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Arizona Notes
&c

Union Well Supply Co.

LOS ANGELES, CAL.

1911

1911 CALENDAR 1911

JANUARY

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

FEBRUARY

			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28				

MARCH

			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

APRIL

						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

MAY

	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

JUNE

				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

JULY

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

AUGUST

		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

SEPTEMBER

					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

OCTOBER

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

NOVEMBER

			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

DECEMBER

					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

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UNION WELL SUPPLY CO.

USEFUL INFORMATION.

WATER.

A Gallon of Water (U. S. Standard) contains 231 cubic inches and weighs 8⅓ pounds.

A Cubic Foot of Water contains 7½ gallons, or 1728 cubic inches, and weighs 62½ pounds.

A "Miner's Inch" is a measure for the flow of water, and is the amount discharged through an opening 1 inch square in a plank 2 inches in thickness, under a head of 6 inches to the upper edge of the opening; and this is equal to 11,625 U. S. gallons per minute.

The height of a column of fresh water, equal to a pressure of 1 pound per square inch, is 2.31 feet.

A column of water 1 foot high exerts a pressure of .433 pounds per square inch.

The capacity of a cylinder in gallons is equal to the length in inches multiplied by the area in inches, divided by 231 (the cubical contents of one U. S. gallon in inches).

The velocity in feet per minute, necessary to discharge a given volume of water in a given time, is found by multiplying the number of cubic feet of water by 144, and dividing the product by the area of the pipe in inches.

The area of a required pipe, the volume and velocity being given, is found by multiplying the number of cubic feet of water by 144, and dividing the product by the velocity in feet per minute. The area being found, the diameter is obtained by the table of areas.

Doubling the diameter of a pipe increases its capacity four times.

The friction of liquids in pipes increases as the square of the velocity.

The horse-power necessary to elevate water to a given height is found by multiplying the weight of the water elevated per minute, in pounds, by the height in feet, and dividing the product by 33,000.

Pressure of Water Due to its Weight. The pressure of still water in pounds per square inch against the sides of any pipe, channel or vessel of any shape whatever is due solely to the "head." or height of the level surface of the water above the point at which the pressure is considered, and is equal to .43302 lb. per square inch for every foot of head, or 62,355 lbs. per square foot for every foot of head (at 62° F.)

The pressure per square inch is equal in all directions, downwards, upwards, or sideways, and is independent of the shape or size of the containing vessel.

The pressure against a vertical surface, as a retaining-wall, at any point is in direct ratio to the head above that point, increasing from 0 at the level surface to a maximum at the bottom. The total pressure against a vertical strip of a unit's breadth increases as the area of a rightangled triangle whose perpendicular represents the height of the strip and whose base represents the pressure on a unit of surface at the bottom; that is, it increases as the square of the depth. The sum of all the horizontal pressures is represented by the area of the triangle, and the resultant of this sum is equal to this sum exerted at a point one-third of the height from the bottom. (The center of gravity of the area of a triangle is one-third of its height.)

The horizontal pressure is the same if the surface is inclined instead of vertical.

(For an elaboration of these principles see Trautwine's Pocket-Book, or the chapter on Hydrostatics in any work of Physics. For dams, retaining-walls, etc., see Trautwine.)

The amount of pressure on the interior of walls of a pipe has no appreciable effect upon the amount of flow.

Buoyancy. When a body is immersed in a liquid, whether it float or sink, it is buoyed up by a force equal to the weight of the bulk of the liquid displaced by the body. The weight of a floating body is equal to the weight of the bulk of the liquid that it displaces. The upward pressure or buoyancy of the liquid may be regarded as exerted at the center of gravity of the displaced water, which is called the center of pressure or of buoyancy. A vertical line drawn through it is called the axis of buoyancy or of flotation. In a floating body at rest a line joining the center of gravity and the center of buoyancy is vertical, and is called the axis of equilibrium. When an external force causes the axis of equilibrium to lean, if a vertical line be drawn upward from the center of buoyancy to this axis, the point where it cuts the axis is called the metacentre. If the metacentre is above the centre of gravity the distance between them is called the metacentric height, and the body is then said to be in stable equilibrium, tending to return to its original position when the external force is removed.

Boiling-Point. Water boils at 212° F. (100° C.) at mean atmospheric pressure at the sea-level, 14.7 lbs. per square inch. The temperature at which water boils at any given pressure is the same as the temperature of saturated steam at the same pressure.

The Boiling-Point of Water may be Raised. When water is entirely freed of air, which may be accomplished by freezing or boiling, the cohesion of its atoms is greatly increased, so that its temperature may be raised at 50° above the ordinary boiling-point before ebullition takes place. It was found by Faraday that when such air-freed water did boil, the rupture of the liquid was like an explosion. When water is surrounded by a film of oil, its boiling temperature may be raised considerably

above its normal standard. This has been applied as a theoretical explanation in the instance of boiler explosions.

The freezing-point also may be lowered, if the water is perfectly quiet, to 10° C., or 18° Fahrenheit below the normal freezing-point. (Hamilton Smith, Jr., on Hydraulics, p. 13.) The density of water at 14° F., is .99814, its density at 39.1° F. being 1, and at 32° F., 99987.

Freezing-Point. Water freezes at 32° F., at the ordinary atmospheric pressure, and ice melts at the same temperature. In the melting of 1 pound of ice into water at 32° F., about 142 heat units are absorbed, or become latent; and in freezing 1 pound of water into ice a like quantity of heat is given out to the surrounding medium.

Sea-Water freezes at 27° F. The ice is fresh. (Trautwine.)

Ice and Snow. (From Clark.) 1 cubic foot of ice at 32° F., weighs 57.50 lbs.; 1 lb. of ice at 32° F., has a volume of .0174 cu. ft.=30.067 cu. in.

Relative volume of ice to water at 32° F., 1.0855, the expansion in passing into the solid state being 8.55 per cent. Specific gravity of ice=0.922, water at 62° F., being 1.

At high pressures the melting point of ice is lower than 32° F.. being at the rate of .0133° F., for each additional atmosphere of pressure.

The specific heat of ice is .504, that of water being 1.

1 cubic foot of fresh snow, according to humidity of atmosphere: 5 lbs. to 12 lbs. 1 cubic foot of snow moistened and compacted by rain: 15 lbs. to 50 lbs. (Trautwine.)

Specific Heat of Water. (From Clark's Steam-engine.) Calculated by means of Regnault's formula, $c = 1 + 0.00004t + 0.0000009t^2$, in which c is the specific heat of water at any temperature, t in centigrade degrees, the specific heat at the freezing point being 1.

Compressibility of Water. Water is very slightly compressible. Its compressibility is from .000040 to .000051 for one atmosphere, decreasing with increase of temperature. For each foot of pressure distilled water will be diminished in volume .0000015 to .0000013. Water is so incompressible that even at a depth of a mile, a cubic foot of water will weigh only about half a pound more than at the surface.

Water is composed of two gases, hydrogen and oxygen, in the ratio of two volumes of former to one of the latter. It is never found pure in nature, owing to the readiness with which it absorbs impurities from the air and soil.

One foot of water column at 39.1° F. = 62 425 lbs. on the square foot.

One foot of water column at 39.1° F. = 0.4335 lbs. on the square inch.

One foot of water column at 39.1° F. = 0.0295 atmospheric pressure.

One foot of water column at 39.1° F. = 0.8826 in. mercury column at 32° F.

One foot of water column at 39.1° F. = 773.3 ft. of air column at 32° F. and atmospheric pressure.

One lb. pressure on sq. ft. = 0.01602 ft. water column at 39.1° F.

One lb. pressure on sq. in. = 2.307 ft. water column at 39.1° F.

One atmospheric pressure = 29.92 in mercury column = 33.9 ft. water column.

One inch of mercury column at 32° F.= 1.133 ft. water column.

One foot of air column at 32° F. and 1 atmospheric pressure = 0.001293 ft. water column.

WATER HAMMER

Extracts from Paper by O. Simin, Read Before the Twenty-fourth Annual Convention of the American Water Works Association.

The question of the so-called "water hammer" or "hydraulic shock" caused by stopping the flow in a water pipe, is of great practical importance, as the shock frequently bursts the pipe.

Geo. N. Peck describes water hammer as follows:

"When a liquid is flowing through a pipe there is a certain amount of energy in the liquid, and if we stop the flow this energy must be used up in some way.

"If the liquid is incompressible, and we stop the flow suddenly, the energy of the liquid is used up in doing work on the pipe by stretching it or increasing its diameter.

"If the liquid is compressible, the energy of the liquid is used up in compressing the liquid and stretching the pipe. Nearly all bursting of pipes is due to a sudden checking of the velocity of the liquid or to the freezing of the liquid."

The following summary and conclusions are based on exhaustive experiments conducted by Prof. Joukovsky, of Moscow, Russia, to determine the effects of water hammer in pipes.

1. The shock pressure is transmitted through the pipe with a constant velocity, which seems to be independent of the intensity of the shock. This velocity depends upon the elasticity of the material

of the pipes and upon, the ratio of the thickness of their walls to their diameter.

Ordinarily, in cast-iron pipes the ratio of thickness to diameter decreases somewhat with increase of the diameter; hence the velocity of the pressure wave is a little less, in pipes of large diameters, than in pipes of smaller diameters.

For pipes of diameters from 2 to 6 inches this velocity is about 4,200 feet per second; for 24-inch pipe it is about 3,290 feet per second.

The speed of propagation of the pressure wave remains the same, whether the shock is caused by arresting the flow of a column of water moving in a pipe, or by suddenly changing the pressure in the column of water (flowing or standing) in any part and by any other means.

2. The shock pressure is transmitted along the pipe with constant intensity. The shock pressure is proportional to the destroyed velocity of flow and to the speed of propagation of the pressure wave. For ordinary cast-iron pipes, of diameters from two to six inches, the increase of pressure, for every foot per second of extinguished velocity of flow, is about four atmospheres (58.8 lbs.) and for a twenty-four inch pipe, about three atmospheres (44.1 lbs.)*

*For example: By suddenly closing a valve on a line, from two to six inches in diameter, in which the water is flowing at a velocity of five lineal feet per second, would cause an increase of pressure or "water hammer" of approximately 294 lbs., and this shock pressure would be transmitted along the entire length of the pipe with constant intensity.

Showing U. S. Gallons in Given Number of Cubic Feet

Cubic Feet	Gallons	Cubic Feet	Gallons
0.1	0.75	600	4,488.3
0.2	1.50	700	5.236.3
0.3	2.24	800	5,984.4
0.4	2.99	900	6,732.4
0.5	3.74	1,000	7,480.0
0.6	4.49	2,000	14,961.0
0.7	5.24	3,000	22,441.5
0.8	5.98	4,000	29,922.0
0.9	6.73	5,000	37,402.6
1	7.48	6,000	44,883.1
2	14.9	7,000	52,363.6
3	22.4	8,000	59,844.1
4	29.9	9,000	67,324.6
5	37.4	10,000	74.805.2
6	44.9	20,000	149,610.4
7	52.4	30,000	224,415.6
8	59.8	40,000	299,220.7
9	67.3	50,000	374,025.9
10	74.8	60,000	448,831.1
20	149.6	70,000	523,636.3
30	224.4	80,000	598,441.5
40	299.2	90,000	673,246.7
50	374.0	100,000	748,051.9
60	448.8	200,000	1,496,103.8
70	523.6	300,000	2,244,155.7
80	598.4	400,000	2,992,207.6
90	673.2	500,000	3,740,259.5
100	748.0	600,000	4,488,311.4
200	1,496.1	700,000	5,236,363.3
300	2,244.1	800,000	5,984,415.2
400	2,992.2	900,000	6,732,467.1
500	3,740.2	1,000,000	7,480,519.0

From the above any cubic feet reading can readily be converted into U. S. gallons, as follows:

How many gallons are represented by 53,928 cubic feet?

50,000	cubic feet	=	374,025.9 gallons
3,000	"	=	22,441.5 "
900	"	=	6,732.4 "
20	"	=	149.6 "
8	"	=	59.8 "
53,928	cubic feet	=	403,409.2 gallons

TABLE SHOWING CONTENTS IN GALLONS OF ROUND TANKS AND CISTERNS

Diameter in Feet	* DEPTH IN FEET AND CONTENTS IN GALLONS											
	*1	4	5	6	7	8	9	10	11	12		
4	93.99	376.	470.	564.	658.	752.	846.	940.	1034.	1128.		
5	146.87	588.	734.	881.	1028.	1175.	1322.	1469.	1616.	1763.		
6	211.50	847.	1058.	1269.	1481.	1692.	1914.	2115.	2327.	2538.		
7	287.86	1152.	1439.	1727.	2015.	2303.	2591.	2879.	3167.	3455.		
8	375.98	1504.	1880.	2256.	2632.	3008.	3384.	3760.	4136.	4512.		
9	475.85	1904.	2379.	2855.	3331.	3806.	4283.	4759.	5235.	5711.		
10	587.47	2350.	2938.	3525.	4113.	4700.	5288.	5875.	6462.	7050.		
11	710.84	2844.	3554.	4265.	4976.	5687.	6398.	7109.	7819.	8531.		
12	845.97	3384.	4230.	5076.	5922.	6768.	7614.	8460.	9306.	10152.		

* To ascertain contents of a round tank or cistern of the above diameters, and of depth not given, multiply the contents of tank one foot deep by the required depth in feet.

TABLE SHOWING CONTENTS IN GALLONS OF SQUARE TANKS AND CISTERNS

Dimensions of Bottom in feet	* DEPTH IN FEET AND CONTENTS IN GALLONS									
	*1	4	5	6	7	8	9	10	11	12
4 x 4	119.68	479.	598.	718.	838.	957.	1077.	1197.	1316.	1436.
5 x 5	187.00	748.	935.	1202.	1309.	1516.	1683.	1870.	2057.	2244.
6 x 6	269.28	1077.	1346.	1616.	1885.	2154.	2424.	2693.	2968.	3231.
7 x 7	366.52	1466.	1833.	2199.	2566.	2922.	3299.	3665.	4032.	4398.
8 x 8	478.72	1915.	2394.	2872.	3351.	3830.	4308,	4787.	5266.	5745.
9 x 9	605.88	2424.	3029.	3635.	4241.	4847.	5453.	6059.	6665.	7272.
10 x 10	748.00	2992.	3740.	4488.	5236.	5984.	6732.	7480.	8228.	8976.
11 x 11	905.08	3620.	4525.	5430.	6336.	7241.	8146.	9051.	9956.	10861.
12 x 12	1077.12	4308.	5386.	6463.	7540.	8617.	9694.	10771.	11848.	12925.

* To ascertain the contents of a square tank or cistern of depth not given, multiply the contents of tank one foot deep as in table by the required depth in feet.

TABLE SHOWING EQUIVALENTS OF PRESSURE AND HEAD OF WATER

HEAD IN FEET AND EQUIVALENT PRESSURE IN POUNDS						PRESSURE IN POUNDS AND EQUIVALENT HEAD IN FEET					
5 to 60 feet		70 to 180 feet		200 to 1,000 feet		5 to 60 Lbs.		70 to 170 Lbs.		180 to 500 Lbs.	
Feet Head	Lbs. Press	Feet Head	Lbs. Press	Feet Head	Lbs. Press	Lbs. Press	Feet Head	Lbs. Press	Feet Head	Lbs. Press	Feet Head
5	2.17	70	30.3	200	86.6	5	11.5	70	161.6	180	415.6
10	4.33	80	34.6	250	108.2	10	23.0	80	184.7	190	438.9
15	6.50	90	39.0	300	129.9	15	34.6	90	207.8	200	461.7
20	8.66	100	43.3	350	151.5	20	46.2	100	230.9	225	519.5
25	10.83	110	47.6	400	173.2	25	57.7	110	253.9	250	577.2
30	12.99	120	52.0	500	216.5	30	69.3	120	277.0	275	643.0
35	15,16	130	56.3	600	259.8	35	80.8	130	300.1	300	692.7
40	17,32	140	60,6	700	303.1	40	92.3	140	323.2	325	750.4
45	19.49	150	65.0	800	346.4	45	103.9	150	346.3	350	808.1
50	21.65	160	69.2	900	389.7	50	115.4	160	369.4	400	922.6
60	26.09	180	78.0	1,000	433.0	60	138.5	170	392.5	500	1154.5

Loss by Friction of Water in Pipes—Continued

Gals. per minute.	SIZES OF PIPE—INSIDE DIAMETER.							
	4 in.	6 in.	8 in.	10 in.	12 in.	14 in.	16 in.	18 in.
5	.....	.....	.....	.....	.....	.....	.....	.....
10	.....	.....	.....	.....	.....	.....	.....	.....
15	.....	.....	.....	.....	.....	.....	.....	.....
20	.....	.....	.....	.....	.....	.....	.....	.....
25	.....	.....	.....	.....	.....	.....	.....	.....
30	.....	.....	.....	.....	.....	.....	.....	.....
35	.....	.....	.....	.....	.....	.....	.....	.....
40	.....	.....	.....	.....	.....	.....	.....	.....
45	.....	.....	.....	.....	.....	.....	.....	.....
50	0.09	.....	.....	.....	.....	.....	.....	.....
75	.....	.....	.....	.....	.....	.....	.....	.....
100	0.33	0.05	.....	.....	.....	.....	.....	.....
125	.....	.....	.....	.....	.....	.....	.....	.....
150	0.69	0.10	.....	.....	.....	.....	.....	.....
175	.....	.....	.....	.....	.....	.....	.....	.....
200	1.22	0.17	.....	.....	.....	.....	.....	.....
250	1.89	0.26	0.07	0.03	0.01	.....	.....	.....
300	2.66	0.37	0 09	0.04	.....	.....	.....	.....
350	3.65	0.50	0.12	0.05	0.02	.....	.....	.....
400	4.73	0.65	0.16	0.06	.....	.....	.....	.....
450	6.01	0.81	0.20	0.07	0.03	.....	.....	.....
500	7.43	0.96	0.25	0.09	0.04	0.017	0.009	0.005
750	.....	2.21	0.53	0.18	0.08	.....	.....	.....
1000	.....	3.88	0.94	0.32	0 13	0.062	0.036	0.020
1250	.....	.....	1.46	0.49	0.20	.....	.....	.....
1500	.....	.....	2.09	0.70	0.29	0.135	0.071	0.040
1750	.....	.....	.....	0.95	0.38	.....	.....	.....
2000	.....	.....	.....	1.23	0.49	0.234	0.123	0.071
2250	.....	.....	.....	.....	0.63	.....	.....	.....
2500	.....	.....	.....	.....	0.77	0.362	0.188	0.107
3000	.....	.....	.....	.....	1.11	0.515	0.267	0.150
3500	.....	.....	.....	.....	.....	0.697	0.365	0.204
4000	.....	.....	.....	.....	.....	0.910	0.472	0.263
4500	.....	.....	.....	.....	.....	.....	0.593	0.333
5000	.....	.....	.....	.....	.....	.....	0.730	0.408

USEFUL FACTORS FOR WATER

Based on Weights at 62° F. (Standard Temperature)

U. S. Gallons	x	8.3356	= pounds
" "	x	.13368	= cubic feet
" "	x	231.	= cubic inches
" "	x	.83356	= English gallons
" "	x	3.78544	= Liters
" "	x	.020985	= Kokus, Japan
" "	x	.30815	= Bedeps Russia
English Gallons	x	10.	= pounds
" "	x	.160372	= cubic feet
" "	x	277.12	= cubic inches
" "	x	1.1997	= U. S. gallons
" "	x	4.5413	= Liters
" "	x	.025175	= Kokus, Japan
" "	x	.36969	= Bedeps. Russia
Liters	x	2.202	= pounds
"	x	.035302	= cubic feet
"	x	61.023	= cubic inches
"	x	.26417	= U. S. gallons
"	x	.2202	= English gallons
"	x	.0055435	= Kokus, Japan
"	x	.081405	= Bedeps, Russia
Kokus	x	397.22028	= pounds
"	x	6.3703	= cubic feet
"	x	11008.00	= cubic inches
"	x	47.6535	= U. S. gallons
"	x	39.722028	= English gallons
"	x	180.39	= Liters
"	x	14,6847	= Bedeps, Russia
Bedeps	x	27.05	= pounds
"	x	.43381	= cubic feet
"	x	749.618	= cubic inches
"	x	3.24512	= U. S. gallons
"	x	2.705	= English gallons
"	x	12.2843	= Liters
"	x	.0680983	= Kokus, Japan
Cubic ft. of water	x	62.355	= pounds
" " "	x	1728.00	= cubic inches
" " "	x	7.4805	= U. S. gallons
" " "	x	6.2355	= English gals.
" " "	x	28.317	= Liters
" " "	x	.15698	= Kokus, Japan
" " "	x	2.3052	= Bedeps, Russia
Pounds of water	x	.016037	= cubic feet
" " "	x	27.712	= cubic inches
" " "	x	.11997	= U. S. gallons
" " "	x	.1	= English gallons
" " "	x	.45413	= Liters
" " "	x	0025175	= Kokus, Japan
" " "	x	.036969	= Bedeps, Russia

STEAM.

A cubic inch of water, evaporated under ordinary atmospheric pressure. will be converted into, approximately. one cubic foot of steam, and it exerts a mechanical force equal to lifting 2,120 pounds one foot high.

27,222 cubic feet of steam weighs one pound.

13,817 cubic feet of air weighs one pound; the specific gravity of steam, atmospheric pressure, being 411 that of air at 34°F., and .0006 that of water at the same temperature.

Each nominal horse-power of boilers requires from four to eight gallons of water per hour.

In calculating the horse-power of boilers allow for tabular boilers 15 square feet, for flue boilers 12 square feet. and for cylinder boilers 10 square feet of heating surface per horse-power.

The unit of power for boilers adopted by the Committee of Judges of the Centennial Exhibition is as follows: One horse-power equals 30 pounds of water evaporated into dry steam per hour from feed water at 100°F., and under a pressure of 70 lbs. per square inch above the atmosphere.

One square foot of grate surface will consume from 10 to 12 pounds of hard coal, or from 18 to 20 pounds of soft coal. per hour, natural draft. With forced draft these amounts can be doubled.

Good boilers will evaporate from 7 to 10 pounds of water per hour per pound of coal.

Steam at a given temperature is said to be saturated when it is of maximum density for that temperature. Steam in contact with water is saturated steam.

Steam which has water (in the form of small drops) suspended in it is called wet or supersaturated steam. If wet steam be heated until all the water suspended in it is evaporated, it is said to be dryed.

If dry saturated steam be heated when not in contact with water, its temperature is raised and its density is diminished or its pressure is raised. The steam is then said to be super-heated.

Let W=weight of a given quantity of wet steam, w=weight of water suspended in this steam, then dryness fraction $=\frac{W-w}{W}$

Under ordinary conditions and good stoking the dryness fraction is about 95 per cent.

Circumference and Areas of Circles

D=Diameter of Circle A=Area of Circle

$A=\frac{1}{4}\pi D^2=.785398\ D^2$

$D=\sqrt[2]{\frac{A}{.785398}}=1.128379\sqrt{A}$

Diam.	Circum.	Area.	Diam.	Circum.	Area.
1/8	.39270	.012	9	28.274	63.617
1/4	.78540	.049	9 1/4	29.060	67.201
3/8	1.1781	.110	9 1/2	29.845	70.88
1/2	1.5708	.196	9 3/4	30.631	74.66
5/8	1.9635	.307	10	31.416	78.54
3/4	2.3562	.442	10 1/4	32.201	82.52
7/8	2.7489	.601	10 1/2	32.987	86.59
1	3.1416	.785	10 3/4	33.772	90.76
1 1/8	3.5343	.994	11	34.558	95.03
1 1/4	3.9270	1.227	11 1/4	35.343	99.40
1 3/8	4.3197	1.485	11 1/2	36.128	103.87
1 1/2	4,7124	1.767	11 3/4	36.914	108.43
1 5/8	5.1051	2.074	12	37.699	113.10
1 3/4	5.4978	2.405	12 1/4	38.485	117.86
1 7/8	5.8905	2.761	12 1/2	39.270	122.72
2	6.2832	3.142	12 3/4	40.055	127.68
2 1/4	7.0686	3.976	13	40.841	132.73
2 1/2	7.8540	4.909	13 1/4	41.626	137.89
2 3/4	8.6394	5.940	13 1/2	42.412	143.13
3	9.4248	7.069	13 3/4	43.197	148.49
3 1/4	10.210	8.296	14	43.982	153.94
3 1/2	10.996	9.621	14 1/4	44.768	159.48
3 3/4	11.781	11.045	14 1/2	45.553	165.13
4	12.566	12.566	14 3/4	46.338	170.87
4 1/4	13.352	14,186	15	47.124	176.71
4 1/2	14.137	15.904	15 1/4	47.909	182.65
4 3/4	14.923	17.721	15 1/2	48.695	188.69
5	15.708	19.635	15 3/4	49.480	194.83
5 1/4	16.493	21.648	16	50.265	201.06
5 1/2	17.279	23.758	16 1/2	51.836	213.82
5 3/4	18.064	25.967	17	53.407	226.98
6	18.850	28.274	17 1/2	54,978	240.53
6 1/4	19.635	30.680	18	56.549	254.47
6 1/2	20.420	33.183	18 1/2	58.119	268.80
6 3/4	21.206	35.785	19	59.690	283.53
7	21.991	38.485	19 1/2	61.261	298.65
7 1/4	22.776	41.282	20	62.832	314.16
7 1/2	23.562	44.179	20 1/2	64.403	330.06
7 3/4	24.347	47.173	21	65.973	346.36
8	25.133	50.265	21 1/2	67.544	363.05
8 1/4	25.918	53.456	22	69.115	380.13
8 1/2	26.704	56.745	22 1/2	70.686	397.61
8 3/4	27.489	60.132	23	72.257	415.48

Circumferences and Areas of Circles

(CONTINUED.)

Diam.	Circum.	Area.	Diam.	Circum.	Area.
23½	73.827	433.74	47	147.655	1734.9
24	75.398	452.39	47½	149.226	1772.1
24½	76.969	471.44	48	150.796	1809.6
25	78.540	490.87	48½	152.367	1847.5
25½	80.111	510.71	49	153.938	1885,7
26	81.681	530.93	49½	155.509	1924.4
26½	83.252	551.55	50	157.080	1963.5
27	84.823	572.56	50½	158.650	2003.0
27½	86.394	593.96	51	160.221	2042.8
28	87.965	615.75	51½	161.792	2083.1
28½	89.535	637.94	52	163.363	2123.7
29	91,106	660.52	52½	164.934	2164.8
29½	92.677	683.49	53	166.504	2206.2
30	94.248	706,86	53½	168.075	2248.0
30½	95.819	730.62	54	169.646	2290.2
31	97.389	754.77	54½	171.217	2332.8
31½	98.960	779.31	55	172,788	2375.8
32	100.531	804.25	55½	174.358	2419.2
32½	102.102	829.58	56	175.929	2463.0
33	103.673	855.30	56½	177.500	2507.2
33½	105.243	881.41	57	179.071	2551.8
34	106.814	907.92	57½	180,642	2596.7
34½	108.385	934.82	58	182.212	2642.1
35	109.956	962.11	58½	183,783	2687.8
35½	111.527	989.80	59	185.354	2734.0
36	113.097	1017.9	59½	186.925	2780.5
36½	114.668	1046.3	60	188.496	2827.4
37	116.239	1075.2	60½	190,066	2874.8
37½	117.810	1104.5	61	191.637	2922.5
38	119.381	1134.1	61½	193.208	2970.6
38½	120.951	1164.2	62	194.779	3019.1
39	122.522	1194.6	62½	196.350	3068.0
39½	124.093	1225.4	63	197.920	3117.2
40	125.664	1256.6	63½	199.491	3166.9
40½	127.235	1288.2	64	201.062	3217.0
41	128.805	1320.3	64½	202.633	3267.5
41½	130.376	1352.7	65	204.204	3318.3
42	131.947	1385.4	65½	205.774	3369.6
42½	133.518	1418,6	66	207,345	3421.2
43	135.088	1452,2	66½	208.916	3473.2
43½	136.659	1486,2	67	210.487	3525.7
44	138.230	1520.5	67½	212,058	3578.5
44½	139.801	1555.3	68	213,628	3631.7
45	141.372	1590.4	68½	215.199	3685,3
45½	142.942	1626.0	69	216,770	3739.3
46	144.513	1661,9	69½	218.341	3793.7
46½	146.084	1698,2	70	219.911	3848,5

WEIGHTS AND MEASURES

Troy Weight

24 grains=1 pwt. 12 ounces=1 pound.
20 pwts.=1 ounce.
Used for weighing gold, silver and jewels.

Apothecaries' Weight

20 grains=1 scruple. 8 drams=1 ounce.
3 scruples=1 dram. 12 ounces=1 pound.
The ounce and pound in this are the same as in Troy weight.

Avoirdupois Weight

27 11-32 grains=1 dram. 4 quarters=1 cwt.
16 drams=1 ounce. 2,000 lbs.=1 short ton.
16 ounces=1 pound. 2,240 lbs.=1 long ton.
25 pounds=1 quarter.

Dry Measure

2 pints=1 quart. 4 pecks=1 bushel.
8 quarts=1 peck. 36 bushels=1 chaldron.

Liquid Measure

4 gills=1 pint. 31½ gallons=1 barrel.
2 pints=1 quart. 2 barrels=1 hogshead.
4 quarts=1 gallon.

Time Measure

60 seconds=1 minute. 24 hours=1 day.
60 minutes=1 hour. 7 days=1 week.
28, 29, 30 or 31 days=1 calendar month (30 days=1 month in computing interest).
365 days=1 year. 366=1 leap year.

Circular Measure

60 seconds=1 minute. 30 degrees=1 sign.
60 minutes=1 degree. 90 degrees=1 quadrant.
4 quadrants=12 signs, or 360 degrees=1 circle.

Long Measure

12 inches=1 foot. 40 rods=1 furlong.
3 feet=1 yard. 8 furlongs=1 sta. mile.
5½ yards=1 rod. 3 miles=1 league.

Cloth Measure

2¼ inches=1 nail. 4 quarters=1 yard.
4 nails=1 quarter.

Mariners' Measure

6 feet=1 fathom. 5,280 feet=1 sta. mile.
120 fath.=1 cab. length. 6,085 feet=1 naut. mile.
7½ cable lengths=1 mile.

Miscellaneous

3 inches=1 palm. 18 inches=1 cubit.
4 inches=1 hand. 21.8 in.=1 Bible Cubit.
6 inches=1 span. 2½ ft.=1 Military pace.

Square Measure

144 sq. in.=1 sq. foot. 40 sq. rods=1 rood.
9 sq. feet=1 sq. yard. 4 roods=1 acre.
30¼ sq. yards=1 sq. rod. 640 acres=1 sq. mile.

Surveyors' Measure

7.92 inches=1 link. 4 rods=1 chain.
25 links=1 rod.
10 sq. chains or 160 square rods=1 acre.
640 acres=1 sq. mile.
36 sq. miles (6 miles sq.)=1 township.

Cubic Measure

1,728 cubic in.=1 cu. ft. 128 cu. ft.=1 cord (wood)
27 cubic ft.=1 cu. yd. 40 cu. ft.=1 ton(shpg.)
2,150.42 cu. inches=1 standard bushel.
268.8 cu. inches=1 standard gallon.
1 cu. foot=about four-fifths of a bushel.

Metric Equivalents

Linear Measure

1 centimeter=0.3937 in.
1 decimeter=3.937 in.=0.328 feet.
1 meter=39.37 in.=1.0936 yards.
1 dekameter=1 9884 rods.
1 kilometer=0.62137 mile.

1 in.=2.54 centimeters.
1 ft.=3.048 decimeters.
1 yd.=0.9144 meter.
1 rod=0.5029 dekameter.
1 mile=1.6093 kilometers

Square Measure

1 sq. centimeter=0.1550 sq. in.
1 sq. decimeter=0.1076 sq. feet.
1 sq. meter=1.196 sq. yds.
1 are.=3.954 sq. rods.
1 hektar=2.47 acres.
1 sq. kilometer=0.386 sq. m.

1 sq. in.=6.452 square centimeters.
1 sq. foot=9.2903 square decimeters.
1 sq. yd.=0.8361 square meter.
1 sq. rod=0.2529 are.
1 acre=0.4047 hektar.
1 sq. mile=2.59 square kilometers.

Measure of Volume

1 cu. centimeter=0.061 cu. in.
1 cu. decimeter=0.0353 cu. ft.
1 cu. meter = 1 ster = 1.308 c. yd. = 0.2759 cd.
1 liter = 0.908 qt. dry = 1.0567 qts. liq.
1 dekaliter = 2.6417 gals. = .135 peck.
1 heckto.=2.8375 bushels.

1 cu. in.=16.39 cu. centimeters.
1 cu. foot=28.317 cu. decimeters.
1 cu. yd.=0.7646 cu. met.
1 cord=3.624 sters.
1 qt. dry=1.101 liters.
1 qt. liq.=0.9463 liters.
1 gal.=0.3785 dekaliter.
1 peck=0.881 dekaliter.
1 bu.=0.3524 hektoliter.

Weights

1 gram=0.0527 ounce.
1 kilogram=2.2046 lbs.
1 metric ton=1.1023 English tons.

1 ounce=28.35 grams.
1 lb.=0.4536 kilogram.
1 English ton=0.9072 metric ton.

Approximate Metric Equivalents

1 decimeter=4 inches.
1 meter=1.1 yards.
1 kilometer=⅝ of mile.
1 hektar=2½ acres.
1 ster. or cu. meter=¼ of a cord.

1 liter = 1.06 qts. liquid. = 0.9 qt. dry.
1 hektoliter=2⅝ bu
1 kilogram=2 1-5 lbs.
1 metric ton=2,200 lbs.

ADDRESSES

ADDRESSES

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Notes from Mary Kingsley's "West Africa"

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Rubber vine of W Africa
Landolphia florida (Ovar-
-iensis)

Pandanus candelabrum
making dense thickets
with prickly stems, lvs. &
thick aerial roots

"Armchair explorers"
Lamblike calfheadedness"
Suburban agnostics"

On all sides rises the colossal
liane-hung forest mirrored
with the sky in the river.
Natives live & die in the Universe
of forest river & sky. In the
tornado season lightning
comes down into forests
in great forked flashes
& howling winds rush thru
it claiming as many victims
among its giants as the
lightning does.
The heavy brooding suffo-
-cating heat, & evident
apprehensiveness of all living
things when the storm
bursts & roar of rain.
Behind it lie many of its

(see 2 pgs ahead)

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Notes from Selous
Travel & adventure in E. Africa

Camped beneath an immense Baobab-tree close to Wankie's Town on the Zambesi 150 yds below Victoria Falls

The country we passed thru was for from monotonous & uninteresting. Scattered here & there over the alluvial plain were patches of sandy soil covered with bush & tall forest trees amongst wh the darker evergreens wh grow so thickly on the brink of Victoria Falls were conspicuous. Here & there top a fantastic Baobab with its huge gouty-looking stem & long leafless limbs met the eye. (July)

Rain season Nov to April.

The high plateau of Mashunaland, remarkable for its many huge naked masses of granite rising abruptly from grassy downs, some 1 or 200 ft h. The plateau itself 4000 ft h, perhaps the highest part of S. Africa.

These downs now being guttered by heavy rains.

Lightning

Suddenly I saw splinters fly from a tree near me whilst all the cattle standing beneath it fell to the ground.

On going up to see what had happened I found 15 fine oxen lying dead

Some yrs ago I lost 1 of my best friends by lightning

African Elephants 10½ & 10½ ft high at shoulders

Ears 5½ ft l. 3¼ wide

Tusk one thing over 400 lbs

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noblest trees with all their bearing of foliage ... "

Pistia stratiotes, makes floating islands, some slowly swirling round & round in eddies

The great rollers of the Atlantic meeting here their first check since they left Cape Horn -

Natives say if you fire the grass too soon or when there is no wind you kill it outright. But if you wait until it is very dry you don't kill it, Because the grass grows in tufts from bulb-like roots, & when dry & the fire fanned by the [wind] it sweeps rapidly over it without heating the roots instead of smouldering long enough to kill them.

The happy cocksureness of stay at home suburban [illegible] regarding God & the Universe.

Mts

"The magnificent Mungo Mah Lobeh, - the Throne of Thunder" The great Peak of Cameroon 13760 ft high, rising suddenly right up out of the sea while close at hand to westward towers the lovely island mass of Fernando Po to 10,190 ft. Every time you pass it by its beauty grows on you with greater & greater force. tho it is never twice the same. Sometimes wreathed with indigo black clouds sometimes softly gorgeous with gold, green, & rose-colored vapors tinted by by the setting sun, sometimes crested with snow sometimes completely swathed in dense clouds so that you can't see it at all but when you once know it is there it is all the same & you bow down & worship "

There are only 2 distinct peaks the Big & Little Cameroon Mtns.
Most striking when you first see it after coasting for weeks along the low shores & mangrove fringed rivers of the Niger Delta "

"My business never takes me up Mtns" -
colossal sweeps of color "
When I reached the S. W. end I saw the South Atlantic down below like a plain of frosted silver. Out of it barely 20 ms away rose Fernando Po with that majestic grace peculiar to volcanic mtns
Soon the white mists rose from the mangrove swamps & grew rose color in the light of the setting sun as they swept upward over the now purple foothills forests & the mist sea rose toward

me changing to lavender color & was soon at my feet blotting out the whole world leaving only the two summits Cameroon & Fernando Po, then down came the rains

Slippery Amomum stems

To me it seems unthinkable that there can be anything more perfect in loveliness, majesty, color & charm" (Then Mtn Cameroon region)

Notes from "An African Farm" Olive Schreiner

"Dear old man, to such as you time brings no age. You die with the purity & innocence of childhood"

"never a great man who had not a great mother"

As intellect grows love strikes deeper

Stars looking down in glory

Oh little hand! Oh little voice! Oh lit. form!

"around God's throne there may be choirs & companies of Angels, Cherubim & Seraphim rising tier above tier, but for one of them all does the soul cry aloud, only perhaps for a little human woman full of sin that it once loved." "

Notes from "Game Trails"

"The climate is delightful & healthy. a White man's Country (British E. Africa.) No danger to health greater than going to the Riviera."

The best timber is got from the tall Mahogo tree. a kind of Sandal wood. often killed by the wild fig wh begins as a parasitic vine & ends, as one of the largest most stately & shady.

"Death by violence, cold starvation. are the normal endings of the stately & beautiful creatures of the wilderness" Life is hard & cruel for all the lower creatures & for man also in what sentimentalists call a state of Nature

The sentimentalists who prattle about the peaceful life of nature do not realize its utter merciless[illegible]

The curious "lily trotters" or jacanas running across the lily pads

"If they (hippos) are found in a pool with little cover, & if the shots can be taken close by, preferably from a boat, there is no sport whatever in killing them."

The bulbuls sang well. 3 men who had been mauled by lions informed me that the actual biting caused them [illegible]

no moment no pain whatever.

In this part of Africa in spring flies bloom & birds sing all the year round, there is no such burst of bloom & song as in the northern spring & early summer

Saw the heavens redden & the sun flame over the rim of ○

Ostrich (male) weighed 263 lbs. hen 240 "

Kudus handsomest & stateliest of all the Antelopes

We several times followed honey birds with in each case

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led us to bee-trees!"

"A sight to gladden any hunter's heart as he lay, (an Elephant) a giant in death"

Frogs with queer voices."

Notes from Ouida's Helianthus

The Kindness of Nature is generally thwarted by the iniquity & deviltry of man. Hunters who are hungry & have hungry children at home are excused but not those who hunt for the sheer pleasure of seeing the agonies of their "game"

"Theo is conscientious"
All disagreeable people are

Guardian angel in uniform ever watching over him over him The armed shape that his Heavenly Father's protection assumed. He believed in himself first & then in the Deity as the creator & defender of himself.

The insane impulse of the sportsman to kill everything —

Would eat any amount of dirt in the service of anybody provided the dirt was the washings of a gold pan — H

Has he not enjoyed life & have not all the good physicians

also provides a festival for the unhappy memory of past joys etc. - For the children of O, for the striving, for the seeker of inordinate en-joyments, for the ambitious, for the sensual solitude is but ill-adapted"

O that enobles the heart & strengthens it for holy resolutions

From "Rupert of Hentzau, A. Hope

"Times change for all of us. The roaring flood of youth goes by & the stream of life sinks to a quiet glow"

"In the aged & ailing the love of peace breeds hope of it"

Notes from "Fighting the Slave Hunters in Central Africa". By Alfred J. Swann -

"My youthful enthusiasm was fired by Livingstone's story of slavery in that vast wilderness -

"So long" sailors phrase for "Until we meet again"

The rains were now over (June or July) but as yet the grass about 6 ft h. was not burned up by those devastating fires wh annually sweep over nearly all tropical Africa destroying or stunting most of the young trees

It is this repeated scorching wh partly accounts for the wretched specimens of trees growing in most districts of S. Africa making charcoal deserts on the Shire tributary Blantyre of the Zambesi named after the birthplace of Livingstone.
At Shupanga under a gigantic baobab tree a pure white cross marks Mary Moffat grave - Mrs Livingstone

Diseased persons left outside the village wall. taunted a roaring lion disdaining any attempt at defence challenged the brute to do its worst "Come this way &

don't go sneaking around those poles you know you can't jump a very. Your voice is like thunder but it is the lightning that kills. You are not the lightning Go & hide your clumsy head in the hole of the forest pig & take care the rabbit does not bite your nose.
Strange as it may appear I never heard of lions attacking any of those isolated wretches"

Boys teasing the last boat @ day in a race on Lake Tanganyika "You fellows know more about pushing porridge

down your throats than pushing a canoe " get out & carry the boat. you will go quicker ."

" Cecil Rhodes
thought in Continuity
They asked " Why do you keep on praying to your God ? Is he always watching for an op-portunity to injure you. Does he get tired of preventing bad spirits putting medicine into your porridge."

" Our spirits never sleep & we let them alone as much as poss-ible."

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Notes from " My story by Hall Cain -

" Thrilling sense of the vastness of O & the mighty things of Nature .

" What I felt 50 yrs ago about the Isle of Man - that it was the whole O in little, that all the interests all the passions & almost all the experiences of mankind lay there on that rock in the Irish sea - has been the motive inspiring my books are if I have learned anything by 5 + 20 yrs of almost continuous travel, it is that humanity is one & the same everywhere & that nothing I had known of our tiny Manx race was out of harmony with what I saw of in races great & small at the

farthest corners of the earth. —

She could see a grand heart thru a clear countenance as she saw Storm at the bottom of a mill

Poverty so smart so clean so free from want, more human & beautiful than wealth for ever [illegible]

When I smell a brush fire now I'm 50 yrs younger in a minute —

Poverty if it is sweet & not bitter is in my view a condition far more blessed of God than wealth bringing hearts closer together in

mutual dependence & brotherhood —

" Cat-like devotion to home & belonging, one's own country but the amiable fallacy

" As to Shelley it is really a mercy that he has not been hatching yearly [illegible] till now

Rossetti was born in 1828, in London —

" Work your metal as much as you like, but first take care it is gold & worth working "
Rossetti

Sloth jaundiced all & from my graspless hand Drop friendship's precious pearls like hourglass sand. I weep yet stoop not,

The faint anguish flows
A dreamy pang in
mornings feverish doze
Coleridge

I assure you said Rossetti
that Chatterton was as
great as any English
poet whatever, & might
absolutely, had he lived,
have proved the only
man in England's
theater of imagination
who could have
handled parts with
Shakespeare

Mrs Hey B Clark
Julian
San Diego Co Cal

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SOUTH CHESTER GENUINE WROUGHT IRON CASING

Inside Diameter, Inches	Weight Per Foot, Pounds	Threads Per Inch
4¼	6.36	14
4¼	9.38	14
4½	6.73	14
4½	9.59	14
5 3-16	13.00	11½
5⅝	10.00	14
5⅝	14.20	11½
5⅝	16.70	11½
6¼	17.00	11½
6⅝	17 00	10
7⅝	15.41	11½
7⅝	20.17	11½
8¼	24.38	8
8⅝	17.60	11½
9⅝	21.90	11½
9⅝	30.25	11½
10	35.00	8
10⅝	26.72	11½
11⅝	30.35	11½
12½	33.78	11½
13½	42.02	11½
14½	47 66	
15½	51.47	11½

SOUTH CHESTER CALIFORNIA WROUGHT IRON CASING

All 10 Thread

Inside Diameter, Inches	Outside Diameter, Inches	Weight Per Foot, Pounds
5⅝	6	20
6¼	6⅝	20
6¼	6⅝	26
6¼	6⅝	28
6⅝	7	20
6⅝	7	26
6⅝	7	28
7⅝	8	26
8¼	8⅝	28
8¼	8⅝	32
8¼	8⅝	36
8¼	8⅝	38
8¼	8⅝	43
9⅝	10	33
10	10¾	40
10	10¾	45
10	10¾	48
10	10¾	54
11⅝	12	40
12½	13	40
12½	13	45
12½	13	50
13½	14	50

MERCHANT PIPE.

Inside Diameter Inches	Weight Per Foot Pounds	Threads Per Inch
⅛	.24	27
¼	.42	18
⅜	.56	18
½	.84	14
¾	1.12	14
1	1.67	11½
1¼	2.24	11½
1½	2,68	11½
2	3.61	11½
2½	5.74	8
3	7.54	8
3½	9.00	8
4	10.66	8
4½	12,49	8
5	14.50	8
6	18,76	8
7	23.27	8
8	28.18	8
9	33.70	8
10	40.00	8
12	49.00	8

LINE PIPE.

Inside Diameter Inches	Weight Per Ft. Pounds	Test Pounds	Threads Per Inch
2	3.61	1200	11½
2	3.61	1500	11½
2½	5,74	1500	8 & 11½
3	7.54	1500	8 & 11½
3½	9.00	1500	8 & 11½
4	10.66	1500	8 & 11½
4½	12.49	1500	8 & 10
5	14.50	1500	8
6	18.76	1500	8
7	23.27	1200	8
8	25.00	750	8
8	28.00	1200	8
9	33.70	1200	8
10	32.00	800	8
10	35.00	800	8
10	40.00	800	8
12	45 00	800	8
12	49.00	800	8

SOUTH CHESTER WROUGHT IRON TUBING.

Inside Diameter Inches	Weight Per Foot Pounds	Threads Per Inch
1¼	2.24	11½
1½	2.68	11½
2	4.00	11½
2	4.50	11½
2½	5.74	11½
2½	6.25	11½
3	7.54	11½
3	8,50	11½
3	10.00	11½
3½	9.00	11½
4	10.66	8
4	11.75	8
4½	12.49	8
5	14.50	8
6	18.76	8
7	23.27	8
8	28.00	8
8	32.00	8
9	33.70	8
10	40.00	8
12	49.00	8

DRIVE PIPE.
SOUTH CHESTER WROUGHT IRON

4½-inch.....15 Pound.....10 Thread

All 8 Thread.

Inside Diameter Inches	Weight Per Foot Pounds
2½	5.74
3	7.54
3½	9.00
4	10.66
4½	12 49
5	14.50
6	18.76
7	23.27
8	28.18
9	33.70
10	40.00
12	49.00

WHITLOCK

Manila Drilling Cables

combine all that is essential in a first-class manila rope, selected long fibre carefully laid, and **besides** are lubricated in a way that keeps the cable flexible despite the drying character of California climate. A special non-drying lubricant does this. The practical value of this feature of Whitlock Cable is attested by **every** user.

We solicit inquiries and stand ready to demonstrate our claims.

1912 CALENDAR 1912

JANUARY

S	M	T	W	T	F	S
...	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	...	...	...

FEBRUARY

...	...	...	...	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	...	...

MARCH

...	...	...	...	1	2	
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31	...	...	...	...	...	...

APRIL

...	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	...	...	...	...

MAY

...	...	...	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	...

JUNE

...	...	...	...	...	...	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	...	...	...	...	...	...

JULY

S	M	T	W	T	F	S
...	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	...	...	...

AUGUST

...	...	...	...	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

SEPTEMBER

...	...	...	...	...	...	...
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	...	...	...	...	...

OCTOBER

...	...	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	...	...

NOVEMBER

...	...	...	...	...	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

DECEMBER

...	...	...	...	...	...	...
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	...	...	...	...

William Bertsch & Co., Phila.