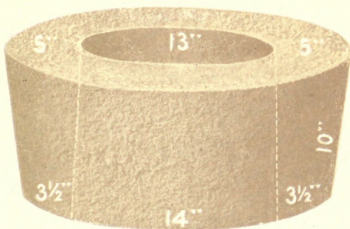
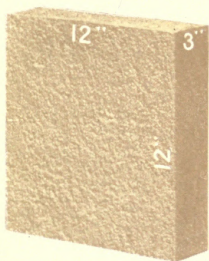
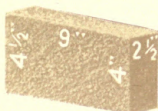
6x13 INCH HEXAGON

For Finishing Top

6 x 7 1/4 x 9"

Typical of many shapes made—
shapes for special stoves shown
with cuts of stoves. See index.

COKE OVEN BRICK AND TILE



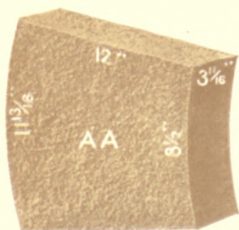
H.-W.
CROWN BRICK
9 x 4 1/2 x 4 x 2 3/16

H.W.
LINER BRICK
9 x 4 1/2 x 4 x 2 1/2

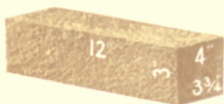
BOTTOM TILE
No. 14
12 x 12 x 3

TRUNNELL HEAD
No. 42
23 x 21 x 10 x 13 x 14

SIEMENS STEEL FURNACE BLOCKS
IN WOODLAND BRAND AND SILICA



SIEMENS STEEL FURNACE COVER BRICK
MADE IN FIRE CLAY ONLY



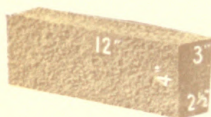
BEVEL COVER

12 x 4 x 3 3/4 x 3"



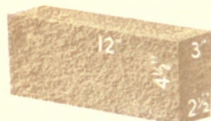
SQUARE COVER

12 x 4 x 3"



ARCH COVER

12 x 4 x 3 x 2 1/2"



SPECIAL COVER

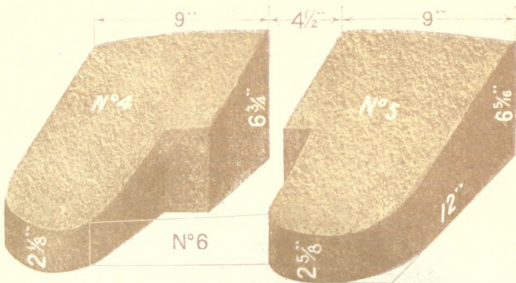
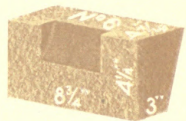
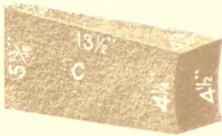
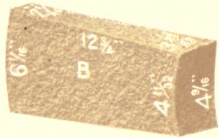
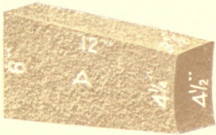
12 x 4 1/2 x 3 x 2 1/2"



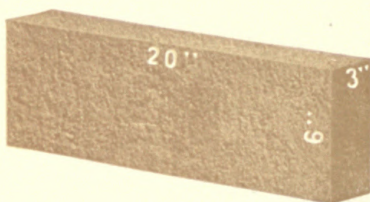
No. 2

11 x 4 1/2 x 2 1/2 x 3/8"

SIEMENS STEEL FURNACE BLOCKS
IN WOODLAND BRAND AND SILICA



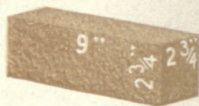
SIEMENS REGENERATOR TILE
AND BRICK



The following sizes are kept in stock:

16 x 6 x 3	21 x 6 x 3	24 x 9 x 3
18 x 6 x 3	22 x 6 x 3	26 x 9 x 3
20 x 6 x 3	24 x 6 x 3	

All other sizes made to order.



REGENERATOR OR CHECKER BRICK

SHAPES FOR ROTARY KILNS



**9-INCH
ROTARY KILN BLOCKS
No. 60**

21 Brick to the Circle
60" Outside Diameter
H-W SPECIAL ALUMINOUS
ALUSIL
 $9 \times 9 \times 6\frac{5}{16} \times 4$ "



No. 66

23 Brick to the Circle
66" Outside Diameter
H-W SPECIAL ALUMINOUS
ALUSIL
 $9 \times 9 \times 6\frac{9}{16} \times 4$ "



No. 72

26 Brick to the Circle
72" Outside Diameter
H-W SPECIAL ALUMINOUS
ALUSIL
 $9 \times 9 \times 6\frac{3}{4} \times 4$ "



No. 78

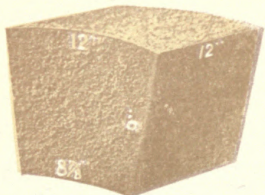
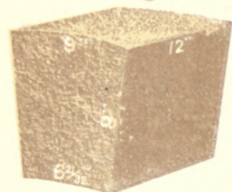
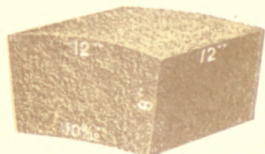
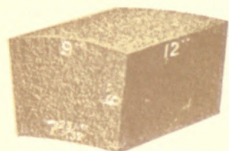
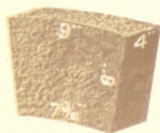
28 Brick to the Circle
78" Outside Diameter
H-W SPECIAL ALUMINOUS
ALUSIL
 $9 \times 9 \times 6\frac{5}{8} \times 4$ "



No. 84

30 Brick to the Circle
84" Outside Diameter
H-W SPECIAL ALUMINOUS
ALUSIL
 $9 \times 9 \times 7\frac{1}{16} \times 4$ "

SHAPES FOR ROTARY KILNS



No. 12

60" Outside Diameter
21 to a Circle

H.-W. Special Aluminous
Alusil

No. 13

72" Outside Diameter
25 to a Circle

H.-W. Special Aluminous
Alusil

No. 14

84" Outside Diameter
30 to a Circle

H.-W. Special Aluminous
Alusil

No. 15

84" Outside Diameter
22 to a Circle

H.-W. Special Aluminous
Alusil

No. 16

84" Outside Diameter
30 to a Circle

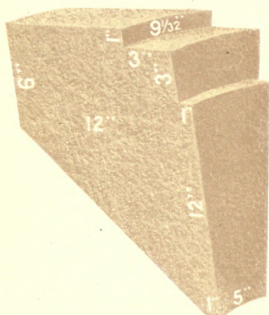
H.-W. Special Aluminous
Alusil

No. 17

84" Outside Diameter
22 to a Circle

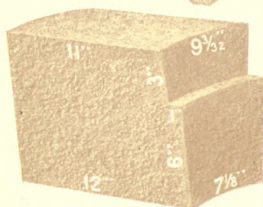
H.-W. Special Aluminous
Alusil

SHAPES FOR ROTARY KILNS



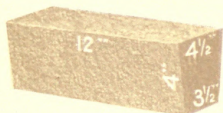
**No. 18
FEED END BLOCK**

72" Outside Diameter
25 to a Circle
C. Tyrone
C. Eureka



**No. 19
DISCHARGE END BLOCK**

84" Outside Diameter
29 to a Circle
H.-W. Special Aluminous
Alusil



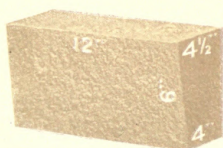
**No. 20
CEMENT KILN SHAPE**

32" Inside Diameter
29 to a Circle



**No. 21
CEMENT KILN SHAPE**

5' 4" Inside Diameter
51 to a Circle

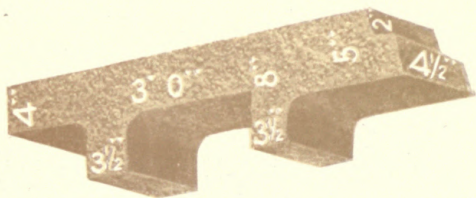
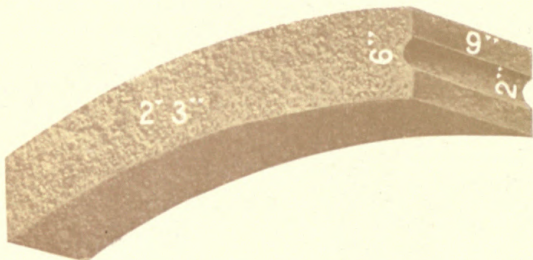


**No. 22
CEMENT KILN SHAPE**

8' 0" Inside Diameter
76 to a Circle

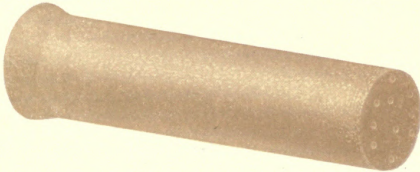
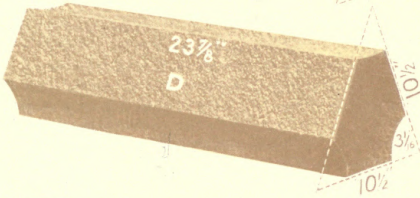
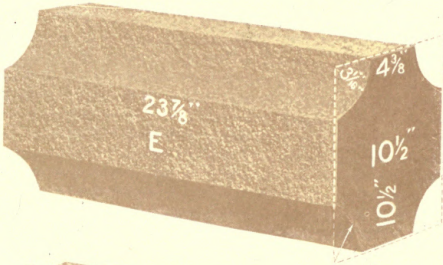
Any shapes desired will be
made to order

TYPICAL LOCOMOTIVE FIRE BRICK



All types of locomotive tile made to order

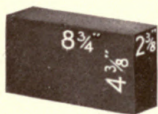
SHAPES FOR CONVERTER BOTTOMS



TUYERE FOR CONVERTER BOTTOM

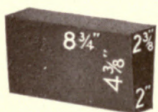
Tuyeres of all types and dimensions made to order

MAGNESIA SHAPES IN STOCK



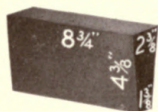
STRAIGHT, STANDARD SIZE

MAGNESIA
 $8\frac{3}{4} \times 4\frac{3}{8} \times 2\frac{3}{8}$ "



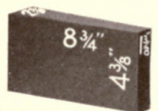
No. 1 ARCH, STANDARD SIZE

86 Brick to the Circle
58" Inside Diameter
MAGNESIA
 $8\frac{3}{4} \times 4\frac{3}{8} \times 2$ "



No. 2 ARCH, STANDARD SIZE

54 Brick to the Circle
30" Inside Diameter
MAGNESIA
 $8\frac{3}{4} \times 4\frac{3}{8} \times 2\frac{3}{8} \times 1\frac{7}{8}$ "



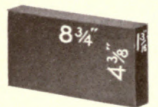
No. 2 WEDGE, STANDARD SIZE

57 Brick to the Circle
2' 3" Inside Diameter
MAGNESIA
 $8\frac{3}{4} \times 4\frac{3}{8} \times 2\frac{3}{8} \times 1\frac{3}{8}$ "



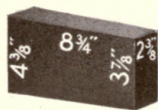
SOAP, STANDARD SIZE

MAGNESIA
 $8\frac{3}{4} \times 2\frac{3}{8} \times 2\frac{3}{8}$ "



SPLIT, STANDARD SIZE

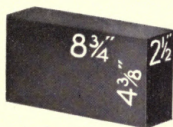
MAGNESIA
 $8\frac{3}{4} \times 4\frac{3}{8} \times 1\frac{3}{8}$ "



No. 1 KEY, STANDARD SIZE

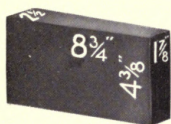
107 Brick to the Circle
10' 8" Inside Diameter
MAGNESIA
 $8\frac{3}{4} \times 4\frac{3}{8} \times 3\frac{7}{8} \times 2\frac{3}{8}$ "

CHROME SHAPES IN STOCK



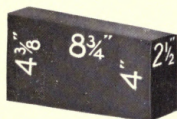
9-INCH STRAIGHT
CHROME

8 3/4" x 4 3/8" x 2 1/2"



9-INCH No. 1 WEDGE
CHROME

8 3/4" x 4 3/8" x 2 1/2" x 1 7/8"



No. 1 KEY
CHROME

8 3/4" x 4 3/8" x 4" x 2 1/2"



No. 2 KEY
CHROME

8 3/4" x 4 3/8" x 3 1/2" x 2 1/2"

THE above are the only shapes carried in stock for the reason that the shapes shown will generally answer all purposes for which chrome brick are required. Other shapes will be made to order.



BLAST FURNACE LININGS

BLAST furnace linings have been furnished for many small furnaces running on high fuel consumption and high top heats where magnetite and foreign hæmatite ores are used, Cornwall ores and zinc residium ores; also furnaces using fuel high in sulphur, and others using by-product coke, all with good results.

We have been making blast furnace linings for the last thirty-five years, and have made more than 90 per cent. of all the linings used in the United States. Our linings have been used under every imaginable condition, under hundreds of different managers, in all types of furnaces, and with all classes of ore and fuel. The uniformly good results prove that reliable brick were furnished. The results from a blast furnace lining are too important to depend on a hit or a miss lining.

The importance of calling workmen's attention constantly, while placing the lining, to the fact that the brick are made for a certain part of the furnace, has led to our branding on the brick, plainly, that part of the furnace for which the brick are made, viz., "HEARTH AND BOSH," "INWALL," "TOP."

In order to get uniformly satisfactory results about a furnace, it is of great importance that the brick used for lining downcomers and flues be able to resist the cutting action of strong blasts charged with ore dust and the cutting

BLAST FURNACE LININGS—CONTINUED

particles of coke that usually come from a blast furnace. "BENEZET PIPE" and "WOODLAND PIPE" brick are made specially for this purpose and give good results.

The present blast furnace practice—closed top furnaces, high-pressure hot blasts, etc., makes it more essential than ever before that the lining be the best obtainable. At an early period, and continuously to the present time, this branch of our business has received special attention, resulting in tonnage of metal per lining not thought of as possible previous to the records we have recently obtained. The cut on page 50 shows the method of building or breaking joints with 9-inch and 13½-inch brick in the construction of furnace lining wall.

BOTTOM BLOCKS

THE cuts on page 51 show our present method of constructing bottoms and the method of breaking joints. The blocks are all alike; having parallel sides and being made under heavy pressure, they are close in bond and true to shape. This enables the mason to make a closer bottom with less trouble than could be done with the blocks formerly made on radial lines.

SOME RECORD RUNS
“BENEZET” AND “WOODLAND” LININGS
PITTSBURGH DISTRICT AND VALLEYS

Size of Furnace	Product and Tonnage	Period in Blast	Lining
22 x 100	1,287,381	.....	Benezet
22 x 100	1,097,314	.....	Benezet
22 x 100	1,134,382	.....	Benezet
22 x 100	950,774	.....	Benezet
20 x 80	Bessemer, 1,296,192	.....	Benezet
	Bessemer, 858,159	.....	Benezet
	Spiegel, 18,065	.....	Benezet
	Ferro, 19,635	.....	Benezet
	895,860		
20 x 90	Bessemer, 942,365	.....	Benezet
20 x 90	Bessemer, 870,255	.....	Benezet
20 x 90	Bessemer, 635,741	.....	Benezet
20 x 80	Bessemer, 632,669	.....	Benezet
20 x 80	Bessemer, 608,103	.....	Benezet
20 x 80	Bessemer, 580,060	.....	Benezet
20 x 80	Bessemer, 793,892	.....	Benezet
20 x 80	600,957	.....	Benezet
20 x 80	596,491	.....	Benezet
20 x 80	Mill iron, 380,000		
	Bessemer, 117,000		
	Spiegel, 25,000		
	522,000	6 yrs. 1 mo.	Benezet
20 x 80	Bess'r and Mill 550,000	6 yrs. 1 mo.	Benezet
18 x 78	327,000	5 yrs. 7 mos.	Benezet
23 x 105 $\frac{2}{3}$	572,000	3 yrs. 3 mos.	
	565,000	3 yrs. 4 mos.	
20 x 80	Bessemer, 520,356	.....	Woodland
20 x 80	Bess'r, 322,617		
	Ferro, 5,026		
	Spiegel, 36,503		
	Sil. 688 364,834	.....	Woodland

OTHER DISTRICTS

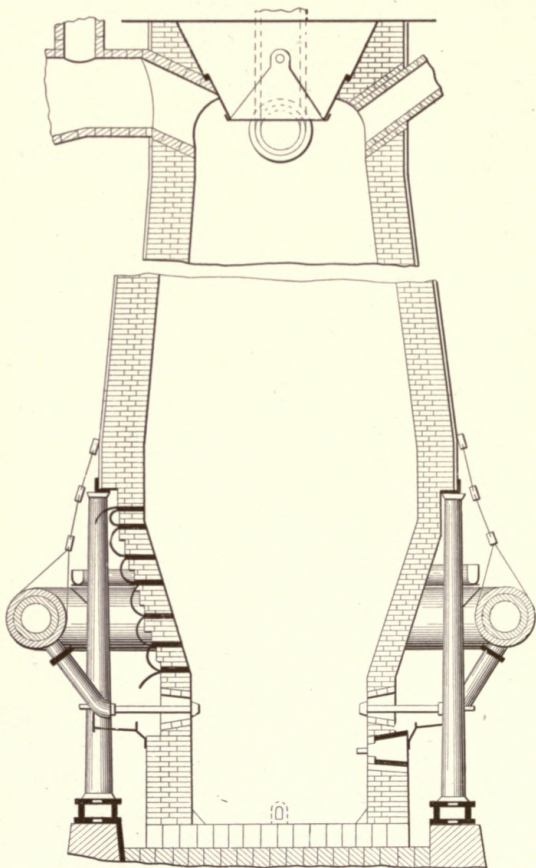
18 x 74	Foundry, 152,462	3 yrs.	Woodland
16 x 76' 10"	Foundry, 235,000	4 yrs. 3½ mos.	Woodland
13 x 65	F'dry & Bess'r 115,500	*3 to Aug., '05	Woodland
16 x 63' 10"	Foundry, 202,354	3 yrs. 10 mos.	Woodland
15 x 66' 9"	Foundry, 196,392	5 yrs. 3 mos.	Woodland
16 x 63' 10"	F'dry & Bess'r 306,290	5 yrs. 3 mos.	
17 x 83'	275,000	3 yrs. 6 mos.	
18'6" x 91'	Bess'r, over 700,000	4 yrs. 6 mos.	

Thirty-six (36) of our best records show a production of 19,493,390 tons, or an average of 541,483 tons per lining.

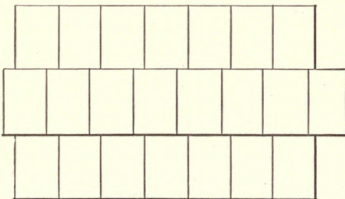
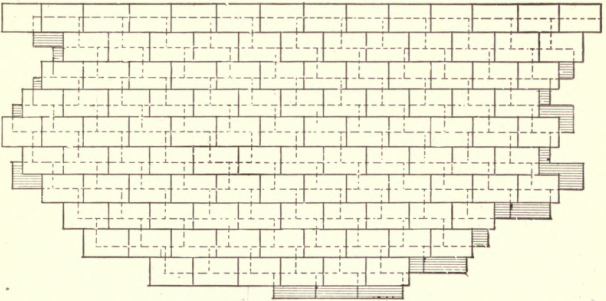
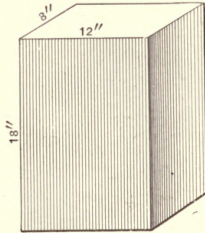
* August, 1905, still running in good shape.

TYPICAL BLAST FURNACE

Showing Method of Breaking Joints with Lining of $13\frac{1}{2}$ " and 9" Brick



FURNACE HEARTH BLOCK



Above cuts show method of setting blocks and breaking joints in construction of furnace hearth.

Bottom blocks referred to on page 48.

BLAST FURNACE STOVE BRICK

BLAST furnace stove brick are only second in importance to the furnace lining, for the reason that it is not as costly to cut a stove out for repairs as to shut down a furnace for a new lining; but, owing to the heavy burden carried and the disintegrating tendency of hot gases constantly varying in temperature, the difficulties to contend with in making a good stove brick are equal, though different, to those met with in making a good lining.

The essential qualities in blast furnace stove brick are, capacity to absorb heat readily from the combustion of waste furnace gases, readiness to give off this heat rapidly to the air that is blown into the furnace, and strength of bond between the particles of fire clay to resist the disintegrating action of the hot gases. In addition to strength of bond necessary to resist action of hot gases, it is essential that the iron which is in all fire clay should be converted into a silicate of iron, which is a fixed form that is not acted upon by furnace gases. This can only be done by making the brick of high grade fire clay that will stand a temperature of 2,500 degrees Fahrenheit or upwards in burning the fire brick without vitrifying the clay in same. In service, although stove brick are not subjected to the intense heat applied to a blast furnace bosh, the weight carried and long continued heat are apt to cause a gradual fusing and solidifying of the brick, unless high grade clay with a liberal margin of refractoriness is

used in making the brick. If brick are made of sufficiently refractory clay but not well bonded, or made by any modification of the dry process, and not burned by the high temperature above referred to, in order to convert the iron into a silicate, they are apt to disintegrate within a few months after starting the furnace. At the temperatures produced by the combustion of furnace gases in stoves, low grade brick are apt to squeeze and let down the lining, also to become vitrified.

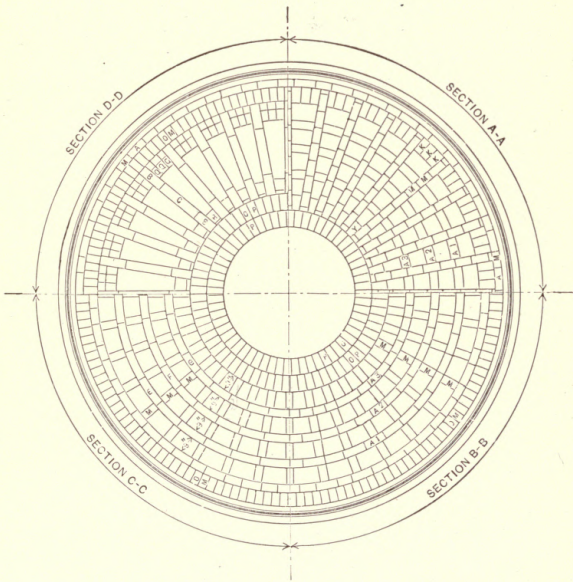
Glazed or vitrified substances will neither absorb nor give off heat as rapidly as porous or rough material.

Through lack of attention to the above requirements, we have been called upon several times to replace stove linings in less than one year from date of construction. Records and non-vitrified bats from old stove linings show that our stove lining brick are perfectly adapted to the service required.

In connection with illustration of typical stoves in use, a cut of the special shape used in each of several types is shown; these, and all similar shapes for stoves, are made from good clay, burned at a high temperature to insure all iron in the clay being converted into the silicate form in order to enable the brick to resist the oxidizing or disintegrating action of the hot gases.

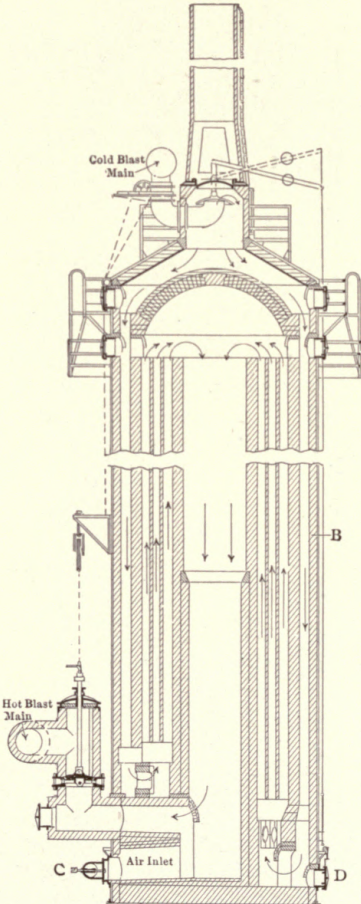
For cuts of stoves in general use, see pages 54 to 63.

JULIAN KENNEDY STOVE
Julian Kennedy, Pittsburgh, Pa., Engineer



McCLURE-AMSLER PATENT STOVE

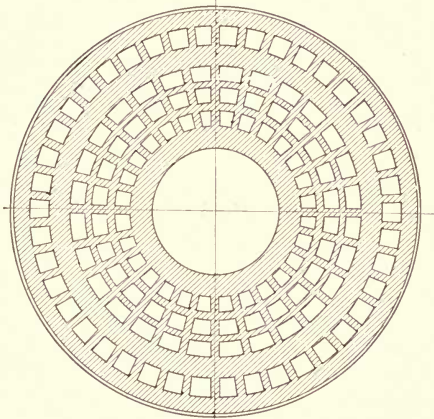
G. W. McClure, Son & Co., Pittsburgh, Pa., Engineers



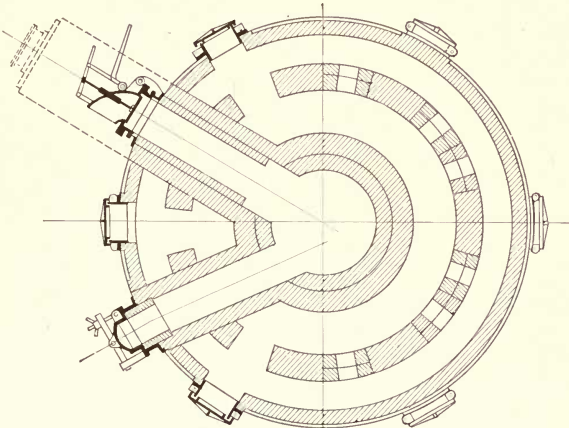
Sectional Elevation

McCLURE-AMSLER PATENT STOVE

G. W. McClure, Son & Co., Pittsburgh, Pa., Engineers



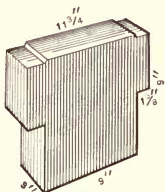
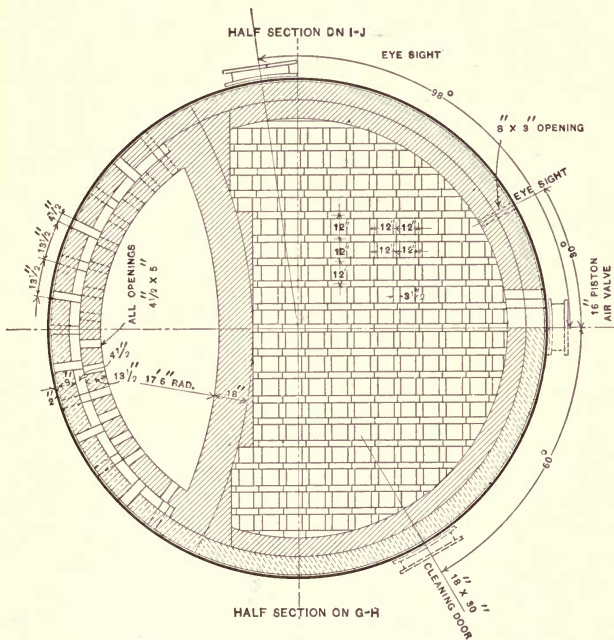
Section Through A B



Section Through C D

ROBERTS PATENT STOVE

F. C. Roberts & Co., Philadelphia, Pa., Engineers

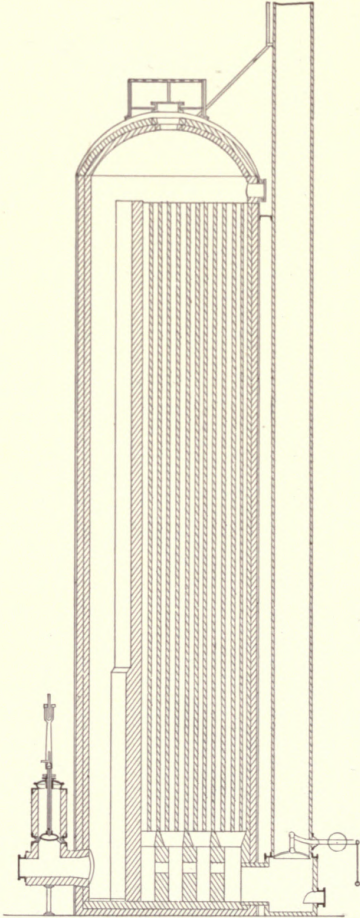


PATENTED DEC. 19 1893
OCT. 27 1896

Checker Brick

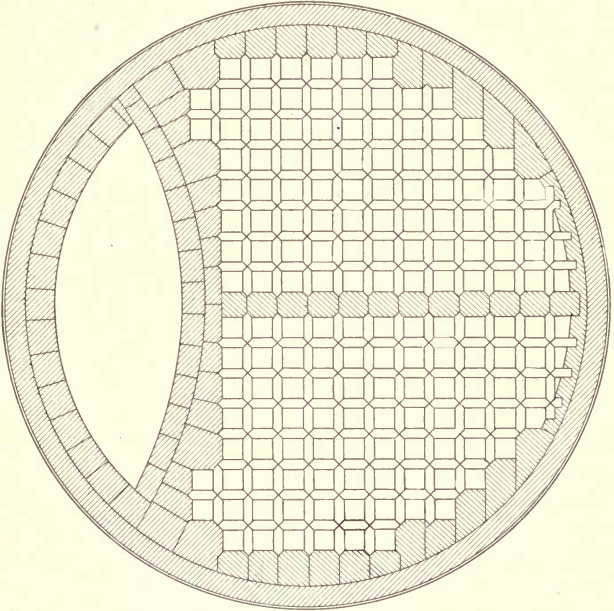
FOOTE PATENT STOVE

D. Lamond & Son, Ferguson Block, Pittsburgh, Pa., Engineers

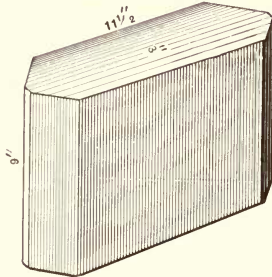


FOOTE STOVE

D. Lamond & Son, Ferguson Block, Pittsburgh, Pa., Engineers



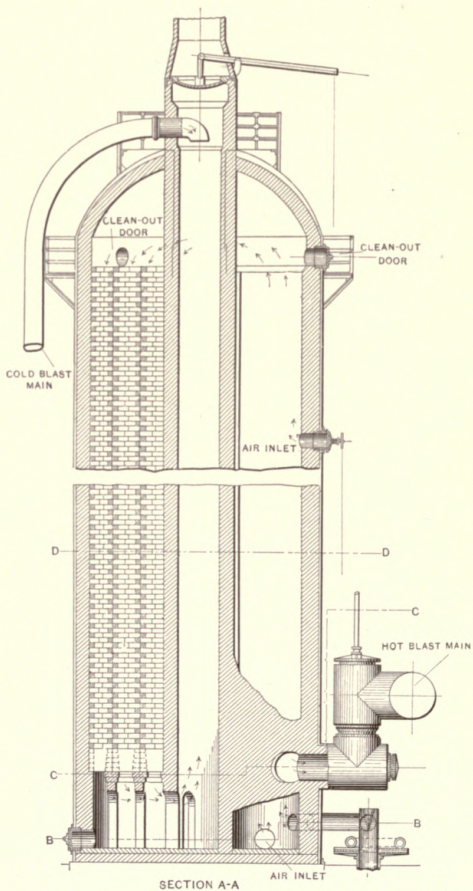
Enlarged Cross Section



Checker Brick

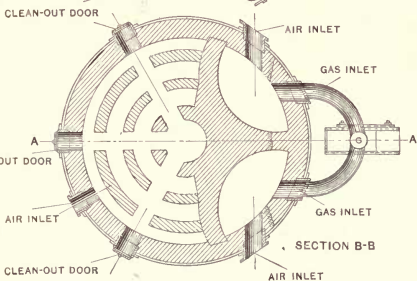
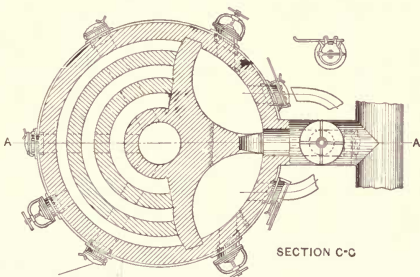
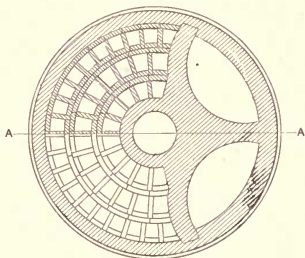
IMPROVED HOT BLAST STOVE

J. W. Calder, Pittsburgh, Pa.



IMPROVED HOT BLAST STOVE

J. W. Calder, Pittsburgh, Pa.



NOTE:
MADE OF 9" & 13 1/2" BRICK

COKE OVEN BRICK

COKE oven construction has changed radically in recent years. Where formerly any cheap clay brick were deemed good enough for the purpose, of late the tendency has been to use the highest grade brick.

The excellent results recently obtained from the use of silica brick in the severe service of by-product ovens, and from the old beehive ovens in the Connellsville region and other places, have clearly demonstrated that the silica brick is the most economical that can be used in this work, due entirely to the increased length of service obtained by their use.

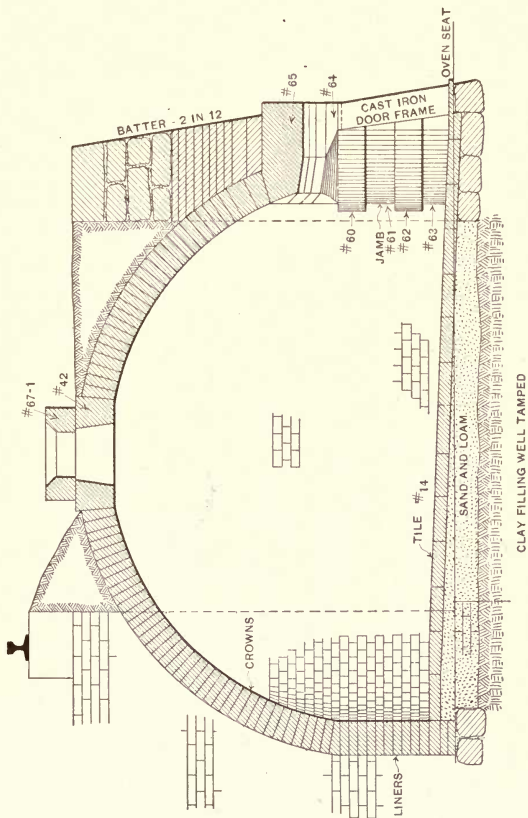
Our "H-W Crown" brick are made for the crowns of beehive ovens, and in addition to their extreme refractory qualities are especially adapted to hold the crown rigid and true to shape through varying temperatures, making in all a more thorough construction physically than can be obtained by the use of clay brick.

The "XX Sand" brand has been found specially suitable for lasting service as liner brick.

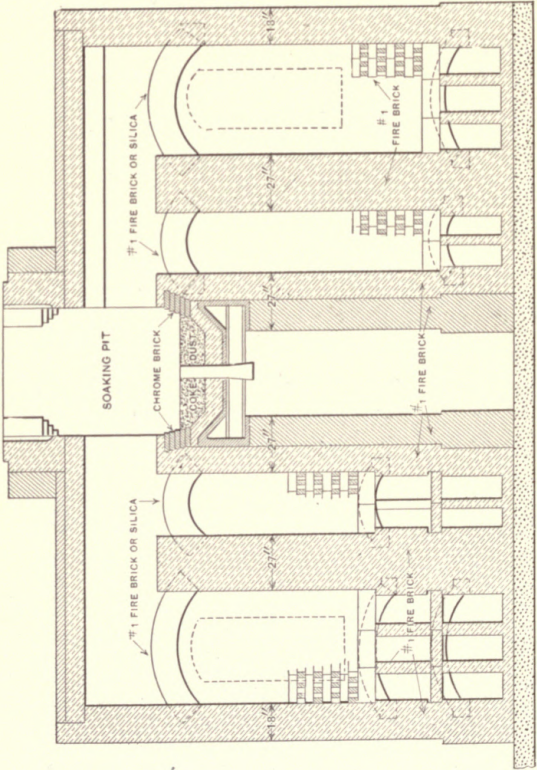
The fronts and floor tile are made of fire clay. Trunnel heads are made of either silica or fire clay, as may be desired.

STANDARD COKE OVEN

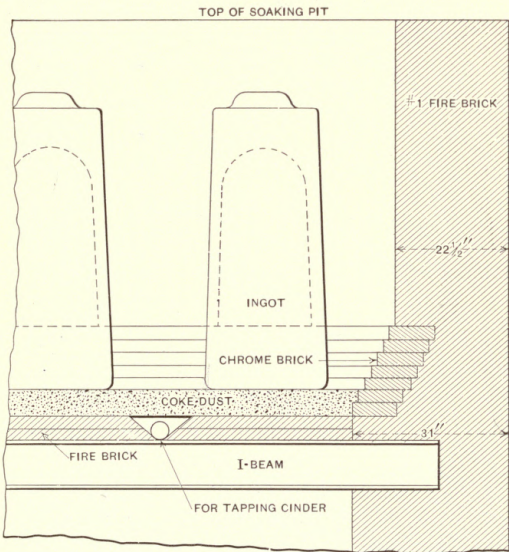
CROSS SECTION



FOUR-HOLE SOAKING PIT FURNACE



SKETCH OF SOAKING PIT SHOWING USE OF CHROME BRICK



SIEMENS CRUCIBLE STEEL MELTING FURNACE

ON page 69 is a cut of this furnace showing the shapes of brick commonly used in building it, and on pages 36 and 37 will be found cuts of each special shape indicated in this drawing, all of which we keep in stock.

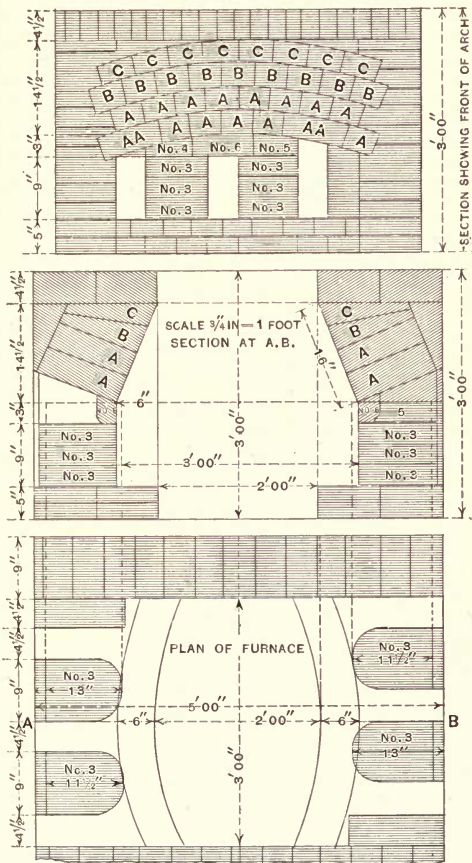
After 20 years' use in these furnaces, the "Woodland" fire brick still holds its enviable reputation as the best brick in the country for steel-melting furnaces. The "Woodland" fire brick secured the greater part of this trade when it was first introduced into the market, and has held it on its merits ever since, being used in more than seventy-five per cent. of the crucible steel furnaces of the country.

LIST OF SHAPES REQUIRED FOR ONE 6-POT FURNACE

Shape No.	No. Pieces	Where Used
A	30	1st and 2d courses in wall
A A	4	Over port openings
B	18	3rd course in wall
C	20	4th course in wall
2	6	Between piers
3	12	Pier brick
4	2	On tops of piers
5	2	On tops of piers
6	2	On tops of piers

We carry the above shapes in "Silica" also, many consumers preferring silica to clay shapes for these furnaces.

PLAN OF SIEMENS STEEL FURNACE.



OUR PLAN OF SHAPES

FOR SIEMENS CRUCIBLE STEEL MELTING FURNACE

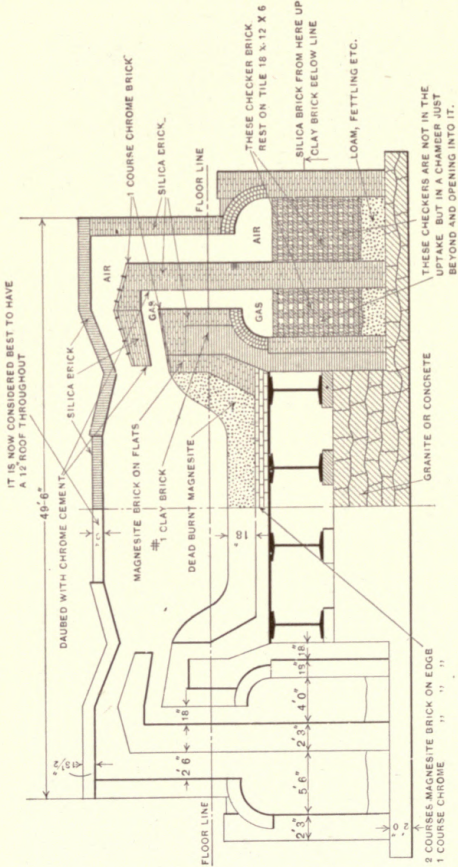
ON page 71 will be found a system of shapes for above furnace designed by ourselves. The plan differs from any heretofore used in having the side walls, or walls over the ports, built with horizontal joints, thus doing away with the arched side walls.

The advantages are, that having all joints or courses of brick horizontal, the side walls are not inclined to pitch into the furnace, as with the old style of shapes; all the shapes extend back to the breast wall, thus making a tight joint the full height of the furnace and preventing the gas from working up between the breast wall and the furnace wall. All of the walls having a straight, solid bearing, the settling will be uniform throughout the furnace, thus avoiding the opening or shattering of the walls by unequal settling. The shapes being of simple pattern, a mason can build a furnace with these shapes in less time than is required with others.

IT REQUIRES THE FOLLOWING SHAPES TO BUILD ONE 6-POT HOLE

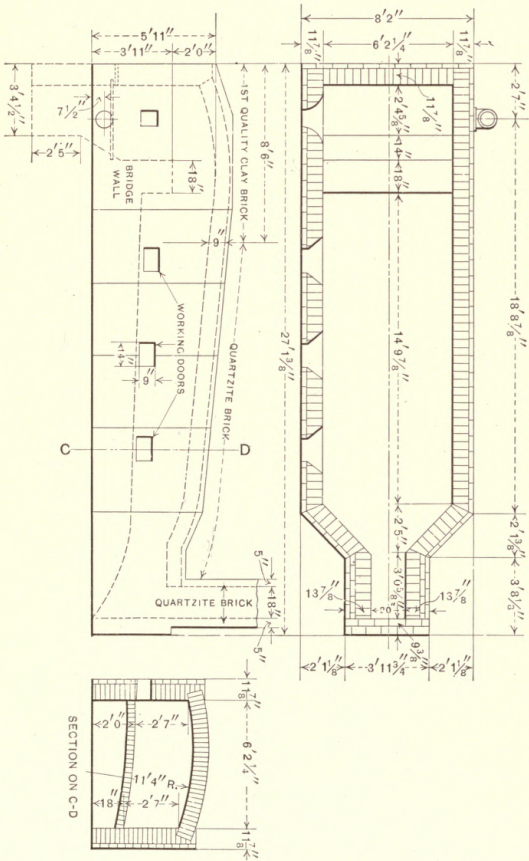
No. 2	6 pieces	
No. 3	12	"
Nos. 7 to 32	2	" each
No. 33	4	"
No. 34	4	"
No. 35	4	"
9-inch	600	"

SECTION OF BASIC OPEN HEARTH FURNACE
40 TON—USING ARTIFICIAL GAS

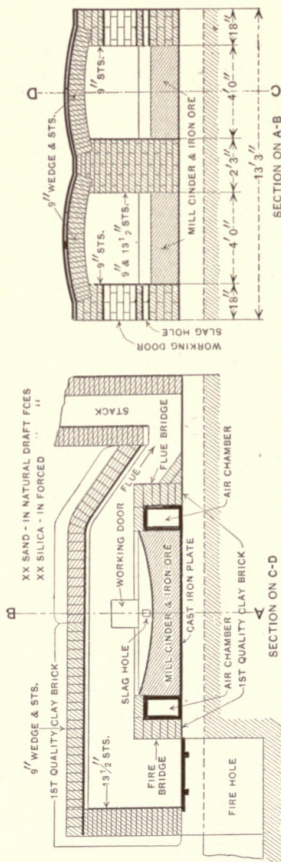


Note—This is not a particular furnace, but is a generalization, the idea being to show the prevailing best brick practice.

TYPICAL HEATING FURNACE SHOWING BRANDS OF BRICK USED



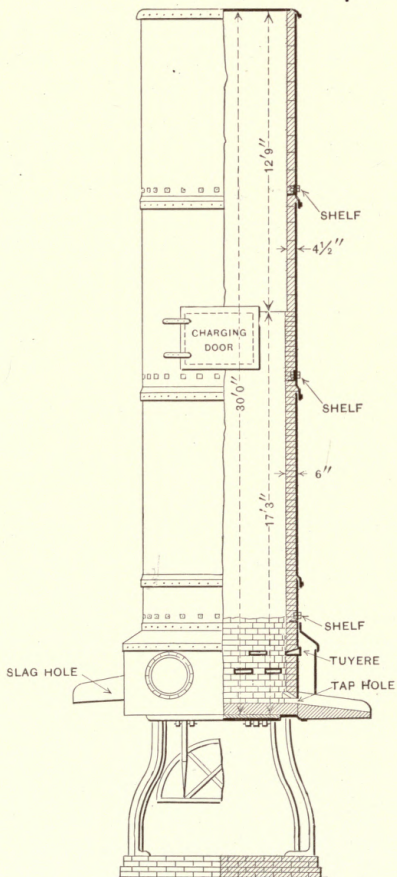
SECTION OF TYPICAL PUDDLING FURNACE



NOTE:-

XX SAND - SOMETIMES USED IN SQ. OF THE STACK
 " " - NECKS, POINTS & CLAMPS.

SECTION OF TYPICAL CUPOLA

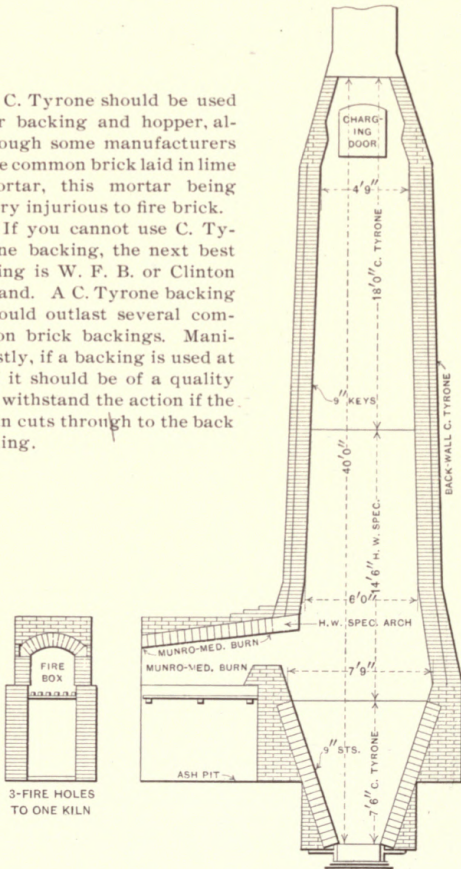


TYPICAL LIME KILN LINING

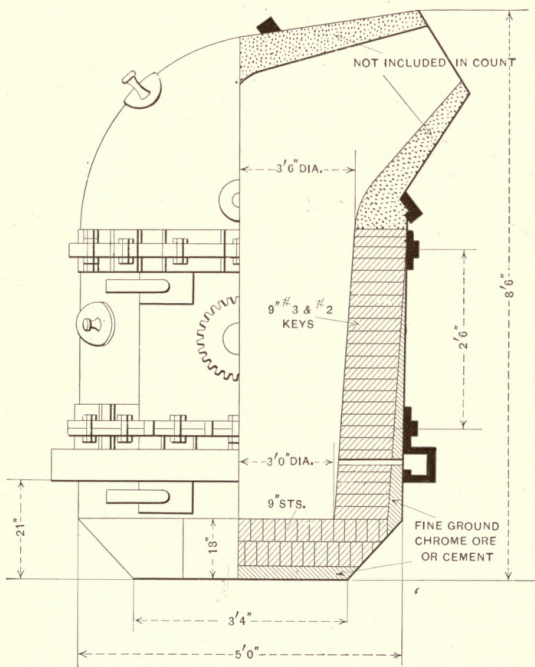
AS RECOMMENDED BY HARBISON-WALKER REFRACTORIES CO.

C. Tyrone should be used for backing and hopper, although some manufacturers use common brick laid in lime mortar, this mortar being very injurious to fire brick.

If you cannot use C. Tyrone backing, the next best thing is W. F. B. or Clinton brand. A C. Tyrone backing should outlast several common brick backings. Manifestly, if a backing is used at all it should be of a quality to withstand the action if the kiln cuts through to the back lining.



SPECIAL SHAPES FOR BASIC LINING FOR
COPPER CONVERTER

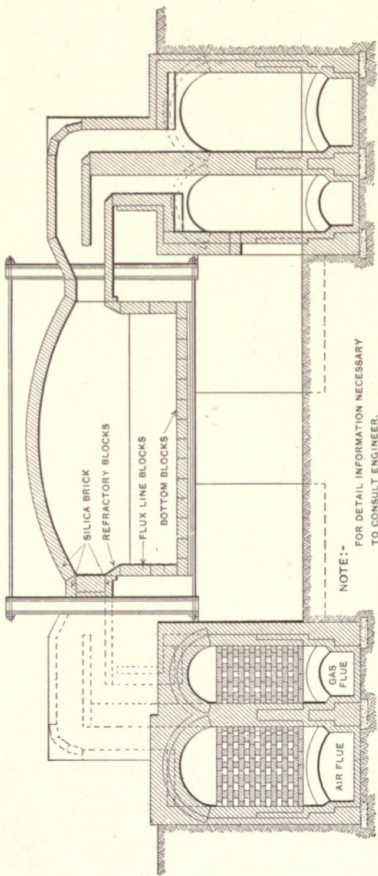


SHAPES REQUIRED FOR ONE LINING AS SHOWN

Shapes	Quality	Pieces Required
9-inch No. 3 Key.....	Chrome or Magnesite....	875
9-inch No. 2 Key.....	Chrome or Magnesite..	125
9-inch Sts.....	Chrome or Magnesite....	205
Total 9 Inch Equivalent.....		1209

Note—Count and dimensions are approximate

CROSS SECTION OF TYPICAL PRODUCER
GAS GLASS TANK



GENERAL INFORMATION ABOUT FIRE BRICK

All fire brick should be kept in a dry place. Moisture, especially in cold weather, will greatly injure any brick.

Good brick work depends much on the following points :

Use of good fire clay (equal in refractoriness to the brick itself) applied very thin, preferably dipped and rubbed close.

Slow warming up to expel moisture.

Attention to fact that fire clay brick contract slightly and silica brick expand under high temperatures.

Lighter burned fire clay brick in roofs will usually give better service than hard burned brick.

The refractoriness of silica brick is greatly decreased by sudden heating up.

From 250 to 350 pounds of fire clay or silica cement is enough to lay up one thousand brick. Fine ground fire clay should be used for laying up fire clay brick and silica cement for silica brick. In first class brick work, less than three hundred and fifty pounds of fire clay per thousand brick should be used.

For approximate estimating on fire brick work, use the following figures:

- 1 square foot 4½-inch wall requires 7 brick
- 1 square foot 9-inch wall requires 14 brick
- 1 square foot 13½-inch wall requires 21 brick
- 1 cubic foot brick work requires 17 nine-inch straight brick
- 1 cubic foot fire clay brick work weighs 150 pounds
- 1 cubic foot silica brick work weighs 130 pounds
- 1000 brick (closely stacked) occupies 56 cubic feet
- 1000 brick (loosely stacked) occupies 72 cubic feet

Magnesite and chrome brick, although highly refractory, are only suitable for use in places where they have to withstand the action of hot basic slags, fumes, etc. Fire clay or silica brick are recommended for other places.

BRICK TABLES

THE following tables show how a circle or arch of any diameter may be laid up with a combination of the standard size fire brick, as designated in this catalogue.

TABLE OF WEDGE BRICK

Inside Diameter	No. 2 Wedge	No. 1 Wedge	Square	Total
2 ft. 0 in.	.....	.....	.....
2 " 6 "	60.5	.....	.....	60.5
3 " 0 "	48.	19.6	.....	68.
3 " 6 "	36.	40.	.....	76.
4 " 0 "	24.	59.	.....	83.
4 " 6 "	12.0637	79.	.....	91.
5 " 0 "	.....	98.	.....	98.
5 " 6 "	.....	98.	7.5	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 OF ARCH BRICK

Inside Diameter	No. 3 Arch	No. 2 Arch	No. 1 Arch	Straight	Total
0 ft. 6 in.	18.	.....	.....	.....	18.
1 " 0 "	13.	13.	.....	.....	26.
1 " 6 "	4.	29.	.....	.....	33.
2 " 0 "	41.5	.....	.....	41.5
2 " 6 "	31.	18.	.....	49.
3 " 0 "	21.	36.	.....	57.
3 " 6 "	10.3673	54.	.....	64.
4 " 0 "	72.	.....	72.
4 " 6 "	72.	7.5	80.
5 " 0 "	72.	15.	87.
5 " 6 "	72.	23.	95.
6 " 0 "	72.	30.	102.
6 " 6 "	72.	38.	110.
7 " 0 "	72.	45.	117.
7 " 6 "	72.	53.	125.
8 " 0 "	72.	60.	132.
8 " 6 "	72.	68.	140.
9 " 0 "	72.	75.	147.
9 " 6 "	72.	83.	155.
10 " 0 "	72.	90.	162.
10 " 6 "	72.	98.	170.
11 " 0 "	72.	105.	177.
11 " 6 "	72.	113.	185.
12 " 0 "	72.	121.	193.

TABLE OF 9-INCH KEY BRICK

Inside Diameter	No. 4 Key	No. 3 Key	No. 2 Key	No. 1 Key	Sq.	Total
1 ft. 6 in.	25.1328	.....	.....	.....	.....	25.
2 " 0 "	17.	12.5	.....	.....	.....	30.
2 " 6 "	8.3776	25.	.....	.....	.....	34.
3 " 0 "	38.	.....	.....	.....	38.
3 " 6 "	32.	10.5	.....	.....	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.	9.5	.....	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 "	5.236	104.	.....	109.
12 " 0 "	113.	.....	113.

TABLE OF 9-INCH KEY BRICK CONTINUED

Inside Diameter	No. 1 Key	Square	Total
12 ft. 6 in.	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.

TABLE OF 9-INCH KEY BRICK CONTINUED

Inside Diameter	No. 1 Key	Square	Total
24 ft. 0 in.	113.	101.	214.
24 " 6 "	113.	105.	218.
25 " 0 "	113.	109.	222.
25 " 6 "	113.	113.	226.
26 " 0 "	113.	117.	230.
26 " 6 "	113.	121.	234.
27 " 0 "	113.	126.	239.
27 " 6 "	113.	130.	243.
28 " 0 "	113.	134.	247.
28 " 6 "	113.	138.	251.
29 " 0 "	113.	142.	255.
29 " 6 "	113.	147.	260.
30 " 0 "	113.	151.	264.
30 " 6 "	113.	155.	268.
31 " 0 "	113.	159.	272.
31 " 6 "	113.	163.	276.
32 " 0 "	113.	168.	281.
32 " 6 "	113.	172.	285.
33 " 0 "	113.	176.	289.
33 " 6 "	113.	180.	293.
34 " 0 "	113.	184.	297.
34 " 6 "	113.	188.	301.
35 " 0 "	113.	193.	306.

TABLE OF 13 1/2-INCH KEY BRICK

Inside Diameter	No. 4 Key	No. 2 Key	Square	Total
6 ft. 0 in.	52.	.....	.....	52.
6 " 6 "	48.	7.5	.....	55.
7 " 0 "	44.	15.	.....	59.
7 " 6 "	39.	23.	.....	62.
8 " 0 "	35.	30.	.....	65.
8 " 6 "	30.	38.	.....	68.
9 " 0 "	26.	45.	.....	71.
9 " 6 "	22.	52.	.....	74.
10 " 0 "	17.	60.	.....	77.
10 " 6 "	13.	67.	.....	80.
11 " 0 "	9.	75.	.....	84.
11 " 6 "	4.5	82.	.....	87.
12 " 0 "	.....	90.	.....	90.
12 " 6 "	.....	90.	3.5	93.5
13 " 0 "	.....	90.	7.	97.
13 " 6 "	.....	90.	10.	100.
14 " 0 "	.....	90.	13.	103.
14 " 6 "	.....	90.	16.	106.
15 " 0 "	.....	90.	20.	110.
15 " 6 "	.....	90.	23.	113.
16 " 0 "	.....	90.	26.	116.
16 " 6 "	.....	90.	29.	119.

TABLE OF 13 ½-INCH KEY BRICK CONTINUED

Inside Diameter	No. 2 Key	Square	Total
17 ft. 0 in.	90.	32.	122.
17 " 6 "	90.	35.	125.
18 " 0 "	90.	38.	128.
18 " 6 "	90.	42.	132.
19 " 0 "	90.	45.	135.
19 " 6 "	90.	48.	138.
20 " 0 "	90.	51.	141.
20 " 6 "	90.	54.	144.
21 " 0 "	90.	57.	147.
21 " 6 "	90.	60.	150.
22 " 0 "	90.	63.	153.
22 " 6 "	90.	66.	156.
23 " 0 "	90.	70.	160.
23 " 6 "	90.	73.	163.
24 " 0 "	90.	76.	166.
24 " 6 "	90.	79.	169.
25 " 0 "	90.	82.	172.
25 " 6 "	90.	85.	175.
26 " 0 "	90.	88.	178.
26 " 6 "	90.	92.	182.
27 " 0 "	90.	95.	185.
27 " 6 "	90.	98.	188.
28 " 0 "	90.	101.	191.

TABLE OF 13 1/2-INCH KEY BRICK
CONTINUED

Inside Diameter	No. 2 Key	Square	Total
28 ft. 6 in.....	90.	104.	194.
29 " 0 "	90.	107.	197.
29 " 6 "	90.	110.	200.
30 " 0 "	90.	114.	204.
30 " 6 "	90.	117.	207.
31 " 0 "	90.	120.	210.
31 " 6 "	90.	123.	213.
32 " 0 "	90.	126.	216.
32 " 6 "	90.	129.	219.
33 " 0 "	90.	132.	222.
33 " 6 "	90.	136.	226.
34 " 0 "	90.	139.	229.
34 " 6 "	90.	142.	232.
35 " 0 "	90.	145.	235.

TABLE OF 9 x 6 INCH KEY BRICK

Inside Diameter	Key 9 x 6 x 5 $\frac{3}{8}$ x 2 $\frac{1}{2}$ "	Straight 9 x 6 x 2 $\frac{1}{2}$ "	Total
12 ft. 0 in.	85.	0.	85.
12 " 6 "	85.	3.	88.
13 " 0 "	85.	6.	91.
13 " 6 "	85.	9.	94.
14 " 0 "	85.	12.	97.
14 " 6 "	85.	15.	100.
15 " 0 "	85.	18.	103.
15 " 6 "	85.	21.	106.
16 " 0 "	85.	24.	109.
16 " 6 "	85.	28.	113.
17 " 0 "	85.	31.	116.
17 " 6 "	85.	34.	119.
18 " 0 "	85.	37.	122.
18 " 6 "	85.	40.	125.
19 " 0 "	85.	43.	128.
19 " 6 "	85.	46.	131.
20 " 0 "	85.	49.	134.
20 " 6 "	85.	53.	138.
21 " 0 "	85.	56.	141.
21 " 6 "	85.	59.	144.
22 " 0 "	85.	62.	147.
22 " 6 "	85.	65.	150.
23 " 0 "	85.	68.	153.
23 " 6 "	85.	71.	156.
24 " 0 "	85.	75.	160.
24 " 6 "	85.	78.	163.
25 " 0 "	85.	81.	166.
25 " 6 "	85.	84.	169.
26 " 0 "	85.	87.	172.

**TABLE OF GAS FLUE ARCH BRICK
FOR BLAST FURNACE TOP OPENINGS**

Inside Diameter Openings	Shapes Required			
	No. 3	No. 4	No. 5	Squares
3 ft. 0 in.....	49			
3 ft. 6 in.....	23	31		
4 ft. 0 in.....		60		
4 ft. 6 in.....		26	39	
5 ft. 0 in.....			70	
5 ft. 6 in.....			70	6
6 ft. 0 in.....			70	11
6 ft. 6 in.....			70	16
7 ft. 0 in.....			70	22
7 ft. 6 in.....			70	27
8 ft. 0 in.....			70	33
8 ft. 6 in.....			70	38
9 ft. 0 in.....			70	43

**CUPOLA BLOCKS
FOR SPECIAL DIAMETERS**

Inside Diameter Cupola	Shapes Required			
	No. 1	No. 2	No. 3	No. 4
2 ft. 6 in.....	15			
2 ft. 9 in.....	8	8		
3 ft. 0 in.....		17		
3 ft. 3 in.....		12	6	
3 ft. 6 in.....		8	11	
3 ft. 9 in.....		4	16	
4 ft. 0 in.....			21	
4 ft. 3 in.....			15	7
4 ft. 6 in.....			10	13
4 ft. 9 in.....			5	19
5 ft. 0 in.....				25

TABLE OF SILICA, 12-INCH WEDGE
BRICK

Inside Diameter	No. 2 Wedge 12 x 6 x 2 $\frac{7}{8}$ x 2 $\frac{1}{2}$ "	No. 1 Wedge 12 x 6 x 2 $\frac{1}{8}$ x 2 $\frac{1}{2}$ "	Squares	Total
12 ft. 0 in.	181	.....	.....	181
12 " 6 "	173	15	.....	188
13 " 0 "	166	30	.....	196
13 " 6 "	158	45	.....	203
14 " 0 "	151	60	.....	211
14 " 6 "	143	75	.....	218
15 " 0 "	136	90	.....	226
15 " 6 "	128	106	.....	234
16 " 0 "	121	121	.....	242
16 " 6 "	113	136	.....	249
17 " 0 "	106	151	.....	257
17 " 6 "	98	166	.....	264
18 " 0 "	91	181	.....	272
18 " 6 "	83	196	.....	279
19 " 0 "	76	211	.....	287
19 " 6 "	68	226	.....	294
20 " 0 "	61	241	.....	302
20 " 6 "	53	256	.....	309
21 " 0 "	46	271	.....	317
21 " 6 "	38	287	.....	325
22 " 0 "	31	302	.....	333
22 " 6 "	23	317	.....	340
23 " 0 "	16	332	.....	348
23 " 6 "	8	347	.....	355
24 " 0 "	.....	362	.....	362
24 " 6 "	.....	362	8	370
25 " 0 "	.....	362	15	377
25 " 6 "	.....	362	23	385
26 " 0 "	.....	362	30	392
26 " 6 "	.....	362	38	400
27 " 0 "	.....	362	45	407
27 " 6 "	.....	362	53	415
28 " 0 "	.....	362	60	422
28 " 6 "	.....	362	68	430
29 " 0 "	.....	362	75	437
29 " 6 "	.....	362	83	445
30 " 0 "	.....	362	90	452
30 " 6 "	.....	362	98	460
31 " 0 "	.....	362	105	467
31 " 6 "	.....	362	113	475
32 " 0 "	.....	362	120	482
32 " 6 "	.....	362	128	490
33 " 0 "	.....	362	135	497
33 " 6 "	.....	362	143	505
34 " 0 "	.....	362	150	512
34 " 6 "	.....	362	158	520
35 " 0 "	.....	362	165	527
35 " 6 "	.....	362	173	535
36 " 0 "	.....	362	181	543

STANDARD BOTTOM BLOCKS

IN ONE COURSE OF FOLLOWING DIAMETERS

Diameter	No. Blocks	Diameter	No. Blocks
8' 0"	86	17' 0"	387
8' 6"	97	17' 6"	410
9' 0"	108	18' 0"	434
9' 6"	121	18' 6"	459
10' 0"	134	19' 0"	484
10' 6"	148	19' 6"	509
11' 0"	162	20' 0"	536
11' 6"	177	20' 6"	563
12' 0"	194	21' 0"	591
12' 6"	209	21' 6"	619
13' 0"	226	22' 0"	648
13' 6"	244	22' 6"	677
14' 0"	263	23' 0"	709
14' 6"	282	23' 6"	740
15' 0"	301	24' 0"	771
15' 6"	322	24' 6"	804
16' 0"	343	25' 0"	837
16' 6"	364	25' 6"	871

TEMPERATURES

The following table affords a somewhat rough method of estimating high temperature.

	Centigrade Degrees	Fahrenheit Degrees
Just glowing in the dark	525	977
Dark red	700	1252
Cherry red.....	908	1666
Bright cherry red.....	1000	1832
Orange	1150	2102
White.....	1300	2372
Dazzling white.....	1500	2732

TEMPERATURES

Below we give the temperatures of iron, steel and other metals, under various conditions, according to the latest scientific investigations.

	Centigrade Degrees	Fahrenheit Degrees
Mercury.....melts	40	40
Mercury.....boils	349	660
Tin.....melts	229	445
Lead.....melts	322	612
Lead.....boils	1040	1904
Zinc.....melts	412	775
Zinc.....boils	1040	1904
Aluminum.....melts	700	1252
Silver.....melts	957	1775
Brass.....melts	1021	1870
Copper.....melts	1029	1885
Gold.....melts	1038	1900
Cobalt.....melts	1100	2012
Cast Iron, white.....melts	1135	2075
Cast Iron, gray.....melts	1222	2230
Steel.....melts	1300	2372
Iron, wrought.....melts	1500	2732
Nickel.....melts	1500	2732
Platinum.....melts	2533	4593
Glass Furnace, between the pots.	1375	2507
In the pots, refining.....	1310	2390
In the pots, working.....	1045	1913
Tanks melted for casting.....	1310	2390
Annealing Glassware.....	444	800
}	to 555	to 1000
Siemens Crucible Steel Furnace	1230	2246
varies from.....	to 1330	to 2426

TEMPERATURES

	Centigrade Degrees	Fahrenheit Degrees
BESSEMER PROCESS		
Running the slag	1580	2876
Running steel into ladle	1640	2984
Running steel into mould	1580	2876
Annealing furnace, ingot in	1200	2192
Ingot under hammer	1080	1976
OPEN HEARTH PROCESS		
Gas from producers	720	1328
Gas entering generator	400	752
Gas leaving generator	1200	2192
Air leaving generator	1000	1832
Fumes passing to shaft	300	572
End of fusion of charge	1420	2588
Refining the steel	1500	2732
Running into ladle, first	1580	2876
Running into ladle, last	1490	2714
BLAST FURNACE—GRAY BESSEMER		
Front of tuyere	1930	3506
At tapping	1570	2858

CIRCUMFERENCES AND AREAS OF CIRCLES
FROM 1-64 TO 50

Diam.	Circum.	Area	Diam.	Circum.	Area
$\frac{1}{64}$	.04909	.000192	4	12.5664	12.5664
$\frac{1}{32}$	.09818	.000767	$4\frac{1}{8}$	12.9591	13.3641
$\frac{1}{16}$	.19635	.003068	$4\frac{1}{4}$	13.3518	14.1863
$\frac{1}{8}$	.3927	.012272	$4\frac{3}{8}$	13.7445	15.033
$\frac{3}{16}$	.589	.027612	$4\frac{1}{2}$	14.1372	15.9043
$\frac{1}{4}$	.7854	.049087	$4\frac{5}{8}$	14.5299	16.8002
$\frac{5}{16}$	.98175	.076699	$4\frac{3}{4}$	14.9226	17.7206
$\frac{3}{8}$	1.1781	.110447	$4\frac{7}{8}$	15.3153	18.6555
$\frac{7}{16}$	1.37445	.15033			
$\frac{1}{2}$	1.5708	.19635	5	15.708	19.635
$\frac{9}{16}$	1.76715	.248505	$5\frac{1}{8}$	16.1007	20.629
$\frac{5}{8}$	1.9635	.306796	$5\frac{1}{4}$	16.4934	21.6476
$\frac{11}{16}$	2.15985	.371224	$5\frac{3}{8}$	16.8861	22.6907
$\frac{3}{4}$	2.3562	.441787	$5\frac{1}{2}$	17.2788	23.7583
$\frac{7}{8}$	2.55255	.518487	$5\frac{5}{8}$	17.6715	24.8505
$\frac{15}{16}$	2.7489	.601322	$5\frac{3}{4}$	18.0642	25.9673
$\frac{1}{8}$	2.94525	.690292	$5\frac{7}{8}$	18.4569	27.1086
1	3.1416	.7854	6	18.8496	28.2744
$1\frac{1}{8}$	3.5343	.99402	$6\frac{1}{8}$	19.2423	29.4648
$1\frac{1}{4}$	3.927	1.2272	$6\frac{1}{4}$	19.635	30.6797
$1\frac{3}{8}$	4.3197	1.4849	$6\frac{3}{8}$	20.0277	31.9191
$1\frac{1}{2}$	4.7124	1.7671	$6\frac{1}{2}$	20.4204	33.1831
$1\frac{5}{8}$	5.1051	2.0739	$6\frac{5}{8}$	20.8131	34.4717
$1\frac{3}{4}$	5.4978	2.4053	$6\frac{3}{4}$	21.2058	35.7848
$1\frac{7}{8}$	5.8905	2.7612	$6\frac{7}{8}$	21.5985	37.1224
2	6.2832	3.1416	7	21.9912	38.4846
$2\frac{1}{8}$	6.6759	3.5466	$7\frac{1}{8}$	22.3839	39.8713
$2\frac{1}{4}$	7.0686	3.9761	$7\frac{1}{4}$	22.7766	41.2826
$2\frac{3}{8}$	7.4613	4.4301	$7\frac{3}{8}$	23.1693	42.7184
$2\frac{1}{2}$	7.854	4.9087	$7\frac{1}{2}$	23.562	44.1787
$2\frac{5}{8}$	8.2467	5.4119	$7\frac{5}{8}$	23.9547	45.6636
$2\frac{3}{4}$	8.6394	5.9396	$7\frac{3}{4}$	24.3474	47.1731
$2\frac{7}{8}$	9.0321	6.4918	$7\frac{7}{8}$	24.7401	48.7071
3	9.4248	7.0686	8	25.1328	50.2656
$3\frac{1}{8}$	9.8175	7.6699	$8\frac{1}{8}$	25.5255	51.8487
$3\frac{1}{4}$	10.2102	8.2958	$8\frac{1}{4}$	25.9182	53.4563
$3\frac{3}{8}$	10.6029	8.9462	$8\frac{3}{8}$	26.3109	55.0884
$3\frac{1}{2}$	10.9956	9.6211	$8\frac{1}{2}$	26.7036	56.7451
$3\frac{5}{8}$	11.3883	10.3206	$8\frac{5}{8}$	27.0963	58.4264
$3\frac{3}{4}$	11.781	11.0447	$8\frac{3}{4}$	27.489	60.1322
$3\frac{7}{8}$	12.1737	11.7933	$8\frac{7}{8}$	27.8817	61.8625

CIRCUMFERENCES AND AREAS OF CIRCLES
CONTINUED

Diam.	Circum.	Area	Diam.	Circum.	Area
9	28.2744	63.6174	15	47.124	176.715
9 $\frac{1}{8}$	28.6671	65.3968	15 $\frac{1}{8}$	47.5167	179.673
9 $\frac{1}{4}$	29.0598	67.2008	15 $\frac{1}{4}$	47.9094	182.655
9 $\frac{3}{8}$	29.4525	69.0293	15 $\frac{3}{8}$	48.3021	185.661
9 $\frac{1}{2}$	29.8452	70.8823	15 $\frac{1}{2}$	48.6948	188.692
9 $\frac{5}{8}$	30.2379	72.7599	15 $\frac{5}{8}$	49.0875	191.748
9 $\frac{3}{4}$	30.6306	74.6621	15 $\frac{3}{4}$	49.4802	194.828
9 $\frac{7}{8}$	31.0233	76.5888	15 $\frac{7}{8}$	49.8729	197.933
10	31.416	78.54	16	50.2656	201.062
10 $\frac{1}{8}$	31.8087	80.5158	16 $\frac{1}{8}$	50.6583	204.216
10 $\frac{1}{4}$	32.2014	82.5161	16 $\frac{1}{4}$	51.051	207.395
10 $\frac{3}{8}$	32.5941	84.5409	16 $\frac{3}{8}$	51.4437	210.598
10 $\frac{1}{2}$	32.9868	86.5903	16 $\frac{1}{2}$	51.8364	213.825
10 $\frac{5}{8}$	33.3795	88.6643	16 $\frac{5}{8}$	52.2291	217.077
10 $\frac{3}{4}$	33.7722	90.7628	16 $\frac{3}{4}$	52.6218	220.354
10 $\frac{7}{8}$	34.1649	92.8858	16 $\frac{7}{8}$	53.0145	223.655
11	34.5576	95.0334	17	53.4072	226.981
11 $\frac{1}{8}$	34.9503	97.2055	17 $\frac{1}{8}$	53.7999	230.331
11 $\frac{1}{4}$	35.343	99.4022	17 $\frac{1}{4}$	54.1926	233.906
11 $\frac{3}{8}$	35.7357	101.6234	17 $\frac{3}{8}$	54.5853	237.105
11 $\frac{1}{2}$	36.1284	103.8691	17 $\frac{1}{2}$	54.978	240.529
11 $\frac{5}{8}$	36.5211	106.1394	17 $\frac{5}{8}$	55.3707	243.977
11 $\frac{3}{4}$	36.9138	108.4343	17 $\frac{3}{4}$	55.7634	247.45
11 $\frac{7}{8}$	37.3065	110.7537	17 $\frac{7}{8}$	56.1561	250.948
12	37.6992	113.098	18	56.5488	254.47
12 $\frac{1}{8}$	38.0919	115.466	18 $\frac{1}{8}$	56.9415	258.016
12 $\frac{1}{4}$	38.4846	117.859	18 $\frac{1}{4}$	57.3342	261.587
12 $\frac{3}{8}$	38.8773	120.277	18 $\frac{3}{8}$	57.7269	265.183
12 $\frac{1}{2}$	39.27	122.719	18 $\frac{1}{2}$	58.1196	268.803
12 $\frac{5}{8}$	39.6627	125.185	18 $\frac{5}{8}$	58.5123	272.448
12 $\frac{3}{4}$	40.0554	127.677	18 $\frac{3}{4}$	58.905	276.117
12 $\frac{7}{8}$	40.4481	130.192	18 $\frac{7}{8}$	59.2977	279.811
13	40.8408	132.733	19	59.6904	283.529
13 $\frac{1}{8}$	41.2335	135.297	19 $\frac{1}{8}$	60.0831	287.272
13 $\frac{1}{4}$	41.6262	137.887	19 $\frac{1}{4}$	60.4758	291.04
13 $\frac{3}{8}$	42.0189	140.501	19 $\frac{3}{8}$	60.8685	294.832
13 $\frac{1}{2}$	42.4116	143.139	19 $\frac{1}{2}$	61.2612	298.648
13 $\frac{5}{8}$	42.8043	145.802	19 $\frac{5}{8}$	61.6539	302.489
13 $\frac{3}{4}$	43.197	148.49	19 $\frac{3}{4}$	62.0466	306.355
13 $\frac{7}{8}$	43.5897	151.202	19 $\frac{7}{8}$	62.4393	310.245
14	43.9824	153.938	20	62.832	314.16
14 $\frac{1}{8}$	44.3751	156.7	20 $\frac{1}{8}$	63.2247	318.099
14 $\frac{1}{4}$	44.7678	159.485	20 $\frac{1}{4}$	63.6174	322.063
14 $\frac{3}{8}$	45.1605	162.296	20 $\frac{3}{8}$	64.0101	326.051
14 $\frac{1}{2}$	45.5532	165.13	20 $\frac{1}{2}$	64.4028	330.064
14 $\frac{5}{8}$	45.9459	167.99	20 $\frac{5}{8}$	64.7955	334.102
14 $\frac{3}{4}$	46.3386	170.874	20 $\frac{3}{4}$	65.1882	338.164
14 $\frac{7}{8}$	46.7313	173.782	20 $\frac{7}{8}$	65.5809	342.25

CIRCUMFERENCES AND AREAS OF CIRCLES
 CONTINUED

Diam.	Circum.	Area	Diam.	Circum.	Area
21	65.9736	346.361	27	84.8232	572.557
21 $\frac{1}{8}$	66.3663	350.497	27 $\frac{1}{8}$	85.2159	577.87
21 $\frac{1}{4}$	66.759	354.657	27 $\frac{1}{4}$	85.6086	583.209
21 $\frac{3}{8}$	67.1517	358.842	27 $\frac{3}{8}$	86.0013	588.571
21 $\frac{1}{2}$	67.5444	363.051	27 $\frac{1}{2}$	86.394	593.959
21 $\frac{5}{8}$	67.9379	367.285	27 $\frac{5}{8}$	86.7867	599.371
21 $\frac{3}{4}$	68.3298	371.543	27 $\frac{3}{4}$	87.1794	604.807
21 $\frac{7}{8}$	68.7225	375.826	27 $\frac{7}{8}$	87.5729	610.268
22	69.1152	380.134	28	87.9648	615.754
22 $\frac{1}{8}$	69.5079	384.466	28 $\frac{1}{8}$	88.3575	621.264
22 $\frac{1}{4}$	69.9006	388.822	28 $\frac{1}{4}$	88.7502	626.798
22 $\frac{3}{8}$	70.2933	393.203	28 $\frac{3}{8}$	89.1429	632.357
22 $\frac{1}{2}$	70.686	397.609	28 $\frac{1}{2}$	89.5356	637.941
22 $\frac{5}{8}$	71.0787	402.038	28 $\frac{5}{8}$	89.9283	643.549
22 $\frac{3}{4}$	71.4714	406.494	28 $\frac{3}{4}$	90.321	649.182
22 $\frac{7}{8}$	71.8641	410.973	28 $\frac{7}{8}$	90.7137	654.84
23	72.2568	415.477	29	91.1064	660.521
23 $\frac{1}{8}$	72.6495	420.004	29 $\frac{1}{8}$	91.4991	666.228
23 $\frac{1}{4}$	73.0422	424.558	29 $\frac{1}{4}$	91.8918	671.959
23 $\frac{3}{8}$	73.4349	429.135	29 $\frac{3}{8}$	92.2845	677.714
23 $\frac{1}{2}$	73.8276	433.737	29 $\frac{1}{2}$	92.6772	683.494
23 $\frac{5}{8}$	74.2203	438.364	29 $\frac{5}{8}$	93.0699	689.299
23 $\frac{3}{4}$	74.613	443.015	29 $\frac{3}{4}$	93.4626	695.128
23 $\frac{7}{8}$	75.0057	447.69	29 $\frac{7}{8}$	93.8553	700.982
24	75.3984	452.39	30	94.248	706.86
24 $\frac{1}{8}$	75.7911	457.115	30 $\frac{1}{8}$	94.6407	712.763
24 $\frac{1}{4}$	76.1838	461.864	30 $\frac{1}{4}$	95.0334	718.69
24 $\frac{3}{8}$	76.5765	466.638	30 $\frac{3}{8}$	95.4261	724.642
24 $\frac{1}{2}$	76.9692	471.436	30 $\frac{1}{2}$	95.8188	730.618
24 $\frac{5}{8}$	77.3619	476.259	30 $\frac{5}{8}$	96.2115	736.619
24 $\frac{3}{4}$	77.7546	481.107	30 $\frac{3}{4}$	96.6042	742.645
24 $\frac{7}{8}$	78.1473	485.979	30 $\frac{7}{8}$	96.9969	748.695
25	78.54	490.875	31	97.3896	754.769
25 $\frac{1}{8}$	78.9327	495.796	31 $\frac{1}{8}$	97.7823	760.869
25 $\frac{1}{4}$	79.3254	500.742	31 $\frac{1}{4}$	98.175	766.992
25 $\frac{3}{8}$	79.7181	505.712	31 $\frac{3}{8}$	98.5677	773.14
25 $\frac{1}{2}$	80.1108	510.706	31 $\frac{1}{2}$	98.9604	779.313
25 $\frac{5}{8}$	80.5035	515.726	31 $\frac{5}{8}$	99.3531	785.51
25 $\frac{3}{4}$	80.8962	520.769	31 $\frac{3}{4}$	99.7458	791.732
25 $\frac{7}{8}$	81.2889	525.838	31 $\frac{7}{8}$	100.1385	797.979
26	81.6816	530.93	32	100.5312	804.25
26 $\frac{1}{8}$	82.0743	536.048	32 $\frac{1}{8}$	100.9239	810.545
26 $\frac{1}{4}$	82.467	541.19	32 $\frac{1}{4}$	101.3166	816.865
26 $\frac{3}{8}$	82.8597	546.356	32 $\frac{3}{8}$	101.7093	823.21
26 $\frac{1}{2}$	83.2524	551.547	32 $\frac{1}{2}$	102.102	829.579
26 $\frac{5}{8}$	83.6451	556.763	32 $\frac{5}{8}$	102.4947	835.972
26 $\frac{3}{4}$	84.0378	562.003	32 $\frac{3}{4}$	102.8874	842.391
26 $\frac{7}{8}$	84.4305	567.267	32 $\frac{7}{8}$	103.2801	848.833

CIRCUMFERENCES AND AREAS OF CIRCLES
CONTINUED

Diam.	Circum.	Area	Diam.	Circum.	Area
33	103.673	855.901	39	122.522	1194.593
33 $\frac{1}{8}$	104.065	861.792	39 $\frac{1}{8}$	122.915	1202.263
33 $\frac{1}{4}$	104.458	868.309	39 $\frac{1}{4}$	123.308	1209.958
33 $\frac{3}{8}$	104.851	874.85	39 $\frac{3}{8}$	123.7	1217.677
33 $\frac{1}{2}$	105.344	881.415	39 $\frac{1}{2}$	124.093	1225.42
33 $\frac{5}{8}$	105.636	888.005	39 $\frac{5}{8}$	124.486	1233.188
33 $\frac{3}{4}$	106.029	894.62	39 $\frac{3}{4}$	124.879	1240.981
33 $\frac{7}{8}$	106.422	901.259	39 $\frac{7}{8}$	125.271	1248.798
34	106.814	907.922	40	125.664	1256.64
34 $\frac{1}{8}$	107.207	914.611	40 $\frac{1}{8}$	126.057	1264.51
34 $\frac{1}{4}$	107.6	921.323	40 $\frac{1}{4}$	126.449	1272.4
34 $\frac{3}{8}$	107.992	928.061	40 $\frac{3}{8}$	126.842	1280.31
34 $\frac{1}{2}$	108.385	934.822	40 $\frac{1}{2}$	127.235	1288.25
34 $\frac{5}{8}$	108.778	941.609	40 $\frac{5}{8}$	127.627	1296.22
34 $\frac{3}{4}$	109.171	948.42	40 $\frac{3}{4}$	128.02	1304.21
34 $\frac{7}{8}$	109.563	955.255	40 $\frac{7}{8}$	128.413	1312.22
35	109.956	962.115	41	128.806	1320.26
35 $\frac{1}{8}$	110.349	969.	41 $\frac{1}{8}$	129.198	1328.32
35 $\frac{1}{4}$	110.741	975.909	41 $\frac{1}{4}$	129.591	1336.41
35 $\frac{3}{8}$	111.134	982.842	41 $\frac{3}{8}$	129.984	1344.52
35 $\frac{1}{2}$	111.527	989.8	41 $\frac{1}{2}$	130.376	1352.66
35 $\frac{5}{8}$	111.919	996.783	41 $\frac{5}{8}$	130.769	1360.82
35 $\frac{3}{4}$	112.312	1003.79	41 $\frac{3}{4}$	131.162	1369.
35 $\frac{7}{8}$	112.705	1010.822	41 $\frac{7}{8}$	131.554	1377.21
36	113.098	1017.878	42	131.947	1385.45
36 $\frac{1}{8}$	113.49	1024.96	42 $\frac{1}{8}$	132.34	1393.7
36 $\frac{1}{4}$	113.883	1032.065	42 $\frac{1}{4}$	132.733	1401.99
36 $\frac{3}{8}$	114.276	1039.195	42 $\frac{3}{8}$	133.125	1410.3
36 $\frac{1}{2}$	114.668	1046.349	42 $\frac{1}{2}$	133.518	1418.63
36 $\frac{5}{8}$	115.061	1053.528	42 $\frac{5}{8}$	133.911	1426.99
36 $\frac{3}{4}$	115.454	1060.732	42 $\frac{3}{4}$	134.303	1435.37
36 $\frac{7}{8}$	115.846	1067.96	42 $\frac{7}{8}$	134.696	1443.77
37	116.239	1075.213	43	135.089	1452.2
37 $\frac{1}{8}$	116.632	1082.49	43 $\frac{1}{8}$	135.481	1460.66
37 $\frac{1}{4}$	117.025	1089.792	43 $\frac{1}{4}$	135.874	1469.14
37 $\frac{3}{8}$	117.417	1097.118	43 $\frac{3}{8}$	136.267	1477.64
37 $\frac{1}{2}$	117.81	1104.469	43 $\frac{1}{2}$	136.66	1486.17
37 $\frac{5}{8}$	118.203	1111.844	43 $\frac{5}{8}$	137.052	1494.73
37 $\frac{3}{4}$	118.595	1119.244	43 $\frac{3}{4}$	137.445	1503.3
37 $\frac{7}{8}$	118.988	1126.669	43 $\frac{7}{8}$	137.838	1511.91
38	119.381	1134.118	44	138.23	1520.53
38 $\frac{1}{8}$	119.773	1141.591	44 $\frac{1}{8}$	138.623	1529.19
38 $\frac{1}{4}$	120.166	1149.089	44 $\frac{1}{4}$	139.016	1537.86
38 $\frac{3}{8}$	120.559	1156.612	44 $\frac{3}{8}$	139.408	1546.56
38 $\frac{1}{2}$	120.952	1164.159	44 $\frac{1}{2}$	139.801	1555.29
38 $\frac{5}{8}$	121.344	1171.731	44 $\frac{5}{8}$	140.194	1564.04
38 $\frac{3}{4}$	121.737	1179.327	44 $\frac{3}{4}$	140.587	1572.81
38 $\frac{7}{8}$	122.13	1186.948	44 $\frac{7}{8}$	140.979	1581.61

CIRCUMFERENCES AND AREAS OF CIRCLES
CONTINUED

Diam.	Circum.	Area	Diam.	Circum.	Area
45	141.372	1590.43	48	150.797	1809.56
45 $\frac{1}{8}$	141.765	1599.28	48 $\frac{1}{8}$	151.189	1819.
45 $\frac{1}{4}$	142.157	1608.16	48 $\frac{1}{4}$	151.582	1828.46
45 $\frac{3}{8}$	142.55	1617.05	48 $\frac{3}{8}$	151.975	1837.95
45 $\frac{1}{2}$	142.943	1625.97	48 $\frac{1}{2}$	152.368	1847.46
45 $\frac{5}{8}$	143.335	1634.92	48 $\frac{5}{8}$	152.76	1856.99
45 $\frac{3}{4}$	143.728	1643.89	48 $\frac{3}{4}$	153.153	1866.55
45 $\frac{7}{8}$	144.121	1652.89	48 $\frac{7}{8}$	153.546	1876.14
46	144.514	1661.91	49	153.938	1885.75
46 $\frac{1}{8}$	144.906	1670.95	49 $\frac{1}{8}$	154.331	1895.38
46 $\frac{1}{4}$	145.299	1680.02	49 $\frac{1}{4}$	154.724	1905.04
46 $\frac{3}{8}$	145.692	1689.11	49 $\frac{3}{8}$	155.116	1914.72
46 $\frac{1}{2}$	146.084	1698.23	49 $\frac{1}{2}$	155.509	1924.43
46 $\frac{5}{8}$	146.477	1707.37	49 $\frac{5}{8}$	155.902	1934.16
46 $\frac{3}{4}$	146.87	1716.54	49 $\frac{3}{4}$	156.295	1943.91
46 $\frac{7}{8}$	147.262	1725.73	49 $\frac{7}{8}$	156.687	1953.69
47	147.655	1734.95	50	157.08	1963.5
47 $\frac{1}{8}$	148.048	1744.19			
47 $\frac{1}{4}$	148.441	1753.45			
47 $\frac{3}{8}$	148.833	1762.74			
47 $\frac{1}{2}$	149.226	1772.06			
47 $\frac{5}{8}$	149.619	1781.4			
47 $\frac{3}{4}$	150.011	1790.76			
47 $\frac{7}{8}$	150.404	1800.15			

TABLE FOR CIRCLE BRICK

FOR LENGTH OF CHORD MULTIPLY SINE BY DIAMETER

No. to Circle	Sine of Half Angle	Diameter for 9" Chord	No. to Circle	Sine of Half Angle	Diameter for 9" Chord
5	.58779	15.311"	28	.11196	80.385"
6	.50000	18.000"	29	.10811	83.248"
7	.43386	20.740"	30	.10453	86.099"
8	.38268	23.518"	31	.10044	89.605"
9	.34202	26.314"	32	.09802	91.818"
10	.30902	29.124"	33	.09507	94.667"
11	.28173	31.945"	34	.09225	97.560"
12	.25882	34.773"	35	.08965	100.390"
13	.23932	37.606"	36	.08716	103.257"
14	.22251	40.447"	37	.08481	106.119"
15	.20791	43.287"	38	.08258	108.985"
16	.19509	46.132"	39	.08046	111.856"
17	.18428	48.833"	40	.07846	114.708"
18	.17365	51.828"	41	.07655	117.570"
19	.16459	54.681"	42	.07472	120.449"
20	.15643	57.533"	43	.07300	123.287"
21	.14904	60.386"	44	.07136	127.102"
22	.14230	63.246"	45	.06976	129.014"
23	.13617	66.094"	46	.06825	131.868"
24	.13053	68.949"	47	.06679	134.750"
25	.12534	71.805"	48	.06540	137.614"
26	.12054	74.664"	49	.06407	140.471"
27	.11609	77.526"	50	.06279	143.334"

DECIMALS OF AN INCH FOR EACH 1-64TH

1-64 . . . . .	.015625	33-64 . . . . .	.515625
1-32 . . . . .	.03125	17-32 . . . . .	.53125
3-64 . . . . .	.046875	35-64 . . . . .	.546875
1-16 . . . . .	.0625	9-16 . . . . .	.5625
5-64 . . . . .	.078125	37-64 . . . . .	.578125
3-32 . . . . .	.09375	19-32 . . . . .	.59375
7-64 . . . . .	.109375	39-64 . . . . .	.609375
1-8 . . . . .	.125	5-8 . . . . .	.625
9-64 . . . . .	.140625	41-64 . . . . .	.640625
5-32 . . . . .	.15625	21-32 . . . . .	.65625
11-64 . . . . .	.171875	43-64 . . . . .	.671875
3-16 . . . . .	.1875	11-16 . . . . .	.6875
13-64 . . . . .	.203125	45-64 . . . . .	.703125
7-32 . . . . .	.21875	23-32 . . . . .	.71875
15-64 . . . . .	.234375	47-64 . . . . .	.734375
1-4 . . . . .	.250	3-4 . . . . .	.75
17-64 . . . . .	.265625	49-64 . . . . .	.765625
9-32 . . . . .	.28125	25-32 . . . . .	.78125
19-64 . . . . .	.296875	51-64 . . . . .	.796875
5-16 . . . . .	.3125	13-16 . . . . .	.8125
21-64 . . . . .	.328125	53-64 . . . . .	.828125
11-32 . . . . .	.34375	27-32 . . . . .	.84375
23-64 . . . . .	.359375	55-64 . . . . .	.859375
3-8 . . . . .	.375	7-8 . . . . .	.875
25-64 . . . . .	.390625	57-64 . . . . .	.890625
13-32 . . . . .	.40625	29-32 . . . . .	.90625
27-64 . . . . .	.421875	59-64 . . . . .	.921875
7-16 . . . . .	.4375	15-16 . . . . .	.9375
29-64 . . . . .	.453125	61-64 . . . . .	.953125
15-32 . . . . .	.46875	31-32 . . . . .	.96875
31-64 . . . . .	.484375	63-64 . . . . .	.984375
1-2 . . . . .	.500	1 . . . . .	.1

WEIGHT OF VARIOUS MATERIALS

Material	Average Per Cu. Ft. Pounds
BRICK	
Common red.....	100
Fire clay.....	150
Silica.....	128
Chrome.....	175
Magnesia.....	160
CEMENT	
Portland.....	78
Hydraulic.....	60
CORK	15
COAL AND COKE	
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Charcoal.....	18.5
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Loam, packed.....	95
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Oats.....	24
Wheat.....	48
LIME	
Quick, loose lumps.....	53
Quick, fine.....	75
Stone, large rocks.....	168
Stone, irregular lumps.....	96
MASONRY	
Granite or limestone.....	165
Mortar, rubble.....	154
Dry.....	138
Sandstone, dressed.....	144
METALS	
Aluminum.....	166
Brass, cast.....	524
Bronze.....	534
Copper, cast.....	537
Copper, rolled or wire.....	555
Iron, cast.....	450
Iron, wrought.....	482

WEIGHT OF VARIOUS MATERIALS
CONTINUED

Material	Average Per Cu. Ft. Pounds
METALS—Continued	
Lead, cast.....	708
Lead, rolled.....	711
Steel, cast.....	490
Steel, rolled.....	495
Tin, cast.....	459
Zinc, cast.....	438
OILS	
Engine.....	55
Crude.....	48
Petroleum.....	55
Gasoline.....	43
ROCK	
Chalk.....	145
Granite.....	165
Gypsum.....	143
Sandstone.....	144
Pumice stone.....	57
Quartz.....	165
Salt, coarse.....	45
Salt, fine.....	49
Shales.....	162
Slate, American.....	175
SAND	
Dry and loose.....	100
Dry and packed.....	110
Wet and packed.....	130
Gravel packed.....	118
WATER	
Water as ice.....	58.7
Water at 32 degrees Fahrenheit.....	62.4
Water at 212 degrees Fahrenheit.....	59.6
WOODS, DRY	
Apple.....	48
Beech.....	43
Birch.....	45
Cedar, American.....	35
Chestnut.....	41
Ebony.....	76
Elm.....	35
Hemlock.....	25
Hickory.....	53
Ironwood.....	114
Mahogany.....	35 to 53
Maple.....	49
Oak, live.....	59
Oak, white.....	50
Pine, white.....	25
Pine, yellow northern.....	34
Pine, yellow southern.....	45
Spruce.....	25
Walnut.....	35

COMPARISON OF CENTIGRADE AND FAHRENHEIT
THERMOMETERS

Centi- grade	Fahren- heit	Centi- grade	Fahren- heit	Centi- grade	Fahren- heit
1815	3299	1770	3218	1725	3137
1814	3297.2	1769	3216.2	1724	3135.2
1813	3295.4	1768	3214.4	1723	3133.4
1812	3293.6	1767	3212.6	1722	3131.6
1811	3291.8	1766	3210.8	1721	3129.8
1810	3290	1765	3209	1720	3128
1809	3288.2	1764	3207.2	1719	3126.2
1808	3286.4	1763	3205.4	1718	3124.4
1807	3284.6	1762	3203.6	1717	3122.6
1806	3282.8	1761	3201.8	1716	3120.8
1805	3281	1760	3200	1715	3119
1804	3279.2	1759	3198.2	1714	3117.2
1803	3277.4	1758	3196.4	1713	3115.4
1802	3275.6	1757	3194.6	1712	3113.6
1801	3273.8	1756	3192.8	1711	3111.8
1800	3272	1755	3191	1710	3110
1799	3270.2	1754	3189.2	1709	3108.2
1798	3268.4	1753	3187.4	1708	3106.4
1797	3266.6	1752	3185.6	1707	3104.6
1796	3264.8	1751	3183.8	1706	3102.8
1795	3263	1750	3182	1705	3101
1794	3261.2	1749	3180.2	1704	3099.2
1793	3259.4	1748	3178.4	1703	3097.4
1792	3257.6	1747	3176.6	1702	3095.6
1791	3255.8	1746	3174.8	1701	3093.8
1790	3254	1745	3173	1700	3092
1789	3252.2	1744	3171.2	1699	3090.2
1788	3250.4	1743	3169.4	1698	3088.4
1787	3248.6	1742	3167.6	1697	3086.6
1786	3246.8	1741	3165.8	1696	3084.8
1785	3245	1740	3164	1695	3083
1784	3243.2	1739	3162.2	1694	3081.2
1783	3241.4	1738	3160.4	1693	3079.4
1782	3239.6	1737	3158.6	1692	3077.6
1781	3237.8	1736	3156.8	1691	3075.8
1780	3236	1735	3155	1690	3074
1779	3234.2	1734	3153.2	1689	3072.2
1778	3232.4	1733	3151.4	1688	3070.4
1777	3230.6	1732	3149.6	1687	3068.6
1776	3228.8	1731	3147.8	1686	3066.8
1775	3227	1730	3146	1685	3065
1774	3225.2	1729	3144.2	1684	3063.2
1773	3223.4	1728	3142.4	1683	3061.4
1772	3221.6	1727	3140.6	1682	3059.6
1771	3219.8	1726	3138.8	1681	3057.8

COMPARISON OF CENTIGRADE AND FAHRENHEIT
THERMOMETERS—CONTINUED

Centi- grade	Fahren- heit	Centi- grade	Fahren- heit	Centi- grade	Fahren- heit
1680	3056	1635	2975	1590	2894
1679	3054.2	1634	2973.2	1589	2892.2
1678	3052.4	1633	2971.4	1588	2890.4
1677	3050.6	1632	2969.6	1587	2888.6
1676	3048.8	1631	2967.8	1586	2886.8
1675	3047	1630	2966	1585	2885
1674	3045.2	1629	2964.2	1584	2883.2
1673	3043.4	1628	2962.4	1583	2881.4
1672	3041.6	1627	2960.6	1582	2879.6
1671	3039.8	1626	2958.8	1581	2877.8
1670	3038	1625	2957	1580	2876
1669	3036.2	1624	2955.2	1579	2874.2
1668	3034.4	1623	2953.4	1578	2872.4
1667	3032.6	1622	2951.6	1577	2870.6
1666	3030.8	1621	2949.8	1576	2868.8
1665	3029	1620	2948	1575	2867
1664	3027.2	1619	2946.2	1574	2865.2
1663	3025.4	1618	2944.4	1573	2863.4
1662	3023.6	1617	2942.6	1572	2861.6
1661	3021.8	1616	2940.8	1571	2859.8
1660	3020	1615	2939	1570	2858
1659	3018.2	1614	2937.2	1569	2856.2
1658	3016.4	1613	2935.4	1568	2854.4
1657	3014.6	1612	2933.6	1567	2852.6
1656	3012.8	1611	2931.8	1566	2850.8
1655	3011	1610	2930	1565	2849
1654	3009.2	1609	2928.2	1564	2847.2
1653	3007.4	1608	2926.4	1563	2845.4
1652	3005.6	1607	2924.6	1562	2843.6
1651	3003.8	1606	2922.8	1561	2841.8
1650	3002	1605	2921	1560	2840
1649	3000.2	1604	2919.2	1559	2838.2
1648	2998.4	1603	2917.4	1558	2836.4
1647	2996.6	1602	2915.6	1557	2834.6
1646	2994.8	1601	2913.8	1556	2832.8
1645	2993	1600	2912	1555	2831
1644	2991.2	1599	2910.2	1554	2829.2
1643	2989.4	1598	2908.4	1553	2827.4
1642	2987.6	1597	2906.6	1552	2825.6
1641	2985.8	1596	2904.8	1551	2823.8
1640	2984	1595	2903	1550	2822
1639	2982.2	1594	2901.2	1549	2820.2
1638	2980.4	1593	2899.4	1548	2818.4
1637	2978.6	1592	2897.6	1547	2816.6
1636	2976.8	1591	2895.8	1546	2814.8

COMPARISON OF CENTIGRADE AND FAHRENHEIT
THERMOMETERS—CONTINUED

Centi- grade	Fahren- heit	Centi- grade	Fahren- heit	Centi- grade	Fahren- heit
1545	2813	1500	2732	1455	2651
1544	2811.2	1499	2730.2	1454	2649.2
1543	2809.4	1498	2728.4	1453	2647.4
1542	2807.6	1497	2726.6	1452	2645.6
1541	2805.8	1496	2724.8	1451	2643.8
1540	2804	1495	2723	1450	2642
1539	2802.2	1494	2721.2	1449	2640.2
1538	2800.4	1493	2719.4	1448	2638.4
1537	2798.6	1492	2717.6	1447	2636.6
1536	2796.8	1491	2715.8	1446	2634.8
1535	2795	1490	2714	1445	2633
1534	2793.2	1489	2712.2	1444	2631.2
1533	2791.4	1488	2710.4	1443	2629.4
1532	2789.6	1487	2708.6	1442	2627.6
1531	2787.8	1486	2706.8	1441	2625.8
1530	2785	1485	2705	1440	2624
1529	2784.2	1484	2703.2	1439	2622.2
1528	2782.4	1483	2701.4	1438	2620.4
1527	2780.6	1482	2699.6	1437	2618.6
1526	2778.8	1481	2697.8	1436	2616.8
1525	2777	1480	2696	1435	2615
1524	2775.2	1479	2694.2	1434	2613.2
1523	2773.4	1478	2692.4	1433	2611.4
1522	2771.6	1477	2690.6	1432	2609.6
1521	2769.8	1476	2688.8	1431	2607.8
1520	2768	1475	2687	1430	2606
1519	2766.2	1474	2685.2	1429	2604.2
1518	2764.4	1473	2683.4	1428	2602.4
1517	2762.6	1472	2681.6	1427	2600.6
1516	2760.8	1471	2679.8	1426	2598.8
1515	2759	1470	2678	1425	2597
1514	2757.2	1469	2676.2	1424	2595.2
1513	2755.4	1468	2674.4	1423	2593.4
1512	2753.6	1467	2672.6	1422	2591.6
1511	2751.8	1466	2670.8	1421	2589.8
1510	2750	1465	2669	1420	2588
1509	2748.2	1464	2667.2	1419	2586.2
1508	2746.4	1463	2665.4	1418	2584.4
1507	2744.6	1462	2663.6	1417	2582.6
1506	2742.8	1461	2661.8	1416	2580.8
1505	2741	1460	2660	1415	2579
1504	2739.2	1459	2658.2	1414	2577.2
1503	2737.4	1458	2656.4	1413	2575.4
1502	2735.6	1457	2654.6	1412	2573.6
1501	2733.8	1456	2652.8	1411	2571.8

COMPARISON OF CENTIGRADE AND FAHRENHEIT
THERMOMETERS—CONTINUED

Centi- grade	Fahren- heit	Centi- grade	Fahren- heit	Centi- grade	Fahren- heit
1410	2570	1320	2408	870	1598
1409	2568.2	1310	2390	860	1580
1408	2566.4	1300	2372	850	1562
1407	2564.6	1290	2354	840	1544
1406	2562.8	1280	2336	830	1526
1405	2561	1270	2318	820	1508
1404	2559.2	1260	2300	810	1490
1403	2557.4	1250	2282	800	1472
1402	2555.6	1240	2264	790	1454
1401	2553.8	1230	2246	780	1436
1400	2552	1220	2228	770	1418
1399	2550.2	1210	2210	760	1400
1398	2548.4	1200	2192	750	1382
1397	2546.6	1190	2174	740	1364
1396	2544.8	1180	2156	730	1346
1395	2543	1170	2138	720	1328
1394	2541.2	1160	2120	710	1310
1393	2539.4	1150	2102	700	1292
1392	2537.6	1140	2084	690	1274
1391	2535.8	1130	2066	680	1256
1390	2534	1120	2048	670	1238
1389	2532.2	1110	2030	660	1220
1388	2530.4	1100	2012	650	1202
1387	2528.6	1090	1994	640	1184
1386	2526.8	1080	1976	630	1166
1385	2525	1070	1958	620	1148
1384	2523.2	1060	1940	610	1130
1383	2521.4	1050	1922	600	1112
1382	2519.6	1040	1904	590	1094
1381	2517.8	1030	1886	580	1076
1380	2516	1020	1868	570	1058
1379	2514.2	1010	1850	560	1040
1378	2512.4	1000	1832	550	1022
1377	2510.6	990	1814	540	1004
1376	2508.8	980	1796	530	986
1375	2507	970	1778	520	968
1374	2505.2	960	1760	510	950
1373	2503.4	950	1742	500	932
1372	2501.6	940	1724	490	914
1371	2499.8	930	1706	480	896
1370	2498	920	1688	470	878
1360	2480	910	1670	460	860
1350	2462	900	1652	450	842
1340	2444	890	1634	440	824
1330	2426	880	1616	430	806

COMPARISON OF CENTIGRADE AND FAHRENHEIT
THERMOMETERS—CONTINUED

Centi- grade	Fahren- heit	Centi- grade	Fahren- heit	Centi- grade	Fahren- heit
420	788	220	428	20	68
410	770	210	410	10	50
400	752	200	392	0	32
390	734	190	374	1	30.2
380	716	180	356	2	28.4
370	698	170	338	3	26.6
360	680	160	320	4	24.8
350	662	150	302	5	23
340	644	140	284	6	21.2
330	626	130	266	7	19.4
320	608	120	248	8	17.6
310	590	110	230	9	15.8
300	572	100	212	10	14
290	554	90	194	11	12.2
280	536	80	176	12	10.4
270	518	70	158	13	8.6
260	500	60	140	14	6.8
250	482	50	122	15	5
240	464	40	104	16	3.2
230	446	30	86	17	1.4
				18	0.4

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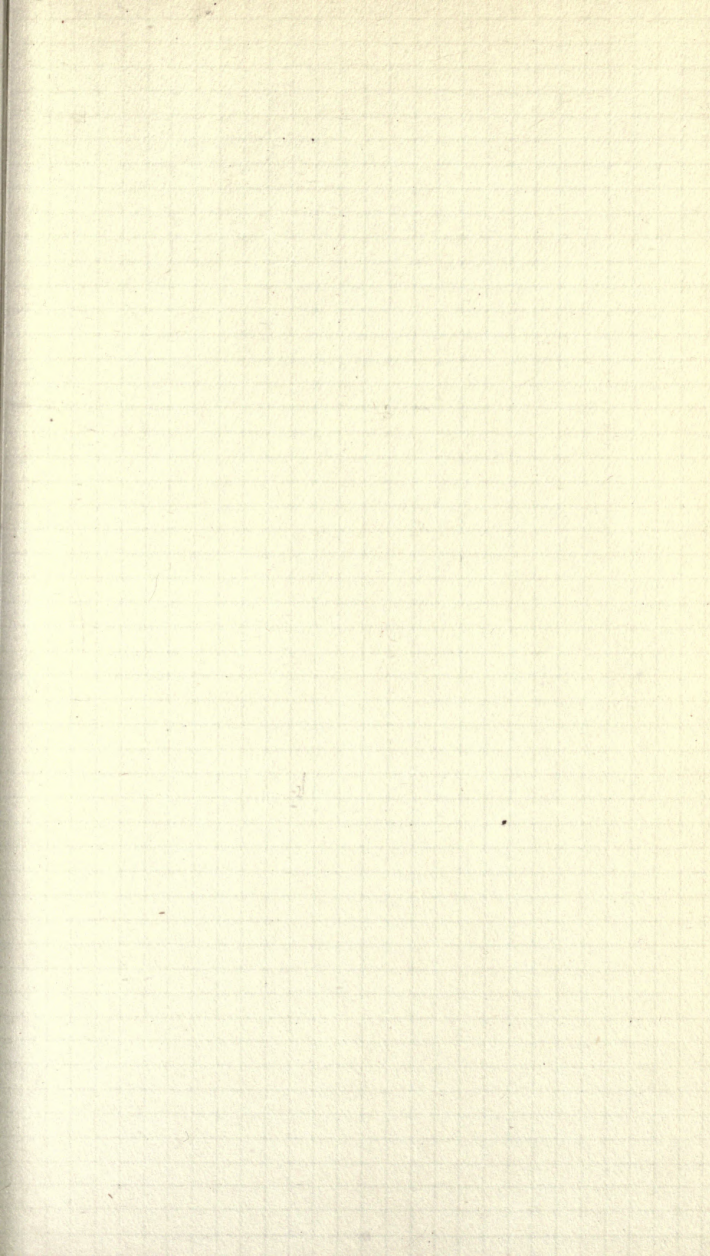
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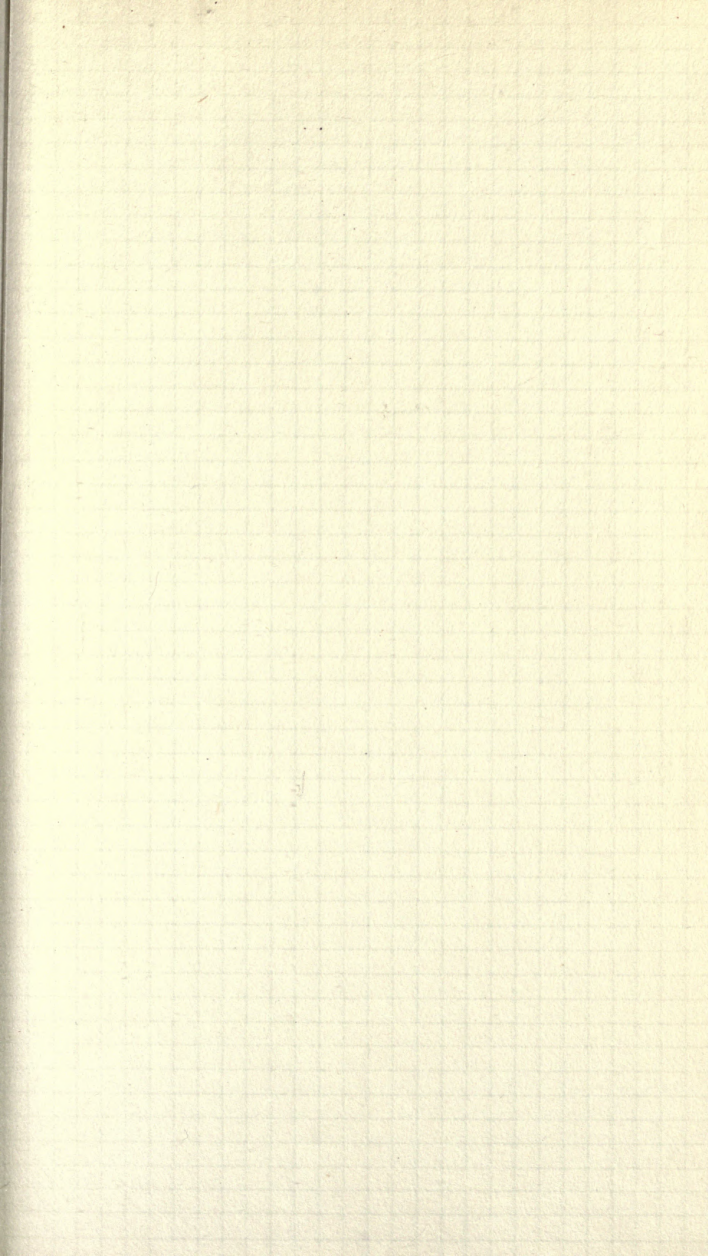
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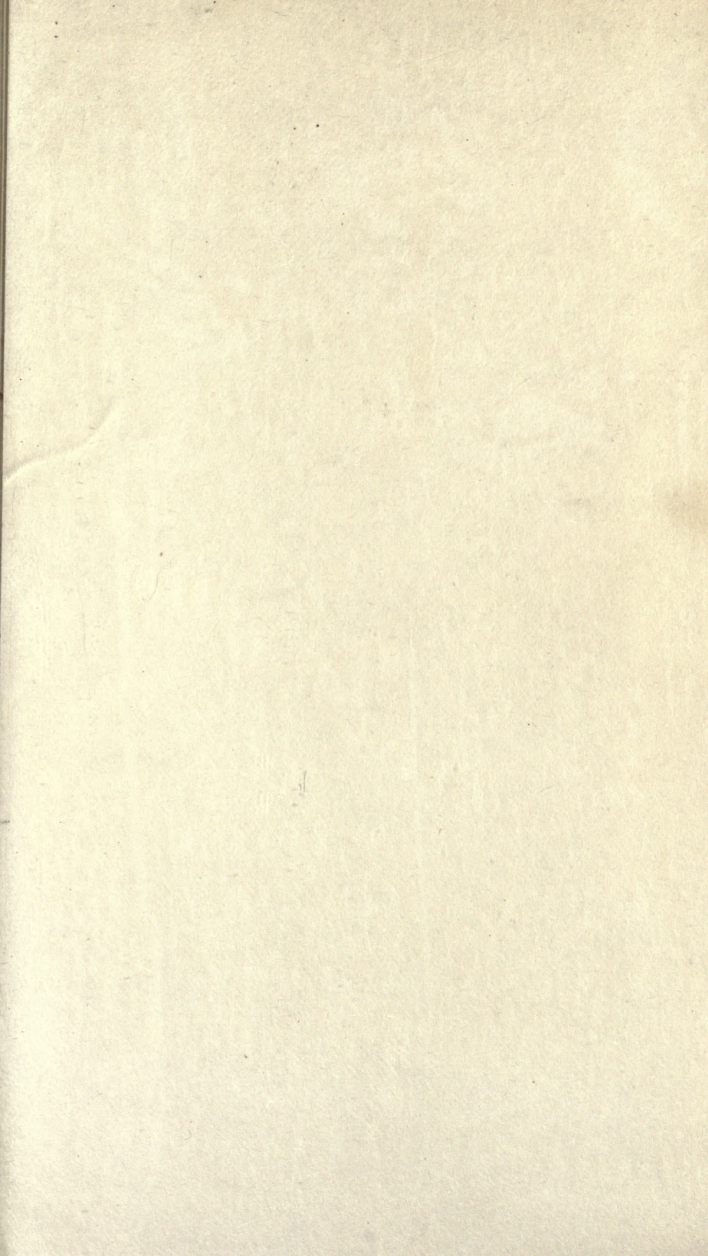
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