«REVISED·CATALOGUE»

1888.

RUSTLESS IRON.

THE WELLS RUSTLESS IRON COMPANY

N. O. NELSON M'F'G CO.

Eighth and St. Charles Sts., St. Louis, Mo.

AGENTS for MISSOURI and KANSAS.

WM. T. WELLS,
Pres't and Gen'l Manager.

CHAS. M. DAVIDSON,
Treasurer.

THE WELLS

RUSTLESS IRON

COMPANY.

MAIN OFFICE, 21 CLIFF STREET, NEW YORK.

AGENCIES.

BRAMAN, DOW & CO.,	Boston, Mass.
JOHN SIMMONS,	110 Centre St., New York City.
RIDGWAY & RUSS,	Albany, N. Y.
PIERCE, BUTLER & PIERCE M'F'G CO.,	Syracuse, N. Y.
EDWARD L. COOK,	Buffalo, N. Y.
JAS. B. CLOW & SON,	Chicago, Ills.
N. O. NELSON M'F'G CO.,	St. Louis, Mo.
I. S. VAN WINKLE & CO.,	San Francisco, Cal.

Press of Wm. J. Pell, 92 John Street, New York.
1888.

LOCATION OF WORKS

AND

RAILROAD CONNECTIONS.

Our Works are situated about eight miles from the New York City Hall, on the lines of the West Shore Railroad, The New York, Ontario & Western Railroad, and the New York, Susquehanna & Western Railroad, and close to the Hackensack River, which has a depth at this point of about twenty-five feet.

By special arrangements with the Railroad Companies all freight is unloaded and loaded at the factory platform, thereby avoiding handling.

Freight leaving New York City at five P. M. is unloaded at works at six o'clock next morning. Freight leaving LITTLE FERRY at six P. M. is delivered in New York City the following morning.

By agreement with Railways, we have direct and cheap railroad connections with all points on the following Roads:

West Shore R. R., N. Y., Susq. & W. R. R., Del., Lack. & W. R. R., Pennsylvania R. R., N. Y., Lake Erie & W. R. R., N. Y., Ont. & W. R. R., N. Y. C. R. R., Fitchburg R. R., &c., &c.

"RUSTLESS" IRON.

Iron and Steel are made "Rustless" by forming on their surfaces a Magnetic Oxide of Iron. This is done by the processes known as the Bower, the Bower-Barff and The Wells processes.

Oxydized Iron has been in the market in Europe and this country for a number of years, and is becoming so well known and is so much appreciated by those who have used it, that it has ceased to be a matter of experiment.

No foreign material such as *paint* or *alloy* is applied to the metal, so that the coating is perfectly pure.

The cost is less than that of Galvanizing or Enameling.

Surfaces of Iron and Steel treated by *our* process have a pleasing blue-gray or blue-black color, and if the article is polished before treatment it has a lustrous ebony-black finish, which gives a beautiful effect.

THE WELLS PROCESS.

After experimenting with and using the BOWER-BARFF process for a considerable time, MR. W. T. WELLS found that that process was not satisfactory in results, the charges coming from the furnace in a very uneven manner, sometimes partly good, but more often entirely bad. He was, therefore, compelled to study the matter very closely, and experiment carefully

until he finally developed the process we now employ. This is known as "THE WELLS PROCESS."

We produce a Rustless Oxide the same as the BOWER-BARFF, but our coating is *evenly* and *thoroughly* distributed over the *whole* surface of the iron articles treated.

Our process is not the guess work or theorizing of any one, but is the result of years of study and practical experience, and has been created at very great expense.

Although the results of the treatment are uniform and satisfactory, we have not ceased to carefully study the matter in hopes that eventually we may be able to produce the coating in a malleable condition, so that treated iron may be bent and worked the same as common iron is, without injury to the coating. No one has as yet been able to produce such an oxide, although the statement has been made that it is done.

Treatment by our process appears to greatly improve the quality of the iron treated. This is specially noticeable in fine castings, which are much stronger after treatment than before.

The finished iron has the pleasing blue-gray or blue-black color which is so much in demand for iron work.

We are constantly receiving the very strongest testimonials as to the merits of our goods, some of which will be found in *the back* part of this catalogue.

Our process is fully protected by patents, and we are now prepared to sell shop rights for special lines of work.

PREPARATION OF THE IRON.

Certain points in the preparation of the iron for treatment are observed to insure satisfactory results.

(1) Foundry sand, if left on castings, generally bakes to a reddish-brown color in the furnace, producing unsightly, rust-like spots, and must be removed by pickling and cleansing with a steel brush, or by thorough milling, preparatory to treatment.

(2) In treating wrought iron a handsome appearance of the oxydized ware is only obtained by removing all forge or rolling-mill scale before treatment. Pickling and brushing accomplish this, but for a large class of ordinary work the expense of this preparation is not incurred.

(3) Articles which are to have a bright polished surface, must be polished to the full extent desired *before* treatment.

(4) *Blow-holes* or other defects in castings must not be plugged with lead. Only brass or iron plugs can be used.

(5) The iron generally undergoes a very slight permanent expansion in the furnace, but this is not sufficient to require any special fitting, except in cases of very tight, accurate fit.

(6) All drilling of holes, trueing of faces, etc., must be done *before* treatment, to save the coating from the injury which subsequent fitting would cause.

(7) To secure the *best* results in piping buildings the pipe should be cut to measure *before* treatment. This we do at small charge.

PROPERTIES OF "RUSTLESS" IRON.

The magnetic oxide coating is very hard and comparatively inelastic. It withstands the wear due to friction, but is injured by blows of the hammer and rough usage. Wherever from this cause the coating is chipped the iron rusts, though the rust remains localized; it does not spread or raise the coating, as is the case with paint or galvanizing.

The protection of the iron being due to a coating of magnetic oxide, and not to anything penetrating the metal, it follows that any working of the iron after treatment will prove destructive of the coating. In riveting, the coating in the immediate neighborhood of the rivet-holes suffers; in fitting "*Rustless*" *Gas and Steam Pipe* the outside coating is injured by the bite of the wrench and vise, unless these are furnished with lead or rubber cheeks. The limit of elasticity of the oxide is practically the same as that of the iron; it adheres firmly to the metal until this limit has been reached, and no further.

A piece of "Rustless" iron can be heated to redness and then plunged into cold water without the least scaling or other change, while coverings of paint, tin, galvanizing and enamel suffer very much under such action. For this reason "*Rustless*" *Hollow Ware* is more *readily cleaned* than even enamel ware; the latter must be allowed to cool after use; and the remains of food in it become dried and congealed, and stick to the utensil, necessitating considerable scraping and involving danger of injuring the enamel.

Magnetic oxide withstands the action of many brines, alkalies, sulphuretted gases and weak, organic acids, but it is gradually dissolved by sulphuric and hydrochloric and other powerful acids. The corroding action of these acids, however, is considerably retarded on "Rustless" iron, and hence such iron has been successfully used in chemical works where it was exposed to strong acid fumes.

Coated articles have been exposed for years without the slightest deterioration to sea-water and to the most varied atmospheric conditions.

We are prepared to treat all kinds of Iron and Steel. The treatment is specially well adapted to the following lines of work: Grate Frames and Fenders, Architectural Iron Work, Ornamental Iron Work, Plumbers' Iron Work, Iron Work exposed to destructive gases and fumes, Ship Work, Culinary Utensils, Cast Iron Water and Drain Pipe, Wrought Iron Gas and Water Pipe, Highly Polished Iron Work of all kinds, &c.

New York, April, 1888.

From "THE METAL WORKER," New York.

GALVANIZED IRON WATER PIPES.—In the course of a paper on the above subject by Dr. F. P. Venable, in the *Journal* of the American Chemical Society, he states that it has long been known that zinc dissolves in water, and that soft water, such as rain water, dissolves it more easily than hard water. Water containing carbonic acid is specially able to dissolve it. The use of galvanized iron for pipes and tanks being so much on the increase, the subject becomes more and more important, and it is desirable to ascertain, as far as possible, to what extent solution of the zinc coating takes place, and how far water contaminated by zinc is injurious to health. The author quotes several investigators as to the latter point, the evidence being to some extent conflicting, but giving a very decided balance on the side of the view that such water is considerably injurious. Investigations made on behalf of the French Government resulted in the prohibition by the Ministry of Marine of the use of galvanized iron tanks on board men-of-war. Professor Heaton has given an analysis of a spring water, with a further analysis of the same water after it had traveled through half a mile of galvanized iron pipe. It had taken up 6.41 grains of zinc carbonate per gallon. Dr. Venable gives the results of an observation of his own, where spring water passed through 200 yards of galvanized iron pipes to a house, and took up 4.29 grains of zinc carbonate per gallon. It therefore seems pretty clear that drinking water should not be allowed to come in contact with zinc.

PIPE CYPHER.

FOR ORDERING BY TELEGRAPH.

Number of Feet.		Size.	
25	Africa	⅛	Allegheny.
50	Alabama	¼	Baltimore.
75	Cuba	⅜	Camden.
100	Asia	½	Detroit.
200	Belgium	¾	Erie.
300	Chili	1	Fairmount.
400	Denmark	1¼	Galena.
500	Egypt	1½	Harrisburg.
600	France	2	Ithaca.
700	Germany	2½	Jamestown.
800	Holland	3	Kensington.
900	Ireland	3½	Lancaster.
1,000	Japan	4	Macon.
1,500	Jersey	4½	Quincy.
2,000	Kentucky	5	Newark.
2,500	Kansas	6	Oneida.
3,000	Liberia	7	Paris.
3,500	Lapland	8	Reading.
4,000	Maine	9	Salem.
4,500	Mexico	10	Troy.
5,000	Nevada	12	Utica.
6,000	Ohio.		
7,000	Peru.		
8,000	Russia.		
9,000	Spain.		
10,000	Texas.		
20,000	Utah.		

"RUSTLESS"

IRON WATER PIPE.

This Pipe can be cut and threaded the same as ordinary pipe.

BEWARE OF IMITATIONS.

The Reason Why

THE WELLS "RUSTLESS" IRON PIPE

Is superior to all others for conveying water.

First. Lead Pipe is poisonous, as the oxide of lead mixes with the water and COLLECTS in the system of the person drinking it.

Second. Galvanized Pipe is ordinary pipe covered with ZINC. Water acts on the zinc and forms a poisonous combination with it, and this is also a CUMULATIVE poison and remains in the system.

Third. Calamined or Kalameined Pipe is iron pipe coated with a mixture of LEAD and some other ingredients, but consisting principally of LEAD. Iron coated with lead is just as bad for use as common lead pipe—in fact, it is a little worse, as the iron and lead have a repulsive action toward each other which tends to throw off the lead.

Fourth. Pipe to be properly galvanized, so that it will be rustless, must be thoroughly cleaned of scale; this it is almost impossible to do, so it is only the *outside* of galvanized pipe which is rust-proof, and the inside will often rust just as badly as common pipe.

Fifth. "Rustless" Iron Pipe is pipe the surfaces of which are changed from ordinary iron to the magnetic oxide of iron. This oxide is not affected by water and is absolutely free from poisonous compounds. The inside of the pipe is as thoroughly treated or oxydized as the outside. The work being done by *heat* and *gas* and *superheated steam*, every part and crevice is reached by the treatment; hence, "Rustless" Iron Pipe is the very best for conveying water.

NOTE.—"Rustless" Wrought Iron Water Pipe is already being largely used to pipe first-class dwellings, to the exclusion of lead or other pipes.

NOTE.

The Magnetic Oxide of Iron being absolutely free from all poison is specially well adapted for use as a lining for water pipes. Galvanized Iron and Lead Pipes are acted upon by the water and the Oxides of Zinc and Lead mix with the water.

TERMS OF SALE.

Our terms to dealers of good standing are thirty days, with an allowance of one per cent. for prompt cash.

Parties unknown to us must accompany their orders with satisfactory reference; or with Check, Draft, or Post Office Order, covering amount of bill.

All prices quoted are for goods on board cars at works, unless otherwise specified.

THE WELLS "RUSTLESS"

Wrought Iron Water, Gas and Steam Pipe.

NOTE.—This Pipe can be cut and threaded as readily as ordinary pipe.

BUTT-WELDED.

Size, Inches	¼	½	¾	1	1¼
Price, per Foot	4c.	5c.	7c.	9½c.	12½c.
Weight, "	.42	.84	1.12	1.67	2.24

Discount.....per cent.

LAP-WELDED.

Size, Inches	1½	2	2½	3	3½	4	4½	5	6
Price, per Foot	22c.	28c.	44c.	58c.	70c.	85c.	$1.00	$1.20	$1.65
Weight, "	2.60	3.61	5.74	7.54	9.00	10.66	12.34	14.50	18.75

Discount.....per cent.

FITTINGS.

REVISED PRICE LIST.

Size of Pipe.....Inches,	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Elbows	.05	.09	.15	.22	.32	.38	.60	1.25	1.75	2 10	4.00	5.00	5.70	7.80	
Reducing Elbows	.05	.10	.16	.25	.35	.42	.65	1.35	1.90	2.25	4.30	5.50	6.25	8.40	
45° Elbows	.08	.10	.21	.29	.32	.40	.70	1.90	2.25	2.70	4.70	6.00	6.50	8.50	
Tees	.05	.09	.18	.28	.40	.48	.75	1.40	2.10	2.50	4.15	5.25	6.00	7.00	
Reducing Tees	.07	.11	.20	.32	.45	.54	.85	1.55	2.35	2.80	4.55	5.75	6.50	7.50	
Crosses	.10	.16	.25	.35	.50	.60	.95	2.00	3.10	4 00	5.75	....	....	....	
Reducing Crosses	..	.14	.24	.34	.48	.63	.95	2.25	3.40	4.30	6.25	....	....	....	
Return Bends, close	..	.10	.15	.22	.34	.45	.75	1.50	2.25	3.75	5.00	....	....	....	
" open	..	..	.20	30	.48	.68	1.15	1.75	2.75	4.50	6.00	....	....	....	
Unions	.15	.20	.28	34	.46	.60	.80	1.50	2.10	3.00	4.00	....	....	....	
Flange Unions, complete	..	.60	.65	.70	.85	1.15	1.50	1.75	2.25	2.75	3.15	4.50	5.00	6.50	
Bushings	.05	.06	.07	.09	.13	.17	.27	.42	.60	.80	1.00	1.50	1.85	2.50	
Plugs	.03	.04	.05	.06	.10	.13	.20	.35	.50	.75	.85	1.75	2.40	....	
Caps	.08	.05	.08	.11	.15	.22	.30	.50	.80	1.10	1.30	1.75	2.00	2.35	
Nipples, shoulder or close	.05	.07	.09	.10	.14	.17	.25	.56	.75	1.00	1.25	1.75	2.00	2.75	
" long	.07	.10	.11	.15	.20	.25	.35	.75	.95	1.25	1.60	2.25	2.60	3.60	
" right and left	.12	.16	.20	.24	.35	.46	.60	1.30	1.60	2.00	2.40	....	....	....	
Wrought Iron Couplings	.05	07	.10	.13	.17	.21	.28	.44	.60	.80	1.00	1.50	1.65	2.40	
Reducing ditto	.05	.09	.12	.18	.25	.35	.50	.75	1.20	1.50	2.00	2.50	3.00	4.00	
Right and Left ditto	.07	11	.15	.20	.25	.36	.50	.85	1.20	1.60	2.00	....	....	....	
Locknuts	.04	.06	07	.08	.10	.12	.25	.40	.50	.70	.95	1.15	1.35	1.90	
Long Screws	.30	.40	.55	.75	1.00	1.30	1.90	2.70	3.70	5.40	6.60	....	....	....	
Y Branches	..	.25	.30	.40	.60	.90	1.25	2.25	3.25	4.50	6.00	....	9.00	12.00	
Wrought Iron Bends	..	.28	.37	.56	.77	1.12	1.65	...	....	....	....	....	....	....	
Drop Elbows or Tees	.08	.12	.20	.35	....	....	....	....	....	....	....	....	....	....	

LIGHT
Artesian Well Tubing or Oil Well Casing.

Inside Diam. Nominal, Inches.	Outside Diam. Actual, Inches.	Weight Per Foot, Nominal.	Price, Per Foot.
2	2¼	2.23	$0.25
2¼	2½	2.75	.28
2½	2¾	3.00	.31
2¾	3	3.33	.34
3	3¼	3.95	.38
3¼	3½	4.27	.43
3½	3¾	4.60	.45
3¾	4	5.33	.52
4	4¼	5.50	.56
4¼	4½	6.00	.60
4½	4¾	6.50	.66
4¾	5	7.25	$0.72
5	5¼	7.66	.79
5 3/16	5½	8.08	.86
5⅝	6	9.35	1.00
6¼	6⅝	10.06	1.30
6⅝	7	12.45	1.45
7⅝	8	15.10	1.85
8¼	8⅝	16.15	2.10
8⅝	9	17.25	2.25
9⅝	10	19.00	2.75

DRIVE-WELL PIPE.

Inside Diam., in.	Weight, Per Foot.	Full Lengths, Price, per Foot.	Half Lengths, Price, per Foot.	Third Lengths, Price, per Foot.
1¼	2.70	.21	.23	.24
1½	3.24	.25	.27	.29
2	4.26	.32	.34	.35
2½	6 89	.49	.52	.55
3	8.74	.65	.68	.71
3½	10.18	.84	.88	.93
4	11.89	1.03	1.09	1.15
4½	13.36	1.21	1.29	1.37
5	15.32	1.35	1.47	1.59
6	18.76	1.80	1.95	2.10
7	23.27	2.33	2.56	2.79
8	28.18	3.15	3.46	3.76

Full lengths range from 16 to 18 feet. Half lengths range from 8 to 9 feet.
Third lengths range from 5 to 6 feet.

Each length is fitted with one coupling without extra charge.

SOCKETS FOR DRIVE-WELL PIPE.

Size, Inches	1¼	1½	2	2½	3	3½	4	4½	5	6	7	8
Price, each	.25	.30	.40	.60	.80	1.30	1.50	2.00	2.40	2.80	3.85	4.00

X STRONG AND XX STRONG PIPE.

TABLE OF STANDARD DIMENSIONS.

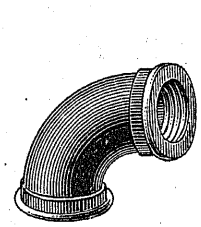
Dimensions not given below made to order.

Nominal Diam.	Price per foot. Extra Strong.	Price per foot. Double Ex. Strong.	Actual Outside Diameter.	Actual Inside Diameter. Ex. Strong.	Thickness. Double Extra Strong.	Actual Inside Diam. Double Ex. Strong.
⅛ in.	$0.08	....	0.405 in.	0.20 in.	....	....
¼	.08	....	0.54	0.29	....	....
⅜	.08	....	0.675	0.42	....	....
½	.10	$0.20	0.84	0.54	0.30 in.	0.24 in.
¾	.14	.28	1.05	0.73	0.31	0.42
1	.19	.38	1.315	0.95	0.36	0.59
1¼	.25	.50	1.66	1.27	0.39	0.88
1½	.44	.88	1.9	1.49	0.41	1.09
2	.56	1.12	2.375	1.93	0.44	1.49
2½	.88	1.76	2.875	2.31	0.56	1.75
3	1.16	2.32	3.5	2.89	0.61	2.28
3½	1.40	2.80	4.0	3.36	0.64	2.71
4	1.70	3.40	4.5	3.82	0.68	3.13
5	2.40	4.80	5.563	4.81	0.75	4.06
6	3.30	6.60	6.625	5.75	0.875	4.87

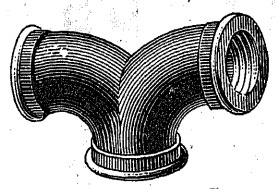
PRICE FOR CUTTING PIPE.

Ins.	Per cut.	Ins.	Per cut.	Ins.	Per cut.
⅛	$0.06	1½	$0.10	5	$0.60
¼	.06	2	.14	6	.80
⅜	.06	2½	.20	7	1.00
½	.06	3	.30	8	1.20
¾	.06	3½	.40	9	2.00
1	.06	4	.40	10	2.50
1¼	.08	4½	.50	12	3.50

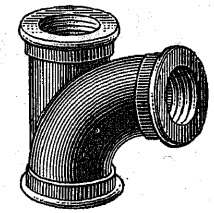
LONG TURN FITTINGS FOR WATER CONNECTIONS.



No. 1.



No. 2.



No. 3.

SIZE.....INCHES	1	1¼	1½	2	2½	3	3½	4	4½	5	6	7	8	9	10	12
No. 1, Screwed	.25	.35	.45	.60	1.00	1.50	2.00	2.50	3.50	4.50	6.50	10.00	14.00	17.00	20.00	30.00
2, "	.38	.52	.68	.90	1.50	2.25	3.00	3.75	5.25	6.75	9.75	15.00	21.00	25.00	30.00	45.00
3, "	.38	.52	.68	.90	1.50	2.25	3.00	3.75	5.25	6.75	9.75	15.00	21 00	25.00	30.00	45.00
Crosses. Screwed	....	....	.90	1.20	2.00	3.00	4.00	5.00	7.00	9.00	13.00	20 00	28.00	34.00	40.00	60.00
No. 1, Flanged	....	....	....	....	....	....	....	4.00	....	6.00	8.00	11.00	15.00	18.00	22.00	32.00
2, "	....	....	....	....	....	....	....	6.00	....	9.00	12.00	17.25	22.50	27.00	33.00	48.00
3, "	....	....	....	....	....	....	....	6.00	....	9.00	12.00	17.25	22.50	27.00	33.00	48.00
Crosses, Flanged	....	....	....	....	....	....	....	8.00	....	12.00	16.00	22.00	30.00	36.00	44.00	64.00

CAST IRON WATER PIPE.

TABLE SHOWING THICKNESS OF METAL AND WEIGHT PER LENGTH OF PIPE, INCLUDING BELLS, UNDER VARIOUS HEADS OF WATER.

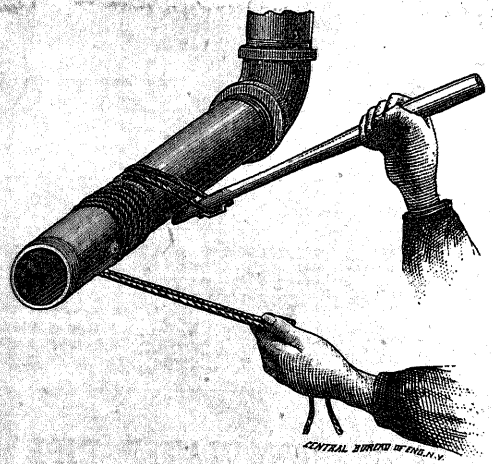
Pipes are cast in lengths of 12 feet 4 inches, including Bell; 440 lengths to the mile when laid. 2-inch Pipes are cast 9 feet long.

SIZE.	50 ft. Head or 22 lb. pressure.		100 ft. Head or 43 lb. pressure.		200 ft. Head or 86 lb. pressure.		250 ft. Head or 108 lb. pressure.		300 ft. Head or 130 lb. pressure.		400 ft. Head or 174 lb. pressure.		Contents for 1 foot in length.	Area of Pipe.	Depth of Lead in Socket.	Weight of Lead, per Joint, about
	Thick'ss of Metal.	Weight per Length.	Thick'ss of Metal.	Weight per Length.	Thick'ss of Metal.	Weight per Length.	Thick'ss of Metal.	Weight per Length.	Thick'ss of Metal.	Weight per Length.	Thick'ss of Metal.	Weight per Length.				
in.	in.	lbs.	in.	lbs.	in.	lbs.	in.	lbs.	in.	lbs.	in.	lbs.	galls.	in.	in.	lbs.
2	.29	63	.31	67	.35	70	.37	81	.38	86	.40	91	.163	3.14	1⅛	2¼
3	.32	139	.33	142	.34	148	.35	151	.36	156	.37	163	.367	7.06	1¼	3½
4	.36	198	.37	203	.38	213	.39	218	.40	226	.41	238	.652	12.56	1⅜	4¼
6	.40	321	.42	342	.44	364	.45	375	.47	390	.49	411	1.469	28.27	1⅜	6¼
8	.45	482	.46	500	.49	588	.51	555	.53	582	.56	620	2.611	50.26	1⅜	8¼
10	.48	649	.50	676	.54	739	.56	760	.58	799	.62	856	4.081	78.54	1⅜	10¼
12	.52	828	.54	869	.59	949	.61	1002	.64	1042	.69	1123	5.876	113.10	2	13
14	.55	1064	.58	1119	.64	1232	.66	1289	.69	1346	.75	1460	8.00	153.93	2	15
16	.58	1277	.61	1350	.68	1496	.71	1569	.74	1642	.80	1783	10.44	201.06	2⅛	24
20	.64	1782	.67	1898	.75	2128	.79	2246	.83	2364	.91	2599	16.32	314.16	2¼	31
24	.69	2247	.73	2408	.83	2735	.88	2899	.93	3063	1.02	3441	23.50	452.39	2¼	38
30	.76	3158	.82	3414	.93	3930	.99	4190	1.05	4453	1.18	4976	36.72	706.86	2⅜	57
36	.82	4005	.89	4369	1.04	5096	1.11	5459	1.18	5823	1.32	6550	52.88	1017.8	2½	79
48	.94	6080	1.03	6722	1.22	8006	1.32	8649	1.42	9291	1.61	10575	94.02	1809.5	2⅝	111

Doubling the Diameter of a Pipe increases its capacity four times. About 60 gallons of water per day to each inhabitant is usually considered a fair ample allowance in large cities. A gallon of water contains 231 cubic inches, and weighs 8⅓ lbs. U. S. standard.

DIRECTIONS FOR USING

"RUSTLESS" PIPE.



First.—Where it is desired to preserve the coating on the outside of pipe from injury, do not use common tongs or pipe wrenches, but use "Rope Tongs" which we provide free of charge. The use of these tongs will be readily understood from above cut.

Second.—Do not cut it with a wheel cutter, but use a knife cutter when you cannot use a pipe-cutting machine.

Third.—Do not try to cut too fast.

Fourth.—Do not bend the pipe, as bending will injure the coating.

Fifth.—Grasp the pipe with the tongs as near as possible to the fitting into which you wish to screw it.

Do not put your tongs on the end of pipe furthest from the fitting.

Sixth.—Use "Rustless" Packing for all joints, and put the packing INTO *the fittings*, so as it will crowd against and cover the raw ends of the pipe.

Seventh.—The rolling mill scale on the pipe is often reduced to a *red Per-Oxide* of Iron, by the high heat of the furnace.

Some people call this *rust* because it is red. It will do no harm and will *wash* or rub off in most cases.

By observing these few simple directions you will have no trouble with joints which you may have to cut.

"RUSTLESS" PACKING.

To Take the Place of Red Lead, &c.

For Making
Water, Gas and Steam-Pipe Joints Absolutely Tight.

This Packing is made from a pigment that cannot be decomposed by acids, alkalies, or any degree of heat, salt or fresh water, sulphuretted hydrogen, or other destructive gases, and consequently makes a very perfect and permanent Joint.

It is superior to lead, because further oxydation is impossible, and being lighter, an equal weight will cover fully 50 per cent. more surface.

We recommend this Packing for use on the joints of our pipe.

When the pipe is cut and this Packing is used in connection with our "Rustless" Fittings, the joint is almost as perfect as if the pipe had been cut and fitted before treatment.

EXTRACT FROM LETTER FROM MR. H. HAWKES, WATER PURVEYOR OF THE CITY OF BROOKLYN, TO HON. GEO. RICARD CONNER, COMMISSIONER.

Have never tested any Iron Pipe that withstood severe tests as successfully as the "Rustless," and have no hesitancy in commending it to the consideration of sanitarians, either for small services or large mains for water.

Under the most favorable circumstances the "life" of ordinary Galvanized Iron Water Pipe is about ten years.

If the "Rustless" will remain unchanged by reason of resistance to the corrosive action of earth alkalies or acids and which experiments can only establish, then it can justly claim the name of Perfect Pipe.

Respectfully submitted,

(Signed,) H. HAWKES,
Water Purveyor.

I fully endorse the above tests, and accept the Wells "Rustless" Iron Pipe as proper material for use in the introduction of water into premises in the City of Brooklyn.

(Signed,) GEO. RICARD CONNER,
Com. Dep't City Works.

Brooklyn, November 13th, 1886.

Office of GEO. H. FREEMAN, Lumber Manufacturer, Feeder Dam.

Glens Falls, N. Y., December 2d, 1886.

WELLS RUSTLESS IRON CO.

Gentlemen:—The "Rustless" Iron Pipe ordered of you last Spring has given entire satisfaction so far. There is not a particle of rust and the water tastes as pure from the pipe as when taken from the spring. Mr. Van Dusen, who has had the pipe in use about one year, joins me in recommending the pipe, and says he would not exchange it for Galvanized Iron.

Very truly yours,

(Signed,) J. H. KENYON, Agent.

WELLS RUSTLESS IRON CO. Cummington, Mass., Sept. 13th, 1887.

Gentlemen:—Your favor of Aug. 15th was mislaid, and I have just now found it. Since I began to use the "Rustless Pipe" I have used more of it than any other; I like it very much. I have used it mostly in wells attached to pumps. I think it is the best pipe for conveying water now on the market. Most respectfully, L. B. COBB.

NOTE.—MR. COBB bought his first pipe June 27th, 1885.

EXTRACTS FROM LETTERS FROM DR. HENRY STEWART, THE CELEBRATED AUTHORITY ON AGRICULTURAL MATTERS.

Highlands, N. C., August 22d, 1887.

"The pipe is laid and is working beautifully. As soon as the oil worked off the water ran without any taste and there is no appearance of rust on any part of it. The pipe is really rustless so far. The kettle has been exposed to the weather for months and is as bright as at first. This pipe settles the question about conveying water with no detriment from rust, and without any danger of lead poisoning. I am glad to hear that the public appreciate this excellent pipe. I have not found the surface damaged, although the pipe had a hard road to travel to get here."

Highlands, N. C., February 22d, 1888.

"I see no indication of rust in the pipe. The water flows quite pure and free from all flavor of iron. *I am more than ever satisfied* with it after more than a year's trial. Anything I could say in favor of it is well deserved, for it is *free* from *all the objections* which appertain to other water pipes."

Office of CHATFIELD & NEELON, Steam and Gas Fitters, Plumbers, &c.

St. Catharines, Ont., December 6th, 1886.

WELLS RUSTLESS IRON CO.

Gentlemen:—In regard to your "Rustless" Pipe we would say, as far as we know, it has given excellent satisfaction and expect to use considerable later on. Pardon us for not replying to your inquiry sooner, but owing to rush of business it was overlooked.

Respectfully yours,

(Signed,) CHATFIELD & NEELON.

Office of CLARK & MORTON, Plumbers, Tin and Sheet Iron Workers,

W. New Brighton, S. I., December 14th, 1886.

WELLS RUSTLESS IRON CO.

Gents:—Your inquiry in reference to our experience with "Rustless" Iron Pipe was laid aside and overlooked until to-day when we found it in our desk. We have as you are aware put in a good deal of it here on the Island, and at Lawrence, L. I., and also in New York, and it has given universal satisfaction. We have had no complaints of its rusting from any of our customers, and we prefer it to Galvanized for supply lines, &c.

Yours, &c.,

(Signed,) CLARK & MORTON.

R. McNAMEE & CO.,

New York, August 15th, 1887.

WELLS RUSTLESS IRON CO.

Dear Sirs:—With pleasure we reply to yours of the 13th inst., regarding the "Rustless" Iron Pipe we purchased from you last year. It has now been in use for nearly a year bringing water from a spring a mile away from Kaolin, S. C., where our works are situated. The water is used by our hands for drinking, cooking and household purposes generally. Our superintendent reports it as in every way satisfactory, and gives as a proof of the purity of the water after passing through the pipe that rice boiled in it remains unstained. Yours very truly, R. McNAMEE & CO.

SOUTHWARK FOUNDRY AND MACHINE COMPANY,
Sole Makers of
Porter-Allen & Southwark Automatic Engines,

Philadelphia, Pa., August 22d, 1887.

WELLS RUSTLESS IRON CO.

Gentlemen:—Replying to your circular of the 15th inst., asking my opinion of the "Rustless" Pipe furnished by (I think) Mr. Wells, would say, for the purpose to which we applied it, namely, as hand railings to locomotive engines, it answered our purpose very well, and up to the time of the writer severing his connection with the P. & R. R. R. Co., in February, 1887, it showed no defects. Yours truly, W. E. GOOD.

JOHN H. TAYLOR, Sanitary Plumber, Gas and Steam Fitting,

Bloomfield, N. J., August 13th, 1887.

WELLS RUSTLESS IRON CO.

Gentlemen:—Having been experimenting with your iron pipe for the last eighteen months, I am able to pronounce it absolutely rustless, and I can freely recommend it to the trade. Yours respectfully, J. H. TAYLOR.

SHELDON BROS., General Hardware,

Hornellsville, N. Y., August 15th, 1887.

WELLS RUSTLESS IRON CO.

Gents:—We commenced selling your "Rustless" Pipe about one year ago, and thus far without any complaint, and all we have heard has been favorable. One man we sold to has had a piece in water since early in the Spring, and he says there is no sign of rust. The kind we have sold is for conveying water from springs, and the size sold has been one-half inch. This "Rustless" Pipe is something much desired; as other pipe unless galvanized will rust full in a short time, unless a very large size is used, and then there is trouble from air unless it is a heavy spring. Galvanized iron is a great poison.

Yours, SHELDON BROS.

CHARLES H. TURNER, Plumber, Gas and Steam Fitter,

Parkersburg, W. Va., August 17th, 1887.

WELLS RUSTLESS IRON CO.

Gents:—I have used your "Rustless" Iron Pipe and Fittings in several jobs of plumbing and it has given good satisfaction. The first job has been in use since January, 1886, and there have been no complaints. I also used about one hundred feet at my own residence, under ground, and I have never seen any sign of discoloration of the water from rust, and I have every reason to believe it is as good now as when I put it down over one year ago. Wishing you success, I remain yours, etc.,

CHARLES H. TURNER.

Wooodsburgh, L. I., August 18th, 1887.

MR. WM. T. WELLS,

Dear Sir:—In answer to your inquiry in reference to my experience with "Rustless" Iron Pipe I would say that it has given universal satisfaction. I have had no complaint of its rusting. I am using your pipe in a new cottage at Far Rockaway for hot and cold water, which I commenced this week. I wish you success in your oxydized iron treatment. Very truly yours, F. K. WALSH.

Office of JAMES WATSON & SON, General Hardware,

Suspension Bridge, N. Y., August 15th, 1887.

WELLS RUSTLESS IRON CO.

Dear Sirs:—In answer to your inquiry we would say the pipe we bought of you has proved very satisfactory. Yours truly, JAS. WATSON & SON.

JAMES ARMSTRONG, Plumbing, Steam and Gas Fitting,

New York, August 16th, 1887.

WELLS RUSTLESS IRON CO.

Gentlemen:—I have used the "Rustless" Iron Pipe that was ordered from you about fourteen months since. I have had no complaint of the pipe and so far as I have seen it appears to answer the purpose of water and waste pipes.

Yours respectfully, JAMES ARMSTRONG.

F. E. ENSIGN, Pumps, Wrought Iron Pipe and Pipe Fittings,

Carrollton, Carroll Co., O., August 15th, 1887.

WELLS RUSTLESS IRON CO.

Gentlemen:—In reply to yours of the 15th inst. will say that all of the "Rustless" Iron Pipe I have used is giving the very best of satisfaction, and I think that it is a good pipe. Yours respectfully, F. E. ENSIGN.

Granville, N. Y., August 15th, 1887.

WELLS RUSTLESS IRON CO.

Gents:—In reply to yours asking my opinion of the "Rustless" Iron Pipe that I used about two years ago, I would say, I used it to draw water from a well, about one hundred feet distant, with a suction pump, for family use. It has given excellent satisfaction for that purpose for nearly two years, and we discover no rust in the water which we use for drinking purposes every day. Yours truly, HENRY DILLINGHAM.

Corry, Pa., August 15th, 1887.

WELLS RUSTLESS IRON CO.

Dear Sirs:—We use your "Rustless" Pipe for Artesian Water Wells and find it what its name indicates—"Rustless." It is all that is claimed for it.

Respectfully yours, L. E. & E. E. GUIGNON.

MALVEN, GORDON & CO., Jobbers of Hardware,

Port Jervis, N. Y., August 15th, 1887.

WELLS RUSTLESS IRON CO.

Gents:—Replying to yours of this date, would say that the "Rustless" Iron Pipe used by us is giving perfect satisfaction. Yours, &c., MALVEN, GORDON & CO.

Office of A. H. BENNETT, Plumbing, Steam and Gas Fitting, &c.,

Danbury, Conn., August 15th, 1887.

WELLS RUSTLESS IRON CO.

Dear Sirs:—I have used your "Rustless" Pipe the last eighteen months in many places, some of it having been outside on the ground the entire time, and also in a factory where acids are used and where ordinary pipe will last but a short time, and it has proven to be all and more satisfactory than you claimed for it. I made an order on Saturday last for a quantity of it to be used for acid. Yours truly, A. H. BENNETT.

"SCHOHARIE UNION,"

Schoharie, N. Y., August 15th, 1887.

MR. WM. T. WELLS,

Dear Sir:—We put in about seventy-five feet of the one-inch Wells "Rustless" Iron Pipe two years ago to conduct water from tank on roof to kitchen. The water has stood in the pipe nearly all the time and no rust of iron is visible, and the water is as clear after passing through the pipe as it is in the tank.

Yours respectfully, C. C. KROMER.

Patterson, Putnam Co., N. Y., August 16th, 1887.

WELLS RUSTLESS IRON CO.

Gentlemen:—The "Rustless" Iron Pipe bought of you some time since has given entire satisfaction, and I would now use it in preference to any pipe I know of.

Yours, &c., J. H. CORNWALL.

REILLY & DAVIDSON, Plumbers' Water Fittings,

Halifax, N. S., August 16th, 1887.

WELLS RUSTLESS IRON CO.

Sirs:—We began to handle your new process Hollow-Ware in March, 1885, and since that time have not allowed ourselves to be without it. In claiming it to be "absolutely rust-proof" you do not overstate the fact. Yours, &c.,

REILLY & DAVIDSON.

Roxbury Station, Litchfield Co., Conn., August 18th, 1887.

WELLS RUSTLESS IRON CO.

Dear Sirs:—Yours of the 15th inst. is at hand. In answer I will say, that some eighteen months since my attention was called to a statement that iron pipe was made rustless. I called at Cliff street and the clerk in attendance kindly gave me three samples. I doubted, but put a single piece on the back of the stove in warm water, leaving it stand seven days and it showed no rust; I then put in salt, and after a day or two, I still found no rust. I put in the pipe you refer to, to replace iron pipe that rusted so bad as to be useless. I have several times asked about it, and there is no signs of rust. (I warrant it not to rust one year.) *It will not rust, you bet.* I often make the statement that I have iron ware and iron pipe that *will not rust*, but I cannot make people believe except by *experience*, which I am gradually doing, and am sure of an increased sale as it becomes known. "A good thing will sell itself," and "Rustless" Iron Ware and Pipe need only to be known to be appreciated. Please send me two or three Price Lists, as I have given away to brother dealers all I had. Please note at this date the discount off the list. Yours respectfully, L. S. WARNER.

P. S.—I have the samples I tested hung up in the shop, also other samples that I call attention to often. I am selling a few items of Hollow-Ware, and they all prove "Rustless" under all circumstances. L. S. W.

Andover, N. J., August 15th, 1887.

WELLS RUSTLESS IRON CO.

Dear Sirs:—In reply would say, I put a piece of "Rustless" Iron in the water and left it there for about two months, when I got first lot, and there is no rust yet, nor do I believe there ever will be. Respectfully yours, A. OGDEN AYERS.

Oneida, Madison Co., N. Y., August 22d, 1887.

WELLS RUSTLESS IRON CO.

Gentlemen:—It is now more than one year since I first purchased several hundred feet of your "Rustless" Iron Pipe, and it has been in use ever since and gives perfect satisfaction. I can recommend it as the best pipe in the market for conveying water for household purposes. Yours truly, O. J. BURNETT.

Chardon, O., August 22d, 1887.

WELLS RUSTLESS IRON CO.

Dear Sirs:—Replying to yours of the 15th inst. would say, your pipe is the first we have found that will stand the water in this section without rusting or corroding. Please ship us at once two hundred feet of one and one-quarter inch "Rustless" Pipe, and oblige, Yours truly, PARKS & BARKER.

KINGSTON, SAUGERTIES, AND FORT PLAIN WATER WORKS,

Kingston, N. Y., August 25th, 1887.

WELLS RUSTLESS IRON CO.

Gentlemen:—I have now been using your "Rustless" Iron Pipe for some time, and have given it a very thorough test, and find it all that you recommend for water, steam or gas. I think it will take the place of all other pipes for service pipes in towns and cities, and for general use where there is danger of corrosion. It will be universally adopted when its good qualities are known. Respectfully yours, J. M. LOW.

AARON C. LADD,

Sanitary, Steam, Gas and Water Work of every description,

Lowell, Mass., August 26th, 1887.

WELLS RUSTLESS IRON CO.

Gentlemen:—The pipe I purchased of you I have put in, and it is giving perfect satisfaction in every respect as far as I know, having heard no complaints from my customers. Yours respectfully, AARON C. LADD.

AUGUSTIN R. PEALE, Plumber and Gas Fitter,

Philadelphia, Pa., August 29th, 1887.

WELLS RUSTLESS IRON CO.

Dear Sirs.—I have used several hundred feet of your "Rustless" Iron Pipe, and I find it has given entire satisfaction. Respectfully, AUGUSTIN R. PEALE.

F. A. CORNELL, Tin Roofing and Jobbing,

Vineland, N. J., August 29th, 1887.

WELLS RUSTLESS IRON CO.

Gents.—I have used your "Rustless" Iron Water Pipe for nearly a year and can state that the pipe shows no signs of rust yet. I am well pleased with it. I had occasion to remove pumps that had been in deep wells from five to eight months, and I found the pipe as clean and perfect and as free from rust as the day it was put there. The sinks and cooking utensils are giving first-class satisfaction.

Respectfully, F. A. CORNELL.

From the "AMERICAN AGRICULTURIST," November, 1887.
Page 456.

The newly introduced "Rustless" Iron Pipe is a great convenience. Lead pipe is exceedingly objectionable on account of the danger of poisoning by solution of the lead by the carbonic acid almost always contained in water. Iron pipe rusts rapidly from the same cause, and is soon useless. The "Rustless" Pipe is the plain iron pipe subjected to a process by which the inner and outer surfaces are changed to magnetic oxide, which is not acted upon by water, or any acids or alkalies; not even boiling nitric acid affects it. This renders the pipe practically unchangeable and indestructible. A pipe which brings water several hundred feet from a spring, and which has been in use and partly exposed to the air near the surface of the soil for more than a year, is now as bright as when laid, and does not affect the taste of the water in the least.

HARDWICKE & WARE, Iron and Brass Founders, Machinists, &c.,
Oil and Salt Well Supplies, Iron Pipe, Fittings, Valves, &c.,

Buffalo, N. Y., January 21st, 1888.

WELLS RUSTLESS IRON CO.

Gentlemen:—We had several of our Brine Pump Barrels, constructed with sockets, treated by your "Rustless" Process for use in the Salt Country, where considerable trouble had been experienced from an alleged electrical action, produced in some unaccountable manner between the brine and iron, causing frequent breaks. We tried the experiment in one well of using "Rustless" collars with very satisfactory results. We continued the use in several other wells and the former difficulty appears to have been entirely overcome. Sockets in use for six months show no change of any kind, and we believe "Rustless" salt tubing would be far more durable than the ordinary tubing now used. Yours respectfully, HARDWICKE & WARE.

GAS ENGINE & POWER COMPANY,

Manufacturers of Naphtha Engines for Marine Purposes,

New York, September 26th, 1887.

WELLS RUSTLESS IRON CO.

Gentlemen:—We take pleasure in stating that the cylinder chest, or casting of our Naphtha Engine, which you treated with your "Rustless" Iron Process, has been put to the test, and found in every way satisfactory. We placed the casting in salt water for ten days and, on taking it out, found it perfectly free from rust, and as bright as when placed in the water. This was tested four months ago and since then has been in use in our factory, and there is no sign of rust as yet. Yours truly,

GAS ENGINE & POWER CO.

H. T. VULTÉ, PH. D. F. C. S., Chemical and Sanitary Engineer,

New York, March 2d, 1888.

WELLS RUSTLESS IRON CO.

Gentlemen:—After using the Wells Process Pipe for two years for conveying hard and soft water and gas in clay soil and sand, as well as for the plumbing supply of my own residence, I can say that it has given perfect satisfaction. I have used about 2,500 feet in all, and shall continue to use it in preference to any other kind of pipe for water or gas. A pipe which I took up last Fall, having been buried for about one year and unused during all that time, showed no signs of rust inside or outside; this same pipe is now doing service as water supply pipe to one of my houses. In a house which I am now about completing, I am putting in your pipe throughout.

Very truly yours H. T. VULTÉ, PH. D.

GRAFTON WATER COMPANY,

Grafton, Mass., December 1st, 1887.

WELLS RUSTLESS IRON CO.

Gentlemen:—Your circular received; in reply will say we are using a "Rustless" Iron Pipe for our service pipes, which we get from Braman, Dow & Co., Boston; have used 13,000 feet the last year, and so far it gives very good satisfaction. Is it the same as you are making, if not how does it differ, and which is best?

Yours truly, GRAFTON WATER COMPANY,
SOLON F. SMITH, Sup't.

The best iron water pipe I ever handled. FOREST HOOPER, Woburn, Mass.

My customers think it is the best iron pipe they have ever seen, and that is my opinion. PHILLIP P. POTTER, Three Rivers, Mass.

It gives me pleasure to state that the "Rustless" Pipe had of you has given perfect satisfaction. It is used to convey water from the lake to my summer house, and a portion of it lies in the water. I see no indication of rust, and believe it to be a superior article for the purpose.
GEO. H. BARRETT, Sec'y Cushing Academy, Ashburnham, Mass.

After two years find it as represented and believe it to be the best water pipe I have ever seen. G. W. LANE, Short Falls, N. H.

Has proved entirely satisfactory. O. H. VENNER, Blue Hill, Me.

We wanted the best pipe we could get, and believe we got it. My impression is no other pipe is as good. I expect to use considerable the coming season.
W. B. BULL, Lenox, Mass.

Have sold thousands of feet, tested it thoroughly the past two years and shall use no other pipe for water. LEANDER ROWELL, So. Lancaster, Mass.

We can unhesitatingly say that your "Rustless" Iron Pipe has given good satisfaction to our patrons. PROVIDENCE PLUMBING CO., Providence, R. I.

Regarding the "Rustless" Iron Pipe would say after using it one season, have formed a good opinion of it and shall continue to sell it.
L. E. SMITH, Gloucester, Mass.

I have used several thousand feet of your "Rustless" Pipe and find all I have used in as good condition as when first put in. W. A. DELORY, Swampscott, Mass.

Have given the "Rustless" Iron Pipe a good test in salt water, where it has stood for months, and cannot see that the salt or water has produced any effect upon it. It is very satisfactory. B. F. SMITH, 38 Oliver Street, Boston.

I consider it the best iron pipe in use. H. B. BAKER, Norwood, Mass.

Have used thousands of feet and recently had occasion to change some of it and found it as free from rust as when first put in. I consider it much better than Galvanized or Enameled pipe. H. L. SAWYER, So. Framingham, Mass.

It is all right, find no rust about it. H. W. HUMPHREY, Unionville, Conn.

Have used large quantities of all kinds of pipe and am satisfied that the "Rustless" will supersede all others for plumbing.
G. B. BATES, East Braintree, Mass.

The "Rustless" Iron Pipe, as far as we have heard from, gives perfect satisfaction.
GEO. J. REYNOLDS, Barre, Vt.

"Rustless" Iron Pipe is the best water pipe in the market at present.
J. B. MURPHY, Taunton, Mass.

It has proved satisfactory in every respect.
J. A. CREIGHTON & CO., Thomaston, Me.

Has given us perfect satisfaction.
HOLLINGSWORTH & WHITNEY CO., Paper Mfrs.

Gives entire satisfaction; we are convinced the pipe is what it is claimed to be, i. e., "Rustless." DUNBAR & RHODES, So. Abington, Mass.

Have used a great many feet in our jobs and it gives universal satisfaction.
DAVIS & CO., Gloucester, Mass.

After two years' use, I find it all that is claimed for it, "Rustless."
C. H. WESTON, Yarmouthville, Me.

It is a superior pipe. ATTLEBORO MACHINE CO., Attleboro, Mass.

Have used several thousand feet for water and find it far superior to any other. I consider it the best pipe now in use, and surely it is safe.
CHAS. GREENWOOD, Lewiston, Me.

It will be the pipe of Spencer. Shall use lots this season.
BURRAGE & AMIDON, Spencer, Mass.

Has proved entirely satisfactory. W. H. WATSON, Bath, Me.

Has been in use more than a year. We think it a first-class pipe.
SARGENT, STONE & CO., Machias, Me.

"Rustless" gives better satisfaction than any other pipe of which we have knowledge. T. F. GILES, Abington, Mass.

The "Rustless" Iron Pipe has given the greatest satisfaction. It is the best pipe in the world for a water pipe. PORTSMOUTH MACHINE CO., Portsmouth, N. H.

Have laid several thousand feet of it. Am confident it is a good thing.
ADNA BROWN, Gen'l Sup't, PARKS & WOLSON MACHINE Co., Springfield, Vt.

I find my customers are well pleased with it, and believe it to be all you claim for it.
E. W. HOLMES, Brockton, Mass.

I consider it the best pipe in the market. B. F. MITCHELL, Lawrence, Mass.

Have used it for both steam and water and think well of it.
C. E MARSTON, Dover, N. H.

I believe it to be a very excellent pipe for conducting water.

S. S. GERRY, Thomaston, Me.

I think it the best pipe we have seen; like it very much.

JOHN P. BARSTOW & CO., Norwich, Conn.

Know from experience that it is superior to other pipe in every respect.

FREDERICK BOOTH, Concord, N. H.

Last year I used about 6,000 feet and it proved to be all that was claimed for it.

O. C. EVANS, Portland, Me.

Everyone has been pleased with the "Rustless" pipe as far as we know. We have had it in use ourselves for the past year and a half and it is perfectly satisfactory. We hope to sell a large amount the coming season.

M. E. GIFFIN, Sec'y CHASE TURBINE M'F'G CO., Orange, Mass.

We consider the "Rustless" the best pipe in the market for water. We heartily recommend it, having tested it to our entire satisfaction.

BLOOD BROS., Groton, Mass.

The first "Rustless" pipe I used in 1886 is all right and gives perfect satisfaction. I think it the best pipe for water in use. WALTER DOCKENDORFF, Bath, Me.

I have used the "Rustless" pipe in my Laundry the past two years. I consider it a perfect water pipe and am pleased to recommend it.

WM. BETTINSON, Prop'r BETTINSON STEAM LAUNDRY, Malden, Mass.

I consider the "Rustless" the best and safest pipe for water, and have used it ever since it first came into the market. D. L. BARKER, Providence, R. I.

It gives perfect satisfaction, is free from any disagreeable taste or odor, does not scale like tarred or enameled pipe; the water is always pure, sweet, clear and clean. I would use no other.

G. A. WILLARD, Springvale, Me.

I have about five hundred feet for laundry purposes and have detected no rust from it.

JOHN P. RANGER, North Brookfield, Mass.

It has been subjected to very severe tests. It gives universal satisfaction and is being used almost altogether where pipe is liable to rust.

RUFUS G. BURLEIGH, Franklin Falls, N. H.

I have sold the "Rustless" pipe for three years, and find it gives good satisfaction in every case. It is a great improvement. L. B. COBB, Cummington, Mass.

Important to Remember.

In putting "Rustless" or OTHER coated pipe together, care must be taken to grasp the pipe with the tongs as near as possible to the fitting into which it is desired to screw it.

If the pipe is grasped at one end and the other end is forced into a fitting, the unequal strain will cause great friction, and when the pipe is fully in place, it is still possible to turn or twist the pipe, thereby endangering the continuity of the coating.

Yon cannot get a first-class job if you use common or plain iron fittings with our pipe. Use our "RUSTLESS" Fittings and our "RUSTLESS" Packing for all joints, etc.

Galvanized iron water tanks must not be employed on board of French men-of-war. Dr. Venable, in a paper read before the American Chemical Society, has shown that water passed through two hundred yards of galvanized iron pipe took up 4.29 grains of zinc carbonate per gallon.

Custom Work.

Special attention given to treating all kinds of Iron Work, prices for which will be given upon application.

We have treated a very large variety of Decorative, Architectural and other Iron Work, which has given the greatest satisfaction.

The process has been found specially desirable for very fine *leaf* and *flower* work, made from Wrought Iron, and which would be destroyed by rust.

Having had so much experience in treating all kinds of work, we can treat the most delicate without warping or injuring it.

In designing work to be made "Rustless," it is best to allow for a small permanent expansion.

Special care should be observed in riveting bars or bands of iron together, which are of unequal thickness.

PLUMBERS'

"RUSTLESS"

IRON

GOODS.

For Wrought Iron Pipe, see page 10.

"RUSTLESS"

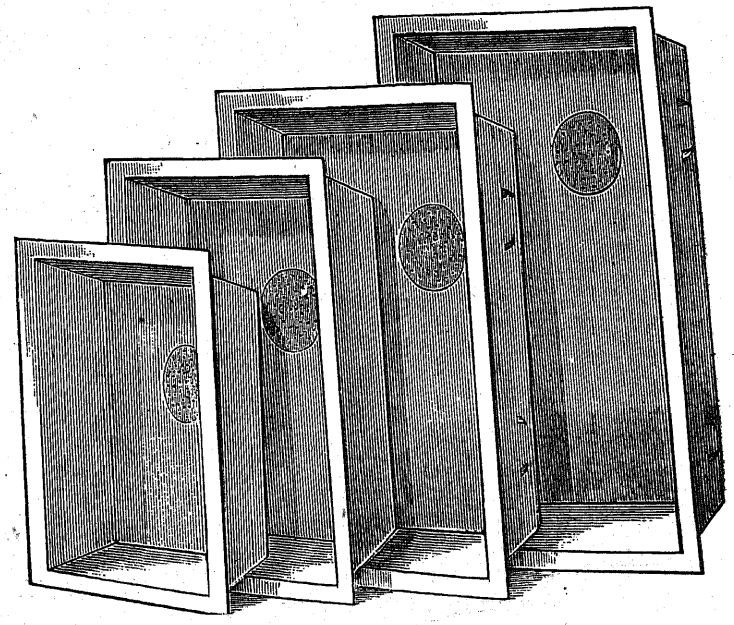
CAST IRON DRAIN PIPE

AND FITTINGS.

	2 inch Diam.	3 inch Diam.	4 inch Diam.	5 inch Diam.	6 inch Diam.
Cast Iron Soil Pipe, per foot	$0.24	$0.30	$0.36	$0.50	$0.60
Double Hub Pipe, per length of 5 feet	1.50	1.80	2.10	2.80	3.30
Quarter Bends	.40	.55	.65	1.00	1.20
Quarter Bends, with 2 in. Outlets with connection, 30c.; 3 in., 40c., and 4 in., 50c. extra.					
Double Hub Quarter Bends	.70	.85	.95	1.30	1.50
Double Hub Eighth Bends	....	....	.90	1.20	....
Sixth Bends	.40	.55	.65	1.00	1.20
Eighth Bends	.35	.45	.60	.90	1.05
Sixteenth Bends	.35	.45	.60	.90	1.05
Return Bends	.65	.85	1.25	2.00	3.00
Long Bends, 18 inches in clear	....	....	1.50	2.25	2.50
T Branches	.40	.55	.65	1.20	1.40
Double Hubs	.30	.45	.65	.75	.80
Single Hubs	.25	.35	.40	.60	.75
Reducers	....	....	.50	.70	.80
Increasers	....	.70	.90	....	1.25

Discount.....per cent.

"RUSTLESS" IRON SINKS.



SQUARE SINKS.

16½ × 12½	5	in. deep	$1 10
18 × 12	6	"	1 25
16 × 16	6	"	1 60
22 × 14	6	"	1 60
23 × 15	6	"	1 70
25½ × 15½	6	"	1 75
20 × 12½	6	"	1 50
20 × 14	6	"	1 50
24 × 14	6	"	1 70
24½ × 16	6	"	1 80
24 × 18	6	"	2 10
25½ × 17½	6	"	2 10
27 × 15	6	"	2 00
24 × 20	6	"	2 40
28 × 17	6	"	2 20
28 × 20	6	"	2 70
30 × 16	6	"	2 25
30 × 18	6	"	2 50
30 × 20	6	"	3 00
22½ × 18	6	in. deep	$3 00
32½ × 21	6	"	3 40
36 × 18	6	"	3 00
36 × 21½	6	"	3 70
38 × 20	6	"	3 80
42 × 22	6	"	4 25
48 × 20	6	"	5 30
48 × 23	6	"	5 75
24 × 14	8	"	2 50
30 × 24	8	"	5 00
50 × 24	6½	"	7 50
50 × 26	6½	"	8 00
62 × 22	8	"	10 75
76 × 22	7	"	15 00
56 × 32	9	"	16 00
60 × 28	10	"	18 00
78 × 28	10	"	25 00
94 × 24	10	"	30 00
120 × 22	6	"	32 00

If with Couplings for Iron Pipe, add 75c. to above prices.

SHALLOW SINKS.

24 × 15½	4 inches deep	$1 40
30 × 17½	4 "	2 10
36 × 19	4 "	2 60
42 × 20½	4 "	3 40
48 × 22	4 "	4 10

HALF CIRCLE SINKS.

No. 1,	Back, 24 inch,	Width, 14 inch,	Depth, 6 inch		$1 50
2,	" 27 "	" 14 "	" 6 "		1 80
3,	" 28 "	" 16 "	" 8 "		2 50
4,	" 31½ "	" 17 "	" 6 "		2 25

CORNER SINKS.

No. 1,	Side, 17 inch,	Front, 25 inch,	Depth, 4½ inch		$1 25
2,	" 20 "	" 28 "	" 6 "		1 75
3,	" 22 "	" 31 "	" 6½ "		2 10

CORNER SINKS,

With Plain Backs and Patent Overflows.

No. 1,	Side, 17 inch,	Front, 25 inch,	Depth, 4½ inch		$5 00
2,	" 20 "	" 28 "	" 6 "		6 00
3,	" 22 "	" 31 "	" 6½ "		7 00

If without Patent Overflow, deduct $1.00.

CORNER SLOP SINK.

Side, 18½ inch, Front, 25 inch, Depth, 12 inch $4 00

SQUARE SLOP SINKS.

16 × 16	10 inches deep	$2 70
20 × 14	12 "	3 50
20 × 16	12 "	4 00
20 × 20	12 "	4 75
24 × 20	12 "	5 00
23 × 15	15 "	4 25
30 × 20	12 "	8 00
36 × 18	12 "	9 00
36 × 21	12 "	10 00
36 × 21	16 "	14 00
48 × 20	12 "	17 00
48 × 20	17 "	20 00

If with Patent Overflow, add to above prices of all styles of Sinks, $1.00
If with Plug Strainer, add ..... .20

SINK LEGS.

Each $0 50

SINK BACKS.

20 inch	$1 25
22 "	1 35
23 "	1 40
24 "	1 50
25½ "	1 60
27 "	1 70
28 "	1 80
30 "	2 00
32½ "	2 25
36 "	2 75
38 "	3 00
42 "	3 50
48 "	4 25

Larger Sizes in sections made to order.

CORNER URINALS.

No. 1,	7 inch on side	$0 75
2,	9 " "	1 00
3,	12 " "	1 25

HALF CIRCLE URINALS.

No. 1,	12 inch on back	$1 00
2,	15 " "	1 30

WASH BASINS.

With Overflow.

12 inch	$1 25
14 "	1 50
15 "	1 75
16 "	2 00

ALL KINDS OF PLUMBERS' CASTINGS

MADE TO ORDER.

Effect of Heat on Various Bodies.

	Degrees.
Ammonia boils	140
Ammonia (liquid) freezes	—46
Antimony melts	951
Arsenic melts	365
Bismuth melts	476
Blood (human), heat of	98
" " freezes	25
Brandy freezes	—7
Brass melts	1,900
Cadmium melts	600
Coal Tar boils	325
Cold, greatest artificial	—166
" greatest natural	—56
Common Fire	790
Copper melts	2,548
Glass melts	2,377
Gold (fine) melts	2,590
Gutta Percha softens	145
Heat, cherry red	1,500
" " (Daniel)	1,141
" bright red	1;860
" red, visible by day	1,077
" white	2,900
Ice melts	32
Iron (cast) melts	3,409
" (wrought) melts	3,980
Iron bright red in the dark	752
" red hot in twilight	884
Lead melts	504
Mercury boils	662
" volatilizes	680
" freezes	—39
Naphtha boils	106
Petroleum boils	306
Platinum melts	3,080
Potassium melts	135
Proof Spirit freezes	—7
Saltpetre melts	660
Sea-water freezes	28
Silver (fine) melts	1,250
Snow and Salt, equal parts	0
Spirits of Turpentine freezes	14
Steel melts	2,500
" polished, blue	580
" " straw color	460
Strong Wines freeze	20
Sulphur melts	226
Sulphuric Acid (sp. grav. 641) freezes	—45
Tin melts	421
Vinous fermentation	60 to 77
Water in *vacuo* boils	98
Zinc melts	740

The sign — before the figures indicate that many degrees below zero or 0.

New York and Brooklyn Suspension Bridge.

Construction commenced Jan. 2d, 1870.
Size of N. Y. Caisson, 172x102 feet.
" Brooklyn " 168x102 "
Timber and Iron in Caisson, 5,253 cubic yds.
Concrete in well holes, chambers, etc., 5,669 cubic feet.
Weight of N. Y. Caisson, about 7,000 tons.
" Concrete filling " 8,000 "
N. Y. Tower contains 46,945 cubic yards masonry.
Brooklyn Tower contains 38,214 cubic yards masonry.
Length of River span, 1,595 feet 6 inches.
" each Land span 930 feet, 1,860 feet.
Length of Brooklyn approach, 971 feet.
" N. Y. approach, 1562 feet 6 inches.
Total length of Bridge, 5,989 feet.
Width of Bridge, 85 feet.
Number of Cables, 4.
Diameter of each Cable, 15¾ inches.
First wire was run out May 29th, 1877.
Cable making really commenced June 11, 1877.
Length of each single wire in cables, 3,578 feet 6 inches.
Ultimate strength of each Cable, 12,200 tons.
Weight of wire, 12 feet per pound.
Each Cable contains 5,296 parallel (not twisted) galvanized steel, oil coated wires, closely wrapped to solid cylinder 15¾ inches in diameter.
Depth of Tower foundation below high water, Brooklyn, 45 feet.
Depth of Tower foundation below high water, New York, 78 feet.
Size of Towers at high water line, 140x59 ft.
Size of Towers at roof course, 136x53 feet.
Total height of Towers above high water, 278 ft.
Clear height of Bridge in centre of river span above high water, at 90 degs. F., 135 feet.
Height of floor at Towers above high water, 119 feet, 3 inches.
Grade of Roadway, 3¼ feet in 100 feet.
Height of Towers above Roadway, 159 feet.
Size of Anchorages at base, 129x19 feet.
" " " top, 117x104 "
Height of " 89 ft. front, 85 feet rear.
Weight of each Anchor Plate, 23 tons.
Total cost of Bridge, exclusive of land, $9,000,000.
Bridge completed May 24th, 1883.

Engineer, Col. W. A. Roebling.

WEIGHTS AND MEASURES.

Avoirdupois Weight.

The Grain is the same in Troy, Apothecaries and Avoirdupois Weights.
The standard avoirdupois pound is the weight of 27.7015 cubic inches of distilled water weighed in the air at 35.85 degrees Fahr., baromerer at 30 inches.

27.343 grains = 1 drachm.

drachms.	ozs.	lbs.	qrs.	cwt.	ton.	French grammes.
1 =	.0625 =	.0039 =	.009139 =	.000035 =	.00000174 =	1.771846
16 =	1 =	.0625 =	.00223 =	.000558 =	.000028 =	28.34954
256 =	16 =	1 =	.0357 =	.00893 =	.000447 =	453.59
7168 =	448 =	28 =	1 =	.25 =	.0125 =	12700
28672 =	1792 =	112 =	4 =	1 =	.05 =	50802
573440 =	35840 =	2240 =	80 =	20 =	1 =	1016040

A stone = 14 pounds. A quintal = 100 pounds.

Troy Weight.—For Gold, Silver and Precious Metals.

grains.	dwts.	ozs.	lbs.	French grammes.
1 =	.04167 =	.00208 =	.0001736 =	.9648
24 =	1 =	.05 =	.004167 =	1.555
480 =	20 =	1 =	.0833 =	31.1035
5760 =	240 =	12 =	1 =	373.242

175 lbs. Troy = 144 Avoirdupois.
lbs. Avoirdupois x .82286 = lbs. Troy.
lbs. Troy x 1.2153 = lbs. Avoirdupois.

The Jewelers' Carat is equal, in the United States, to 3.2 grains; in London, to 3.17 grains; in Paris, to 3.18 grains.

Pure Gold is worth $20.67 per oz. Troy, or $18.84 per oz. Avoirdupois.
" Silver " 1.36 " " 1.24 " "
Standard Gold " 18.60 " " 16.96 " "
" Silver " 1.225 " " 1.117 " "

Long Measure.

ins.	feet.	yards.	fath.	poles.	furl.	mile.	French metres.
1 =	.083 =	.02778 =	.0139 =	.005 =	.000126 =	.0000158 =	.0254
12 =	1 =	.333 =	.1667 =	.0606 =	.00151 =	.0001894 =	.3048
36 =	3 =	1 =	5 =	.182 =	.00454 =	.000568 =	.9144
72 =	6 =	2 =	1 =	.364 =	.0091 =	.001136 =	1.8287
198 =	16½ =	5½ =	2¾ =	1 =	.025 =	.003125 =	5.0291
7920 =	660 =	220 =	110 =	40 =	1 =	.125 =	201.16
63360 =	5280 =	1760 =	880 =	320 =	8 =	1 =	1609.315

A cable's length = 120 fathoms.

A square mile is 640 acres.
A league is three miles.
The term "Sabbath Day's Journey" means 1155 yards.
A day's journey is 33⅓ miles.
A fathom is six feet.

A hand (horse measure) is four inches.
A palm is three inches.
A span is 10½ inches.
A cubit is two feet.
A great cubit is 11 feet.
A pace is three feet.

Surveying Measure (Lineal).

ins.	links.	feet.	yards.	chains.	mile.	French metres.
1 =	.126 =	.0833 =	.0278 =	.00126 =	.0000158 =	.0254
7.92 =	1 =	.66 =	.22 =	.01 =	.000125 =	.2012
12 =	1.515 =	1 =	.333 =	.01515 =	.000189 =	.3048
36 =	4.545 =	3 =	1 =	.04505 =	.000568 =	.9144
792 =	100 =	66 =	22 =	1 =	.0125 =	20 116
63360 =	8000 =	5280 =	1760 =	80 =	1 =	1609.315

1 knot or geographical mile = 6082.66 feet = 1854 metres = 1.152 statute miles.
1 Admiralty knot = 1.1515 statute miles = 6080 feet.

Table of Quantities.

12 units or articles ..... 1 dozen.
12 dozen ..... 1 gross.
20 units or articles ..... 1 score.
24 sheets paper ..... 1 quire.
20 quires ..... 1 ream.
2 reams ..... 1 bundle.
5 bundles ..... 1 bale.
Printer's token ..... 250 sheets.

WEIGHTS AND MEASURES—Continued.

Square Measure.

Inches.	Feet.	Yards.	Perches.	Roods.	Acre.	Sq. Metres.
1 =	.00694 =	.000772 =	.0000255 =	.00000064 =	.000000159 =	.000645
144 =	1 =	.111 =	.00367 =	.0000918 =	.000023 =	.0929
1296 =	9 =	1 =	.0331 =	.000826 =	.0002062 =	.8361
39204 =	272¼ =	30¼ =	1 =	.025 =	.00625 =	25.292
1568160 =	10890 =	1210 =	40 =	1 =	.25 =	1011.7
6272640 =	43560 =	4840 =	160 =	4 =	1 =	4046.7

100 square feet = 1 square.
1 chain wide = 8 acres per mile.
10 square chains = 1 acre.
1 hectare = 2.471143 acres.
1 square mile = 27878400 sq. feet. = 3097600 sq. yds. = 640 acres.
Acres x .0015625 = square miles.
Sq. yds. x .000000323 = " "

A section of land is one mile square, and contains 640 acres.

A square acre is 208.71 feet at each side.
" ½ " 147.58 " "
" ¼ " 104.355 " "
A circular " 235.504 feet in diameter.
" ½ " 166.527 " "
" ¼ " 117.752 " "

52⅛ feet sq., or 2722½ sq. feet is 1/16 acre.
73⅝ " 5445 " ⅛ "
104⅛ " 10890 " ¼ "

120⅛ feet sq., or 14520 sq. feet is ⅓ acre.
147½ " 21780 " ½ "
208⅜ " 43560 " 1 "

Cubic Measure.

1 in. =	.0005788 feet =	.000002144 yards =	.000016386 cubic metres.
1728 ins. =	1 " =	.03704 " =	.028315 " "
46656 " =	27 " =	1 " =	.764513 " "

A cord of wood = 128 cubic feet, being 4 feet high, 4 feet wide, and 8 feet long.
42 cubic feet = a ton of shipping.

A Cubic Foot is Equal to

1728 cubic inches.
.037037 cubic yard.
.803564 U. S. struck bushel of 2150.42 cubic inches.
3.21426 U. S. pecks.
7.48052 U. S. liquid galls. of 231 cubic inches.
6.42851 U. S. dry gallons.
29.92208 U. S. liquid quarts.
25.71405 U. S. dry quarts.
59.84416 U. S. liquid pints.
51.42809 U. S. dry pints.
239.37662 U. S. gills.
.26667 flour barrel of 3 struck bushels.
.23748 U. S. liquid barrel of 31½ gallons.

Dry Measure.

The Standard Bushel contains 2150.42 cubic inches, or 77.627013 pounds avoirdupois of pure water at maximum density. Its legal dimensions are 18½ inches diameter inside, 19½ inches outside, and 8 inches deep; and when heaped, the cone must be 6 inches high, making a heaped bushel equal to 1¼ struck ones.

Pints.	Quarts.	Gallons.	Pecks.	Bushels.	Cubic Inches.
2 =	1 =	.250 =	.125 =	.0315 =	67.2
8 =	4 =	1 =	.5 =	.125 =	268 8
16 =	8 =	2 =	1 =	.25 =	537.6
64 =	32 =	8 =	4 =	1 =	2150.42

Liquid Measure.

The Standard Gallon measures 231 cubic inches, or 8.33888 pounds avoirdupois of pure water, at about 39.85 degrees Fahr., the barometer at 30 inches.

4 =	.1 pint.							
8 =	2 =	1 quart.						
32 =	8 =	4 =	1 gallon.					
1344 =	336 =	168 =	42 =	1 tierce.				
2016 =	504 =	252 =	63 =	1½ =	1 hogshead.			
2488 =	672 =	336 =	84 =	2 =	1⅓ =	1 puncheon.		
4032 =	1008 =	504 =	126 =	3 =	2 =	1½ =	1 pipe.	
8064 =	2016 =	1008 =	252 =	6 =	4 =	3 =	2 =	1 tun.

A cubic foot contains 7½ gallons.

Sizes of Tanks and Contents.

Diameter.	Depth.		Diameter.	Depth.	
12 feet.....	8 feet.....	6,767 gallons.	24 feet.....	12 feet.....	40,607 gallons.
14 "	9 "	10,363 "	26 "	13 "	51,628 "
16 "	9 "	13,535 "	28 "	14 "	64,481 "
18 "	10 "	19,034 "	30 "	15 "	79,310 "
20 "	10 "	23,499 "	32 "	16 "	96,253 "
22 "	11 "	31,277 "	34 "	17 "	115,451 "

Capacity of Cisterns and Reservoirs in Gallons.

DEPTH, 10 INCHES; DIAMETER, FROM 2 TO 25 FEET.

2 feet..... 19.5	5 feet.....122.40	8 feet.....313.33	12 feet..... 705.
2½ " 30.6	5½ " 148.10	8½ " 353.72	13 " 827.4
3 " 44.06	6 " 176.25	9 " 396.56	14 " 959.6
3½ " 59.97	6½ " 206.85	9½ " 461.40	15 " 1,101.6
4 " 78.33	7 " 239.88	10 " 489.20	20 " 1,958.4
4½ " 99.14	7½ " 275.40	11 " 592.40	25 " 3,059.9

Capacity of Boxes.—A box 24 inches long by 16 inches wide, and 28 inches deep, will contain a barrel (3 bushels).
A box 24 inches long by 16 inches wide, and 14 inches deep, will contain half a barrel.
A box 16 inches square and 8.4 inches deep, will contain one bushel.
A box 8 inches by 8.4 inches square, and 8 inches deep, will contain one peck.
A box 8 inches by 8 inches square, and 4.2 inches deep, will contain one gallon.

Table of Dimensions of Various Measures of Capacity.

Size.	Diameter of Top.	Diameter of Bottom.	Height.
1 gallon....	5½ ins....	6⅛ ins....	9¼ ins.
½ "	4 "	4⅝ "	8 "
1 quart.....	3½ "	4 "	5⅝ "
1 gallon....	4 "	7 "	8½ "
½ "	6½ "	4 "	4 "
5 "	8 "	10½ "	12⅝ "
3 "	7 "	11⅝ "	10½ "
2 "	6 "	10½ "	8⅝ "
1 "	3⅝ "	8¾ "	7⅝ "
20 quarts....	19½ "	13 "	8 "
16 "	18 "	11¼ " ..	6½ "
14 "	15½ "	9¼ "	6¼ "
10 "	14⅝ "	11 "	4⅛ "

Size.	Diameter of Top.	Diameter of Bottom.	Height.
1 pint	2⅞ ins....	3⅛ ins....	4⅛ ins.
½ "	2⅝ "	2⅞ "	3⅛ "
3 quarts	3½ "	6 " ...	8½ "
1 pint	4¼ "	3⅜ "	2⅝ "
¼ gallon	3½ "	6⅜ "	6½ "
1 "	2½ "	5⅛ "	5 "
1 "	2 " ...	4½ "	4½ "
½ "	1⅝ "	3¼ "	3⅛ "
2 quarts	9 "	6 "	3⅝ "
3 pints	8½ "	5⅝ "	2⅝ "
1 pint	6½ "	4 "	2⅝ "
Pie.....	9 "	7½ "	1⅝ "

Comparative Values of Woods for Fuel.

Taking shellbark hickory as the highest standard, and calling that 100, other trees will compare with it for burning purposes, as follows: Shellbark hickory, 100; pignut hickory, 95; white oak, 84; white ash, 77; dogwood, 75; scrub oak, 73; white hazel, 72; apple tree, 70; white beech, 69; black birch, 65; hard maple, 65; black walnut, 62; yellow oak, 60; white elm, 58; red oak, 56; red cedar, 56; wild cherry, 55; yellow pine, 54; chestnut, 52; yellow poplar, 51; butternut, 43; white birch, 43; white pine, 30.

Strength of Ice.

Ice two inches thick will bear men on foot; four inches, men on horseback; six inches thick will bear cattle and teams with light loads; eight inches thick, teams with heavy loads. Ten inches will sustain a pressure of 1,000 pounds per square foot. The above is on the supposition that the ice is sound, and not "snow ice."

WORKSHOP RECIPES.

Cement to Resist Fire and Water, and Harden Quickly.

Two parts finely sifted unoxydized iron filings.
One part perfectly dry, finely powdered loam.
Knead the mixture with strong vinegar into a homogeneous plastic mass. To be used as soon as made.

To Soften Putty.

To remove old putty from broken windows, dip a small brush into nitro-muriatic acid or caustic soda (concentrated lye), and with it anoint or paint over the dry putty that adheres to the broken glass and frames of your windows; after an hour's interval the putty will have become so soft as to be easily removable.

Painters' Putty.

Spanish whiting, pulverized.....80.6
Boiled Oil.....20.4 } Made into a stiff paste. If not intended for immediate use, raw oil should be used.

One pound of putty for stopping every 20 yards.

Glaziers' Putty.

Whiting, 70 lbs.; boiled oil, 30 lbs.; water, 2 gallons. Mix. If too thin add more whiting, if too thick add more oil.

Cement for Stopping Joints, Etc.

White lead in oil, mixed with enough white sand to make it a stiff paste. This grows hard by exposure, and resists heat, cold and water.

Cement for Leather Belting.

Take of common glue and American isinglass, equal parts; place them in a boiler and add water sufficient to cover the whole. Let it soak 10 hours, then bring it to a boiling heat, and add pure tannin until the whole becomes ropey, or appears like the whites of eggs. Apply it warm. Buff the grain off the leather where it is to be cemented; rub the joint surfaces solidly together, let it dry a few hours, and it is ready for practical use; and, if properly put together, it will not need riveting, as the cement is nearly of the same nature as the leather itself.

To Remove Rusty Bolts.

To remove bolts that have become rusted badly, without breaking them, is quite simple if understood. The best method is to apply kerosene oil liberally, and give time for it to soften the rust before any attempt is made to turn the nut. If, after the rust has softened, it does not start easily with the wrench, give a rap on one corner with a blow of the hammer. A hammer and cold chisel, rightly used, will often start a rusted nut that would not yield to the wrench without twisting off the bolt.

How to Prepare Fence Posts.

A western farmer says that he discovered many years ago that wood could be made to last longer than iron in the ground. Time and weather, he says, seem to have no effect on it. Posts can be prepared for less than two cents apiece. This is the recipe: Take boiled linseed oil and stir it in pulverized charcoal to the consistency of paint. Put a coat of this over the timber, and, he adds, there is not a man that will live to see it rot.

A Practical Rule for Laying Pipe for Draining Land.

Soils.	Depth of Pipe.	Distance apart.
Coarse Gravel Sand	4 feet 6 inches	60 feet.
Light Sand with Gravel	4 "	60 "
Light Loam	3 " 6 "	50 "
Loam with Clay	3 " 2 "	33 "
" " Gravel	3 " 3 "	21 "
Sandy Loam	3 " 9 "	27 "
Soft Clay	2 " 9 "	40 "
Stiff "	2 " 6 "	21 "
		15 "

Greatest Fall of Rain is 2 inches per hour=54,308.6 gallons per acre.

PLANTS OR TREES.

Number to the Acre at Given Distances.

Dis. apart.	No. Plants.	Dis. apart.	No. Plants.
½ foot	174,240	6 feet	1,210
1 "	43,560	7 "	889
1½ feet	19,360	8 "	680
2 "	10,890	9 "	573
2½ "	6,969	10 "	435
3 feet by 1 foot	14,520	11 "	360
2 " 2 feet	7,260	12 "	302
3 " 3 "	4,840	15 "	193
4 " 1 foot	10,888	18 "	134
4 " 2 feet	5,444	20 "	108
4 " 3 "	3,629	25 "	69
4 " 4 "	2,722	30 "	49
5 " 5 "	1,742		

Customary and Legal Weight of Various Articles in the United States.

	lbs.		lbs.
Apples	per bu. 48	Onions	per bu. 56
" dried	" 24	Peas	" 60
Barley	" 48	Plastering Hair	" 8
Beans	" 60	Rape	" 50
Buckwheat	" 48	Rye	" 56
Broom Corn	" 46	Red Top Seed	" 14
Blue Grass, Kentucky	" 14	Salt, Coarse	" 50
" " English	" 24	Salt, Michigan	" 56
Bran	" 20	Sweet Potatoes	" 56
Canary Seed	" 60	Timothy Seed	" 45
Castor Beans	" 46	Turnips	" 55
Clover Seed	" 64	Wheat	" 60
Corn, shelled	" 56	Beef and Pork, per bbl., net	200
" on ear	" 70	Flour, per bbl., net	196
Corn Meal	" 50	White Fish and Trout, per bbl., net	200
Charcoal	" 22	Salt, per bbl	280
Coal, Mineral	" 80	Lime, "	220
Cranberries	" 40	Hay, well settled, per cubic ft.	4½
Dried Peaches	" 28	Corn, on cob, in bin, "	22
Flax Seed	" 55	Corn, shelled, " "	45
Hemp Seed	" 44	Wheat, " "	48
Hungarian Grass Seed	" 50	Oats, " "	25½
Irish Potatoes, heaping measure	" 60	Potatoes, " "	38½
Millet	" 50	Sand, dry, "	95
Malt	" 34	Clay, compact, "	135
Oats	" 32	Marble, "	169
Osage Orange	" 33	Seasoned Beech Wood, per cord	5,616
Orchard Grass	" 14	" Hickory, "	6,960

QUANTITY OF SEED REQUIRED

TO PRODUCE A GIVEN NUMBER OF PLANTS AND SOW A GIVEN AMOUNT OF GROUND.

	Quantity per acre.
Artichoke, 1 oz. to 500 plants	½ lb.
Asparagus, 1 oz. to 200 plants	5 lbs.
Barley	2½ bu.
Beans, dwarf, 1 qt. to 150 ft. of drill	1½ "
Beans, pole, 1 qt. to 200 hills	½ "
Beet, garden, 1 oz. to 100 ft. of drill	10 lbs.
Beet, Mangel, 1 oz. to 150 ft. of drill	6 "
Brocoli, 1 oz. to 3,000 plants	5 oz.
Broom Corn	10 lbs.
Brussels Sprouts, 1 oz. to 3,000 plants,	5 "
Buckwheat	½ bu.
Cabbage, 1 oz. to 3,000 plants	5 oz.
Carrot, 1 oz. to 250 ft. of drill	2½ lbs.
Cauliflower, 1 oz. to 3,000 plants	5 oz.
Celery, 1 oz. to 10,000 plants	4 "
Clover, Alsike and White Dutch	6 lbs.
Clover, Lucerne, Large Red and Crimson Trefoil	8 "
Clover, Medium	10 "
Collards, 1 oz. to 2,500 plants	6 oz.
Corn, sweet, 1 qt. to 500 hills	8 qts.
Cress, 1 oz. to 150 ft. of drill	8 lbs.
Cucumber, 1 oz. to 80 hills	1½ "
Egg Plant, 1 oz. to 2,000 plants	8 oz.
Endive, 1 oz. to 300 feet of drill	3 lbs.
Flax, broad cast	½ bu.
Garlic, bulbs, 1 lb. to 10 ft. of drill	
Gourd, 1 oz. to 25 hills	2½ "
Grass, Blue Kentucky	2 bu.
" Blue English	1 "
" Hungarian and Millet	½ "
" Mixed Lawn	3 "
" Orchard, Perennial Rye, Red Top, Fowl Meadow and Wood Meadow	2 "

	Quantity per acre.
Hemp	½ bu.
Kale, 1 oz. to 3,000 plants	4 oz.
Kohl Rabi, 1 oz. to 200 ft. of drill	1½ lbs.
Leek, 1 oz. to 250 ft. of drill	4 "
Lettuce, 1 oz. to 250 ft. of drill	3 "
Martynia, 1 oz. to 50 ft. of drill	10 "
Melon, Musk, 1 oz. to 100 hills	1½ "
Melon, Water, 1 oz. to 25 hills	1½ "
Nasturtium, 1 oz. to 50 ft. of drill	10 "
Oats	2½ bu.
Okra, 1 oz. to 50 ft. of drill	10 lbs.
Onion Seed, 1 oz. to 200 ft. of drill	5 "
" " for sets	30 "
Onion Sets, 1 qt. to 20 ft. of drill	8 bu.
Parsnip, 1 oz. to 250 ft. of drill	5 lbs.
Parsley, 1 oz. to 250 ft. of drill	8 "
Peas, garden, 1 qt. to 150 ft. of drill	1½ bu.
Peas, field	2½ "
Pepper, 1 oz. to 1,500 plants	4 oz.
Potatoes	8 bu.
Pumpkin, 1 qt. to 300 hills	4 qts.
Radish, 1 oz. to 150 ft. of drill	8 lbs.
Rye	1½ bu.
Salsify, 1 oz. to 60 ft. of drill	8 lbs.
Spinach, 1 oz. to 150 ft. of drill	10 "
Summer Savory, 1 oz. to 500 ft. of drill	2 "
Squash, summer, 1 oz. to 40 hills	2 "
" winter, 1 oz. to 10 hills	3 "
Tomato, 1 oz. to 3,000 plants	3 oz.
Tobacco, 1 oz. to 5,000 plants	2 "
Turnip, 1 oz. to 250 ft. of drill	1½ lbs.
Vetches	2 bu.
Wheat	1 to 2 "

Velocity and Force of the Wind.

DESCRIPTION.	Miles per Hour.	Feet per minute.	Feet per second.	Force in lbs. per sq. foot.
Hardly perceptible	1	88	1.47	.005
Just perceptible	2	176	2.93	.020
Gentle Breeze	3	264	4.4	.044
Pleasant Breeze	4	352	5.87	.079
Brisk Gale	5	440	7.33	.123
High Wind	10	880	14.67	.492
Very High Wind	15	1320	22.	1.107
Storm	20	1760	29.3	1.968
Great Storm	25	2200	36.6	3.075
Hurricane	30	2640	44.	4.428
	35	3080	51.3	6.027
	40	3520	58.6	7.872
	45	3960	66.	9.963
	50	4400	73.3	12.300
	60	5280	88.	17.712
	70	6160	102.7	24.108
	80	7040	117.3	31.488
	100	8800	146.6	49.200

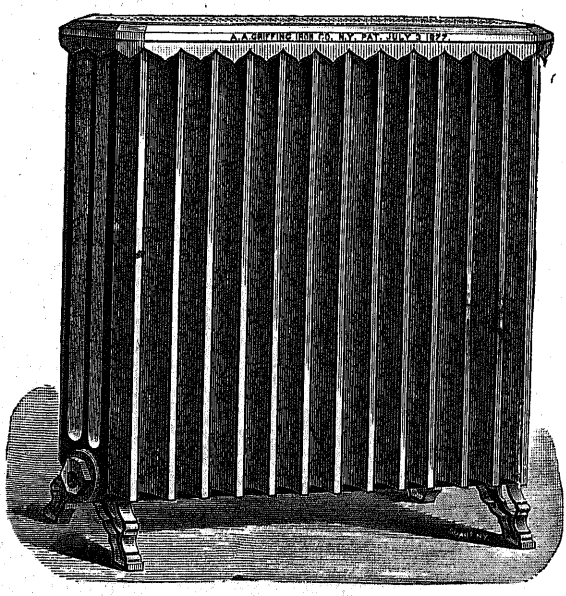
THE BUNDY TRIUMPH RADIATOR

FOR STEAM AND HOT WATER

IS EXTENSIVELY USED.

EACH SECTION IS AN EXACT DUPLICATE.

Each Section Has Five Feet of Surface.



THIS THREE-PIPE RADIATOR IS PROTECTED BY Letters-Patent, No. 192,755, July 3d, 1877. All Other Three-Pipe Radiators are Infringements.

Positive circulation is secured in this Radiator by the steam or hot water passing up the central and down the two outside pipes.

These Radiators can be shipped built up or in separate sections, as no special tools are required in their construction. The legs are detachable and can be applied to any section.

Send for Catalogue "C" for further information.

THE BUNDY CLIMAX INDIRECT RADIATOR

Is the most popular owing to the universal satisfaction it is giving wherever used.

All sections are duplicates; are easily made into stacks.

POSITIVE CIRCULATION GUARANTEED.

No Snapping Noises! No Air Binding!! No Trouble!!!

A. A. GRIFFING IRON CO.,

624 COMMUNIPAW AVE., JERSEY CITY, N. J.