

MISCELLANEOUS INFORMATION.

In this chapter has been assembled a variety of information of a general character, and such as did not naturally fall under any of the other chapter heads of the book.

It is believed that the tables of standard dimensions of brewery vessels will prove peculiarly valuable to brewers for quick reference. They were compiled from the Brewery Architects' and Engineers' Hand-Book, by E. Schmidt.

The information relating to building materials, etc., was largely taken from Kidder's Architects' and Builders' Pocket-Book.

STANDARD DIMENSIONS OF BREWERY VESSELS.

MASH-TUB.

Number of Barrels in Cellar.	Contents of Mash-Tub in Barrels.	Diameter of Mash-Tub.	Height of Shell.	Height of Cover.	Grant.		Wort Pipes.	Sparger.	Steam Inlets at Bottom.		Revolutions of Mashing Machine Per Minute.	Horse-Power Required.
					Diameter.	Length.			Number.	Diameter.			Number.	Diameter.
25	60	ft. in.	ft. in.	ft. in.	in.	ft. in.	in.	in.	in.	in.	22	2
35	80	10.0	4.6	1.9	15	3.0	4	1 1/2	48	1 1/4	19	3
50	110	11.0	4.6	2.0	15	4.0	6	1 1/2	54	2 1/2	18	4
75	130	12.0	5.0	2.0	15	4.0	6	1 1/2	60	2 1/2	16	4
100	155	12.0	6.0	2.0	15	4.6	6	2	60	2 1/2	16	6
125	185	13.0	6.0	2.6	18	4.6	6	2	60	2 1/2	15	10
150	215	14.0	6.0	2.6	18	4.6	6	2	64	2 1/2	14	12
175	235	14.0	6.6	2.6	20	6.0	8	2	64	2 1/2	14	13
200	270	15.0	6.6	2.9	20	6.0	8	2	66	2 1/2	13	14
250	330	16.0	7.0	2.9	20	6.0	8	2	66	2 1/2	12	15
300	370	17.0	7.0	3.0	20	6.0	8	2 1/2	72	3	12	16
350	395	17.6	7.0	3.0	20	6.0	8	2 1/2	72	3	11	18
400	420	18.0	7.0	3.0	20	7.0	10	2 1/2	84	3	11	20
450	465	19.0	7.0	3.3	20	7.0	10	2 1/2	84	3	10	22
500	515	20.0	7.0	3.6	20	7.0	10	2 1/2	90	3	10	25

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STANDARD DIMENSIONS OF BREWERY VESSELS. KETTLE.

Number of Barrels in Cellar.	Contents in Barrels, to Manhole.	Dimensions.				Diameter of Beer Outlet.	Steam.		Valves.			
		Largest Diameter.	Diameter at Bottom.	Height of Shell, to Bottom of Rim.	Height of Outside Bottom.		Number.	Diameter.	Diam. of Steam Outlet, One in Each Case.	Diam. of Pipe for Ring.	Diameter of Reducing Valve.	Diameter of Vacuum Valve.	Diameter of safety Valve.
25	31	ft. in.	ft. in.	ft. in.	ft. in.	in.	in.	in.	in.	in.	in.	in.
35	43.5	6.6	5.0	4.0	1.9	3	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
50	59	7.6	6.0	4.0	2.2	3	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
75	88	8.6	7.0	4.0	2.2	3	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
100	120	10.6	7.5	5.0	2.2	3	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
125	152	11.0	8.11	5.6	3.1	4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
150	177	11.6	9.4	6.6	3.2	4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
175	210	12.0	9.8	7.0	3.4	4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
200	237	12.6	10.1	7.6	3.4	4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
250	296	13.6	10.6	8.0	3.5	4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
300	360	14.6	11.0	8.5	3.5	4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
350	410	15.3	11.6	9.0	3.7	4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
400	470	16.0	12.0	10.0	3.9	4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
450	525	16.6	12.6	10.5	4.0	4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
500	580	17.0	13.0	11.3	4.3	4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
				4.6	4.6	7	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2

Number of Barrels in Cellar.	Contents in Barrels.	RICE TUB.				BAUDELLOT COOLER.									
		Diameter.	Height.	Number.	Steam Inlets.	Revolutions Per Minute.	Horse-Power Required.	Cooling Capacity in Barrels Per Hour.	Length of Ammonia and Water Pipes.	Number of Ammonia Pipes.	Number of Water Pipes.	Pan.			
25	21	ft. in.	ft. in.	in.	in.	in.	in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
35	33	5.0	4.6	4	1 1/2	30	16	8.0	4.0	10.0	1.0	1.0	1.0	1.0	1.0
50	40	6.0	5.0	4	1 1/2	25	20	10.0	4.0	12.0	1.0	1.0	1.0	1.0	1.0
75	70	8.0	6.0	4	1 1/2	18	16	12.6	4.0	16.0	1.0	1.0	1.0	1.0	1.0
100	90	8.0	6.0	4	1 1/2	13	16	12.6	4.0	12.0	1.0	1.0	1.0	1.0	1.0
125	98	9.0	6.6	4	1 1/2	16	16	12.6	4.0	12.0	1.0	1.0	1.0	1.0	1.0
150	105	9.0	7.0	4	1 1/2	16	16	12.6	4.0	12.0	1.0	1.0	1.0	1.0	1.0
175	117	9.6	7.0	4	1 1/2	15	16	12.6	4.0	12.0	1.0	1.0	1.0	1.0	1.0
200	130	10.0	7.0	4	1 1/2	15	16	12.6	4.0	12.0	1.0	1.0	1.0	1.0	1.0
250	150	10.0	8.0	6	1 1/2	14	10	18.0	4.0	18.0	1.0	1.0	1.0	1.0	1.0
300	180	11.0	8.0	6	1 1/2	13	11	72	4.0	21.0	1.0	1.0	1.0	1.0	1.0
350	215	12.0	8.0	6	1 1/2	12	12 1/2	100	4.0	23.0	1.0	1.0	1.0	1.0	1.0
400	240	12.0	9.0	6	1 1/2	12	12 1/2	120	20.0	12	24	7.6	23.0	1.6	1.6
450	283	13.0	9.0	6	1 1/2	11	16	128	20.0	12	24	7.6	19.0	1.6	1.6
500	330	14.0	9.0	6	1 1/2	10	18	144	18.0	16	32	7.6	21.0	1.6	1.6
				8	1 1/2	10	18	160	20.0	16	32	7.6	23.0	1.6	1.6

STANDARD DIMENSIONS OF BREWERY VESSELS.

HOP-JACK.										BEER TANK.		
Round.					Square.					Contents in Barrels.	Diameter.	Height.
Number of Barrels in Cellar.	Contents in Barrels.	Diameter.	Height.	Over Sprinkler.	Contents in Barrels.	Length.	Width.	Height.	ft. in.			
										ft. in.	ft. in.	ft. in.
25	30	7.6	7.0	3.0	40	5.0	5.0	5.0	26	6.0	4.0	
31	37	8.0	7.0	3.6	48	6.0	6.0	5.0	36	7.0	4.0	
50	60	9.6	8.0	4.0	65	8.0	7.0	5.0	55	8.0	4.6	
75	90	11.2	9.0	4.6	82	10.0	8.0	5.6	83	9.0	5.6	
100	120	12.8	10.0	5.0	110	12.0	10.0	6.0	112	10.0	6.0	
125	150	14.4	11.0	5.6	140	14.0	12.0	6.6	135	11.0	6.0	
150	180	16.0	12.0	6.0	165	16.0	14.0	7.0	161	12.0	6.0	
175	210	17.6	13.0	6.6	195	18.0	16.0	7.6	190	13.0	6.0	
200	240	19.2	14.0	7.0	230	20.0	18.0	8.0	220	14.0	6.0	
250	300	22.8	16.0	8.0	275	24.0	22.0	9.0	273	15.0	6.6	
300	360	26.4	18.0	9.0	315	28.0	26.0	10.0	320	16.0	6.9	
350	420	30.0	20.0	10.0	360	32.0	30.0	11.0	380	17.0	7.0	
400	480	33.6	22.0	11.0	425	38.0	36.0	12.0	423	18.0	7.0	
450	540	37.2	24.0	12.0	490	44.0	42.0	13.0	471	19.0	7.0	
500	600	40.8	26.0	13.0	520	48.0	46.0	14.0	523	20.0	7.0	

WATER-TANKS.

Round.					Square				
Number of Barrels in Cellar.	Contents in Barrels.	Diameter.	Height.	Copper Coil.	Contents in Barrels.	Side of Square.	Height.	Copper Coil.	Heating Surface in Square feet.
25	30	7.6	5.0	25	55	7.0	5.0	25	25
50	60	8.0	6.0	35	75	7.6	5.6	36	36
75	90	8.0	8.0	45	100	8.0	6.6	48	48
100	120	8.0	9.0	55	120	8.0	8.0	60	60
125	150	9.0	9.0	65	150	9.0	8.6	72	72
150	180	10.0	9.0	75	180	9.6	9.0	84	84
175	210	11.0	9.0	85	210	10.6	9.6	96	96
200	240	12.0	9.0	95	240	11.0	9.6	108	108
250	300	13.0	9.0	115	300	12.0	10.0	120	120
300	360	14.0	10.0	135	360	13.0	11.0	144	144
350	420	15.0	11.0	155	420	14.0	12.0	168	168
400	480	16.0	12.0	175	480	15.0	13.0	192	192
450	540	17.0	13.0	195	540	16.0	14.0	216	216
500	600	18.0	14.0	215	600	17.0	15.0	240	240

STANDARD DIMENSIONS OF BREWERY VESSELS.

Number of Barrels in Cellar.	Round.				Square.			
	Diameter.	Height of Shell.	Height of Conical Bottom.	Contents in Cu. Ft.	Length.	Width.	Height of Shell.	Height of Conical Bottom.
25	4.0	3.0	2.0	44	5.0	5.0	4.0	2.6
31	4.6	3.6	2.3	56	5.6	5.6	4.6	2.9
50	5.0	3.6	2.6	88	6.0	3.0	4.6	3.0
75	6.0	4.6	3.0	132	7.0	3.6	5.0	3.6
100	6.6	5.0	3.3	176	7.6	3.9	5.9	3.9
125	7.0	5.6	3.6	220	8.0	4.0	6.6	4.0
150	7.6	6.0	3.9	264	8.6	4.3	6.9	4.3
175	8.0	6.0	4.0	308	9.0	4.6	7.0	4.6
200	8.6	6.6	4.3	352	9.6	4.9	7.3	4.9
250	9.0	7.0	4.6	440	10.0	5.0	8.0	5.0
300	9.6	7.6	4.9	528	11.0	5.6	8.6	5.6
350	10.0	8.0	5.0	616	11.6	5.9	9.3	5.9
400	10.6	8.6	5.3	704	12.0	6.0	10.0	6.0
450	11.0	9.0	5.6	792	12.6	6.3	10.3	6.3
500	11.6	9.6	5.9	880	13.0	6.6	11.0	6.6

Table for Single Leather, Four-ply Rubber and Four-ply Cotton Belting, Belts not Overloaded.

1 inch wide, 800 feet per minute = 1 Horse Power.

Speed in Ft. Per Minute.	Width of Belt in Inches.											
	2	3	4	5	6	8	10	12	14	16	18	20
400	H.P.	H.P.	H.P.	H.P.	H.P.	H.P.	H.P.	H.P.	H.P.	H.P.	H.P.	H.P.
600	1½	2¼	3	4½	6	7½	9	10½	12	13½	15	16
800	2¼	3¼	4	5	6	8	10	12	14	16	18	20
1000	3	4	5	6½	8	10	12½	15	17½	20	22½	25
1200	3½	4½	6	7½	9	12	15	18	21	24	27	30
1500	3¾	5¾	7½	9½	11½	15	18½	22½	26½	30	33½	37½
1800	4½	6¾	9	11¼	13½	18	22½	27	31½	36	40½	45
2000	5	7½	10	12½	15	20	25	30	35	40	45	50
2400	6	9	12	15	18	24	30	36	42	48	54	60
2800	7	10½	14	17½	21	28	35	42	49	56	63	70
3000	7½	11¼	15	18½	22½	30	37½	45	52½	60	67½	75
3500	8½	13	17½	22	26	35	44	52½	61	70	79	88
4000	10	15	20	25	30	40	50	60	70	80	90	100
4500	11¼	17	22½	28	34	45	57	69	78	90	102	114
5000	12½	19	25	31	37½	50	62½	75	87½	100	112	125

Double leather, six-ply rubber or six-ply cotton belting will transmit 50 to 75 per cent. more power than is shown in this table. (1 inch wide, 550 feet per minute = 1 horse power).

SIZES AND DIMENSIONS OF STANDARD CORLISS ENGINES.

SIZE OF CYLIND'R.			INDICATED HORSE POWER.									FLY WHEEL.		CRANK SHAFT.			STEAM PIPES.		Approx. Shipping Weight.	
Diameter.	Stroke.	No. of Revolutions.	80 lbs. Pressure.			90 lbs. Pressure.			100 lbs. Pressure.			Diameter.	Weight in Pounds.	Diameter.	Length.	Center Shaft to back of Cyl'dr Head.	Diam. Steam.	Diam. Exhaust.	Pounds.	
			1-5 Cut-off.	1-4 Cut-off.	1-3 Cut-off.	1-5 Cut-off.	1-4 Cut-off.	1-3 Cut-off.	1-5 Cut-off.	1-4 Cut-off.	1-3 Cut-off.									
10	24	90	30	36	43	34	41	48	39	49	60	10	13	13	11	11	3	4	10700	
10	30	90	37	45	53	42	51	60	48	58	68	10	13	13	10	10	3	4	11750	
12	30	90	54	65	76	62	74	87	69	83	97	10	15	15	13	13	3	4	15550	
12	36	85	61	73	86	70	84	98	78	94	110	10	17	17	13	13	3	4	16900	
14	36	85	83	100	118	95	114	134	107	128	150	10	19	19	13	13	4	5	22300	
14	42	82	93	112	132	107	128	140	120	141	168	12	19	19	13	13	4	6	22700	
16	36	82	105	126	140	120	144	167	135	162	187	12	21	21	15	15	4	6	26610	
16	42	78	116	139	163	133	159	188	150	179	210	12	23	23	17	17	4	6	28930	
18	36	80	129	155	182	148	177	208	166	199	233	12	25	25	15	15	5	7	30000	
18	42	78	147	176	208	168	203	237	189	227	266	14	25	25	18	18	7	7	33300	
18	48	75	162	194	227	185	222	259	208	249	291	15	25	25	1	5	7	7	39570	
20	42	75	175	210	246	200	240	280	225	270	314	15	29	29	18	18	6	8	43450	
20	48	72	192	230	268	219	263	307	246	296	346	16	29	29	18	18	6	8	47612	
22	42	75	211	254	298	242	290	340	271	326	382	16	31	31	18	18	6	8	50600	
24	48	72	232	278	308	265	318	369	298	358	410	16	31	31	20	20	6	8	56220	
24	48	70	268	322	380	307	368	432	345	414	486	18	33	33	20	20	7	9	65140	
24	60	65	311	374	438	356	427	500	401	491	581	18	37	37	2	2	7	9	75740	
26	48	70	315	378	445	360	432	507	405	486	570	18	37	37	2	2	7	9	77240	
26	60	65	366	439	512	418	502	586	470	564	658	18	37	37	13	13	7	10	80000	
28	48	68	355	426	508	406	487	568	457	543	630	18	37	37	13	13	3	3	77920	
28	54	68	400	477	554	461	546	631	523	616	709	18	37	37	14	14	3	4	83000	
28	60	65	424	509	594	485	582	655	545	654	763	18	37	37	14	14	3	4	89000	
30	48	68	407	489	571	466	559	652	524	629	734	22	46	46	15	15	3	3	93000	
30	60	62	464	557	650	531	637	743	597	717	837	24	52	52	15	15	3	3	98500	
30	72	55	494	593	695	565	678	791	635	762	890	24	60	60	15	15	3	3	52000	
32	48	65	443	532	632	507	608	717	570	684	800	24	48	48	16	16	3	3	34500	
32	60	62	529	634	739	604	725	846	680	816	952	24	60	60	16	16	3	3	43900	
32	72	55	563	675	787	643	772	902	723	868	1013	24	60	60	16	16	3	3	58200	

MISCELLANEOUS INFORMATION.

MEMORANDA FOR BUILDERS.

Safe Working Loads for Masonry.

BRICKWORK IN WALLS OR PIERS.

	Tons Per Square Foot.
Red brick in lime mortar.....	7
Red brick in hydraulic lime mortar.....	5
Red brick in natural cement mortar, 1 to 3..	6
Arch or pressed brick in lime mortar.....	10
Arch or pressed brick in natural cement.....	8
Arch or pressed brick in Portland cement.....	12
Piers exceeding in height six times their least dimensions should be increased 4 inches in size for each additional 6 feet.	9
	12 1/2

STONEWORK.

Rubble walls, irregular stones.....	(Tons per square foot.)
Rubble walls, coursed, soft stone.....	3
Rubble walls, coursed, hard stone.....	2 1/2
Dimension stone, squared in cement:	5 to 16
Sandstone and limestone.....	10 to 20
Granite.....	20 to 40
Dressed stone, with 3/8-inch dressed joints in cement:	
Granite.....	60
Marble or limestone, best.....	40
Sandstone.....	30
Height of columns not to exceed eight times least diameter.	
CONCRETE.	
Portland cement, 1 to 8.....	8 to 15
Rosendale cement, 1 to 6.....	5 to 10
Hydraulic lime, best, 1 to 6.....	5
HOLLOW TILE.	
(Safe loads per square inch of effective bearing parts.)	
Hard fire-clay tiles.....	80 lbs.
Hard ordinary clay tiles.....	60 lbs.
Porous terra-cotta tiles.....	40 lbs.
MORTARS.	
(In 1/2-inch joints, 3 months old, tons per square foot.)	
Portland cement, 1 to 4.....	40
Rosendale cement, 1 to 3.....	13

Lime mortar, best	8 to 10
Best Portland cement, 1 to 2, in 1/4-inch joints for bedding iron plates	70

MEASUREMENT OF BRICKWORK.

Brickwork is generally measured by the one thousand bricks, laid in the wall, and sometimes by the cubic foot. In estimating by the one thousand, the contractor figures on what the bricks will cost delivered at the site of the building, and adds to this the cost of laying in the wall, including the cost of the mortar.

The general custom in measuring the exterior brick walls of buildings is to compute the total number of brick in the wall, and then the number of face or outside brick that will be required. The difference will be the number of common brick. The outside brick generally cost more than those used for the interior, have to be culled, and the labor in laying costs more.

In measuring brickwork, it is customary to deduct all openings for doors, windows, archways, etc.; but not for small flues, ends of joists, boxes of window frames, sills, or lintels, etc., on account of the wastage of material in clipping around or filling in such parts of the work, and the increased amount of time required.

There are different methods of computing the number of brick in any given quantity of work. Some contractors will compute the total number of cubic feet of brickwork in the building, and multiply by the number of brick contained in a cubic foot, allowing for wastage, etc. This is probably as accurate a method as can be followed. The larger number of masons, however, compute the superficial area of the walls, and multiply by the number of brick in the wall to one square foot of surface; the number, of course, depending upon the thickness of the wall.

In the eastern states, the following scale will be a fair average:

4-in. wall, or 1/2-brick.....	7 1/2 bricks per superficial foot.
8-in. wall, or 1 -brick.....	15 bricks per superficial foot.
12-in. wall, or 1 1/2-brick.....	22 1/2 bricks per superficial foot.
16-in. wall, or 2 -brick.....	30 bricks per superficial foot.
20-in. wall, or 2 1/2-brick.....	37 1/2 bricks per superficial foot.
24-in. wall, or 3 -brick.....	45 bricks per superficial foot.

In the middle and western states, the bricks are larger, and the following scale will be more correct for that section of the country:

4 1/2-in. wall, or 1 1/2-brick.....	7 bricks per superficial foot.
9 -in. wall, or 1 -brick.....	14 bricks per superficial foot.

13 -in. wall, or 1 1/2-brick.....	21 bricks per superficial foot.
18 -in. wall, or 2 -brick.....	28 bricks per superficial foot.
22 -in. wall, or 2 1/2-brick.....	35 bricks per superficial foot.

And seven bricks additional for each half-brick added to thickness.

SHINGLES.

The average width of a shingle is four inches: hence, when shingles are laid four inches to the weather, each shingle averages sixteen square inches, and 900 are required for a square of roofing.

If 4 1/2 inches to the weather, 800 will cover a square.

5 inches to the weather, 720 will cover a square.

5 1/2 inches to the weather, 655 will cover a square.

6 inches to the weather, 600 will cover a square.

This is for common gable-roofs. In hip-roofs, where the shingles are cut more or less to fit the roof, add 5 per cent to above figures.

A carpenter will carry up and lay on the roof from fifteen hundred to two thousand shingles per day, or two squares to two squares and a half of plain gable-roofing.

One thousand shingles laid four inches to the weather will require five pounds of shingle nails to fasten them on. Six pounds of fourpenny nails will lay one thousand split pine shingles.

PAINTING.

Painters' work is generally estimated by the yard, and the cost depends upon the number of coats applied, besides the quality of the work, and the material to be painted.

One coat, or priming, will take, for 100 yards of painting, 20 pounds of lead and 4 gallons of oil. Two-coat work, 40 pounds of lead and 4 gallons of oil. Three-coat, the same quantity as two coats; so that a fair estimate for 100 yards of three-coat work would be 100 pounds of lead and 16 gallons of oil.

1 gallon priming color	will cover 50 superficial yards.
1 gallon white zinc	will cover 50 superficial yards.
1 gallon white paint	will cover 44 superficial yards.
1 gallon lead color	will cover 50 superficial yards.
1 gallon black paint	will cover 50 superficial yards.
1 gallon stone color	will cover 44 superficial yards.
1 gallon yellow paint	will cover 44 superficial yards.
1 gallon blue color	will cover 45 superficial yards.
1 gallon green paint	will cover 45 superficial yards.
1 gallon bright emerald green	will cover 25 superficial yards.
1 gallon bronze green	will cover 75 superficial yards.

One pound of paint will cover about 4 superficial yards the first coat, and about 6 each additional coat. One pound of putty, for stopping, every 20 yards. One gallon of tar and 1 pound of pitch will cover 12 yards superficial the first coat, and 17 yards each additional coat.

A square yard of new brick wall requires, for the first coat of paint in oil, $\frac{3}{4}$ of a pound; and for the second, 3 pounds; and for the third, 4 pounds.

A day's work on the outside of a building is 100 yards of first coat, and 80 yards of either second or third coat. An ordinary door, including casings, will, on both sides, make 8 to 10 yards of painting, or about 5 yards to a door without the casings. An ordinary window makes about $2\frac{1}{2}$ or 3 yards.

Fifty yards of common graining is a day's work for a grainer and one man to rub in. In painting blinds of ordinary size, 12 is a fair day's work for one coat, and 9 pounds of lead and 1 gallon of oil will paint them.—(See also "Treatment of Surfaces.")

STRENGTH AND WEIGHT OF MANILA ROPE.

Diameter.	Circumference.	Weight per ft.	Breaking Load		Diameter.	Circumference.	Weight per ft.	Breaking Load.	
			lbs.	tons.				lbs.	tons.
ins.	ins.	lbs.	lbs.	tons.	ins.	ins.	lbs.	lbs.	tons.
0.239	$\frac{3}{4}$	.019	560	0.280	1.92	6	1.19	25,536	12.77
0.318	1	.033	784	0.39	2.07	6 $\frac{1}{2}$	1.39	29,120	14.56
0.477	1 $\frac{1}{2}$	.074	1,568	0.78	2.23	7	1.62	32,704	16.35
0.636	2	.132	2,733	1.36	2.39	7 $\frac{1}{2}$	1.86	36,288	18.14
0.795	2 $\frac{1}{2}$	.206	4,278	2.14	2.55	8	2.11	39,872	19.93
0.955	3	.297	6,115	3.06	2.66	8 $\frac{1}{2}$	2.67	47,400	23.52
1.11	3 $\frac{1}{2}$	.404	8,534	4.27	3.18	10	3.30	54,208	27.10
1.27	4	.528	11,558	5.78	3.50	11	3.99	61,376	30.69
1.43	4 $\frac{1}{2}$	.668	14,784	7.39	3.82	12	4.75	68,544	34.27
1.59	5	.825	18,368	9.18	4.14	13	5.58	75,712	37.86
1.75	5 $\frac{1}{2}$	.998	21,952	10.97	4.45	14	6.47	82,880	41.44

WEIGHT OF COPPER PLATES.
(Brown & Sharpe or American Gauge.)

Gauge Number.	Fraction of an Inch. (Approx.)	Weight of Plates Per Sq. Ft.		Gauge Number.	Fraction of an Inch. (Approx.)	Weight of Plates Per Sq. Ft.	
		Copper.	Brass.			Copper.	Brass.
2	1-4	11.671	11.027	9	7-64	5.184	4.898
3	15-64	10.893	9.819	11	3-32	4.111	3.844
4	13-64	9.255	8.745	12	5-64	3.661	3.459
5	3-16	8.242	7.787	14	1-16	2.903	2.743
6	11-16	7.339	6.935	17	3-64	2.050	1.937
7	9-64	6.536	6.175	20	1-32	1.442	1.368
8	1-8	5.821	5.499	26	1-64	0.722	0.682

WHITE PINE (OR COMMON SOFT PINE) BEAMS (PER INCH OF WIDTH).
Table of safe quiescent loads for horizontal rectangular beams, supported at both ends, loads uniformly distributed. For concentrated load at center divide by two. For permanent loads (such as masonry) reduce by 10 per cent.

Depth of Beam.	6		8		10		12		14		15		16		17		18		20		22		24		25	
	Ins.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
6	720	540	432	360	308	250	212	180	152	132	112	96	80	68	56	48	40	32	24	16	12	8	6	4	3	2
7	980	735	588	490	420	360	308	250	212	180	152	132	112	96	80	68	56	40	32	24	16	12	8	6	4	3
8	1,280	980	798	640	548	440	360	308	250	212	180	152	132	112	96	80	68	56	40	32	24	16	12	8	6	4
9	1,620	1,215	972	810	694	548	440	360	308	250	212	180	152	132	112	96	80	68	56	40	32	24	16	12	8	6
10	2,000	1,500	1,200	1,000	857	694	548	440	360	308	250	212	180	152	132	112	96	80	68	56	40	32	24	16	12	8
12	2,880	2,160	1,728	1,420	1,234	1,000	857	694	548	440	360	308	250	212	180	152	132	112	96	80	68	56	40	32	24	16
14	3,920	2,940	2,352	1,960	1,680	1,368	1,152	960	784	640	512	420	360	308	250	212	180	152	132	112	96	80	68	56	40	32
15	4,500	3,375	2,700	2,250	1,928	1,588	1,307	1,064	880	720	592	480	400	336	280	232	192	152	120	96	78	64	52	40	32	24
16	5,120	3,840	3,072	2,560	2,192	1,808	1,472	1,184	960	784	640	512	420	360	308	250	212	180	152	132	112	96	80	68	56	40

Loads above and to the right of heavy line will crack plastered ceilings.

WEIGHT OF LUMBER PER THOUSAND (M) FEET.
(Board Measure.)

	Dry.	Partly Seasoned.	Green.
Pine and hemlock.....	2,500 pounds.	2,700 pounds.	3,000 pounds.
Norway and yellow pine.....	3,000 pounds.	4,000 pounds.	5,000 pounds.
Oak and walnut.....	4,000 pounds.	5,000 pounds.	.....
Ash and maple.....	3,500 pounds.	4,000 pounds.	.....

WEIGHTS OF CORDWOOD.

	Pounds	Carbon		Pounds	Carbon
1 cord hickory.....	4,468	100	1 cord Canada pine..	1,870	42
1 cord hard maple.....	2,864	58	1 cord yellow oak....	2,920	61
1 cord beech.....	3,234	64	1 cord white oak.....	1,870	81
1 cord ash.....	3,449	79	1 cord Lombardy poplar	1,775	41
1 cord birch.....	2,368	49	1 cord red oak.....	3,255	70
1 cord pitch pine.....	1,903	43			

RELATIVE HARDNESS OF WOODS.

Taking shell-bark hickory as the highest standard of our forest trees, and calling that 100, other trees will compare with it for hardness as follows:

Shell-bark hickory.....	100	Yellow oak.....	60
Pignut hickory.....	96	Hard maple.....	56
White oak.....	84	White elm.....	58
White ash.....	77	Red cedar.....	56
Dogwood.....	75	Wild cherry.....	55
Scrub oak.....	73	Yellow pine.....	54
White hazel.....	72	Chestnut.....	52
Apple-tree.....	70	Yellow poplar.....	51
Red oak.....	69	Butternut.....	43
White beech.....	65	White birch.....	43
Black walnut.....	65	White pine.....	30
Black birch.....	62		

QUANTITY OF NAILS FOR DIFFERENT KINDS OF WORK.

For 1000 shingles all.....	.....	3½ to 5 pounds 4d. nails, or 3 to 3½ pounds 3d nails
1000 laths.....	.....	about 6 pounds 3d. fine
1000 feet clapboards.....	.....	about 18 pounds 6d. box
1000 feet covering boards.....	.....	about 20 pounds 8d. common
1000 feet covering boards.....	.....	about 25 pounds 10d. common
1000 feet upper floors, square edged.....	.....	about 38 pounds 10d. floor
1000 feet upper floors, square edged.....	.....	about 31 pounds 12d. floor
1000 feet upper floors, } matched and	.....	about 35 pounds 10d. floor
1000 feet upper floors, } blind-nailed }	.....	.....
1000 feet upper floors,.....	.....	about 42 pounds 12d. floor
10 feet partitions, studs or studding.....	.....	about 1 pound 10d. common
1000 feet furring, 1 by 3.....	.....	about 45 pounds 10d. common
1000 feet furring, 1 by 2.....	.....	about 65 pounds 10d. common
1000 feet pine finish.....	.....	about 30 pounds 8d. finish

WROUGHT IRON WELDED STEAM, GAS AND WATER PIPE.—TABLE OF STANDARD DIMENSIONS.

Nominal Internal Diameter, Inches.	Actual External Diameter, Inches.	Actual Internal Diameter, Inches.	Thickness of Walls, Inches.	CIRCUMFERENCE.		TRANSVERSE AREA.		Length of Pipe per Square Foot of Surface.		Length of One Cubic Foot.	Weight per Foot Length.	No of Threads per Inch of Length.	Contents of One Cubic Foot.	Weight of One Foot Length.
				External, Inches.	Internal, Inches.	External, Sq. Inch.	Internal, Sq. Inch.	External, Sq. Inch.	Internal, Sq. Inch.						External, Feet.	Internal, Feet.	Lbs.	Lbs.
1	1.315	1.048	.134	4.131	3.292	1.358	1.104	2.904	3.645	166.9	1.608	11½	.0008	.005
1½	1.66	1.385	.14	5.015	4.385	1.496	1.197	2.705	3.726	166.23	2.244	11½	.0008	.005
2	2.375	2.071	.145	7.599	6.081	2.308	1.797	2.01	4.066	166.8	2.978	11½	.0007	.004
2½	2.875	2.468	.15	9.032	7.753	3.036	2.074	1.608	4.848	167.2	3.609	11½	.0007	.004
3	3.5	3.087	.17	10.986	9.688	4.492	2.788	1.828	5.797	168.1	4.739	11½	.0006	.003
3½	4.1	3.548	.18	12.986	11.148	6.031	3.824	1.955	6.794	169.1	6.001	8	.0008	.004
4	4.5	4.028	.187	15.004	12.648	7.687	5.087	2.075	7.949	170.4	7.588	8	.0008	.004
4½	5.0	4.508	.194	17.058	14.189	9.461	6.574	2.173	9.248	171.8	9.021	8	.0008	.004
5	5.568	5.045	.20	19.147	15.849	11.360	8.216	2.248	10.687	173.2	10.602	8	.0008	.004
6	6.632	6.065	.21	21.268	17.648	13.398	9.986	2.348	12.264	174.7	12.348	8	.0008	.004
7	7.832	7.088	.22	23.518	19.584	15.664	11.898	2.478	13.984	176.2	14.184	8	.0008	.004
8	9.232	8.387	.23	25.998	21.668	18.004	13.961	2.628	15.848	177.7	16.184	8	.0008	.004
9	10.832	9.887	.24	28.618	23.918	20.278	16.091	2.798	17.864	179.2	18.348	8	.0008	.004
10	12.632	11.618	.25	31.368	26.348	22.778	18.391	2.988	19.948	180.7	20.684	8	.0008	.004
11	14.632	13.218	.26	34.348	28.968	25.464	20.841	3.198	22.304	182.2	23.204	8	.0008	.004
12	16.832	15.018	.27	37.568	31.848	28.398	23.461	3.438	24.948	183.7	25.948	8	.0008	.004
13	19.232	17.018	.28	40.948	35.008	31.004	26.101	3.708	27.884	185.2	28.984	8	.0008	.004
14	21.832	19.218	.29	44.588	38.468	33.898	29.001	3.998	31.148	186.7	32.304	8	.0008	.004
15	24.632	21.018	.30	48.498	42.168	37.064	32.261	4.318	34.764	188.2	35.984	8	.0008	.004
16	52.23	47.818	.31	52.668	46.118	40.664	35.801	4.668	38.748	189.7	39.948	8	.0008	.004
18	61.23	56.518	.32	61.118	54.468	45.664	40.001	5.048	43.104	191.2	44.184	8	.0008	.004
20	71.23	66.118	.33	70.068	63.218	50.004	44.778	5.448	47.948	192.7	48.704	8	.0008	.004
22	82.23	76.618	.34	79.518	72.468	55.468	49.898	5.868	53.184	194.2	53.548	8	.0008	.004
24	94.23	88.118	.35	89.468	82.218	60.004	54.778	6.308	58.948	195.7	58.804	8	.0008	.004
26	107.23	100.618	.36	99.918	92.468	65.664	60.398	6.768	65.204	197.2	64.464	8	.0008	.004
28	121.23	114.118	.37	110.868	103.218	71.664	67.001	7.248	72.064	198.7	70.624	8	.0008	.004
30	136.23	128.618	.38	122.318	114.468	82.898	74.001	7.748	79.524	199.2	77.384	8	.0008	.004
32	152.23	144.118	.39	134.268	126.218	95.468	81.301	8.268	87.684	200.7	84.744	8	.0008	.004
34	169.23	160.618	.40	146.718	138.468	109.664	89.801	8.808	96.448	202.2	92.104	8	.0008	.004
36	187.23	178.118	.41	160.668	151.218	125.664	99.401	9.368	105.804	203.7	99.564	8	.0008	.004
38	206.23	195.618	.42	175.118	165.068	143.468	109.301	9.948	115.864	205.2	107.124	8	.0008	.004
40	226.23	214.118	.43	190.068	179.918	163.664	120.601	10.548	126.524	206.7	115.784	8	.0008	.004
42	247.23	234.118	.44	206.518	195.768	184.664	133.401	11.168	137.884	208.2	125.444	8	.0008	.004
44	269.23	255.618	.45	224.468	212.718	208.664	147.701	11.808	149.944	209.7	136.204	8	.0008	.004
46	292.23	278.118	.46	243.918	230.668	234.664	163.601	12.468	162.704	211.2	147.964	8	.0008	.004
48	316.23	302.618	.47	264.868	249.618	262.664	180.101	13.148	176.164	212.7	160.824	8	.0008	.004
50	341.23	328.118	.48	287.318	270.068	292.664	198.301	13.848	190.324	214.2	174.784	8	.0008	.004
52	367.23	354.618	.49	311.268	292.018	325.664	218.401	14.568	205.284	215.7	189.844	8	.0008	.004
54	394.23	381.118	.50	336.718	315.468	361.664	240.601	15.308	221.044	217.2	206.004	8	.0008	.004
56	422.23	408.618	.51	363.668	340.918	400.664	265.101	16.068	237.604	218.7	223.264	8	.0008	.004
58	451.23	438.118	.52	392.118	368.368	442.664	292.101	16.848	254.964	220.2	241.724	8	.0008	.004
60	481.23	468.618	.53	422.068	397.818	488.664	320.601	17.648	273.124	221.7	261.384	8	.0008	.004
62	512.23	500.118	.54	453.518	429.268	538.664	351.601	18.468	292.184	223.2	281.444	8	.0008	.004
64	544.23	532.618	.55	486.468	462.718	592.664	384.101	19.308	312.144	224.7	302.804	8	.0008	.004
66	577.23	566.118	.56	520.918	498.168	650.664	418.101	20.168	333.004	226.2	324.664	8	.0008	.004
68	611.23	601.618	.57	556.868	535.618	712.664	455.601	21.048	354.864	227.7	347.524	8	.0008	.004
70	646.23	638.118	.58	594.318	575.068	779.664	495.601	21.948	377.724	229.2	371.384	8	.0008	.004
72	682.23	675.618	.59	633.268	616.518	850.664	538.101	22.868	401.684	230.7	396.244	8	.0008	.004
74	719.23	714.118	.60	673.718	659.968	925.664	583.101	23.808	426.644	232.2	422.104	8	.0008	.004
76	757.23	754.618	.61	715.668	705.418	1004.664	630.601	24.768	452.604	233.7	449.064	8	.0008	.004
78	796.23	796.118	.62	759.118	753.868	1097.664	680.601	25.748	479.564	235.2	477.024	8	.0008	.004
80	836.23	838.618	.63	804.168	804.318	1204.664	733.101	26.748	507.524	236.7	506.984	8	.0008	.004
82	877.23	881.118	.64	850.718	856.768	1325.664	788.101	27.768	536.484	238.2	537.944	8	.0008	.004
84	919.23	925.618	.65	898.768	912.218	1460.664	845.101	28.808	566.444	239.7	569.904	8	.0008	.004
86	962.23	968.118	.66	948.268	969.668	1609.664	904.101	29.868	597.404	241.2	602.864	8	.0008	.004
88	1006.23	1016.618	.67	1000.268	1029.118	1772.664	965.101	30.948	629.364	242.7	635.824	8	.0008	.004
9														

WROUGHT IRON WELDED EXTRA STRONG PIPE.—TABLE OF STANDARD DIMENSIONS.

DIAMETER.			Thick- ness.	Nearest Wire Gauge.	CIRCUMFERENCE.		TRANSVERSE AREAS.			Length of Pipe per Square Foot of		Nominal Weight per Foot.
Nominal In- ternal.	Actual Ex- ternal.	Actual In- ternal.			External.	Internal.	External.	Internal.	Metal.	External Surface.	Internal Surface.		Pounds.
Inches.	Inches.	Inches.	Inches.	No.	Inches.	Inches.	Sq. Inches.	Sq. Inches.	Sq. Inches.	Feet.	Feet.	Pounds.
1	.405	.205	.1	124	1.272	.644	.129	.088	.086	9.433	18.632	.29
1 1/4	.54	.294	.128	11	1.696	.924	.229	.068	.161	7.075	12.986	.54
1 1/2	.675	.421	.127	10 1/2	2.121	1.323	.358	.139	.219	5.657	9.07	.74
2	.84	.542	.149	9	2.639	1.708	.554	.281	.333	4.547	7.046	1.09
2 1/4	1.05 1/2	.736	.157	8 1/2	3.299	2.312	.866	.452	.414	3.637	5.109	1.30
3	1.315	.951	.182	7	4.131	2.983	1.358	.71	.648	2.904	4.016	2.17
3 1/4	1.66	1.272	.194	6 1/2	5.215	3.996	2.164	1.271	.893	2.301	3.003	3.
3 1/2	1.9	1.494	.203	6	5.969	4.694	2.835	1.753	1.082	2.01	2.550	3.63
4	2.375	1.933	.221	5	7.461	6.073	4.43	2.935	1.495	1.608	1.975	5.02
4 1/4	2.875	2.315	.28	2	9.083	7.273	6.492	4.209	2.283	1.328	1.649	7.67
5	3.5	2.892	.304	1	10.996	9.085	9.621	6.569	3.052	1.091	1.928	10.25
5 1/4	4.	3.858	.321	0	12.566	10.549	12.566	8.856	3.71	.955	1.137	12.47
5 1/2	4.5	4.818	.341	0	14.137	11.995	15.904	11.449	4.455	.840	1.	14.97
6	5.563	4.818	.375	00	17.477	15.120	24.306	18.198	6.12	.687	.793	20.54
6 1/2	6.625	5.75	.487	000	20.813	18.064	34.472	25.967	8.505	.57	.664	28.58

DOUBLE EXTRA STRONG PIPE.

Nominal In- ternal.	Actual Ex- ternal.	Actual In- ternal.	Thick- ness.	Nearest Wire Gauge.	CIRCUMFERENCE.		TRANSVERSE AREAS.			Length of Pipe per Square Foot of		Nominal Weight per Foot.
					External.	Internal.	External.	Internal.	Metal.	External Surface.	Internal Surface.		Pounds.
Inches.	Inches.	Inches.	Inches.	No.	Inches.	Inches.	Sq. Inches.	Sq. Inches.	Sq. Inches.	Feet.	Feet.	Pounds.
1	.84	.244	.298	1	2.639	.766	.554	.047	.507	4.547	15.667	1.7
1 1/4	1.05	.422	.314	1	3.299	1.826	.866	.139	.727	3.637	9.040	2.44
1 1/2	1.315	.587	.364	00	4.131	1.844	1.358	.271	1.087	2.904	6.508	3.65
2	1.66	.885	.388	00	5.215	2.78	2.164	.615	1.549	2.304	4.317	5.2
2 1/4	1.9	1.088	.406	000	5.969	3.418	2.835	.93	1.905	2.01	3.511	6.4
2 1/2	2.375	1.491	.442	0000	7.461	4.684	4.43	1.744	2.686	1.608	2.561	9.02
3	2.875	1.755	.560	0	9.032	5.518	6.492	2.419	4.073	1.328	2.176	13.68
3 1/4	3.5	2.284	.608	0	10.996	7.175	9.621	4.097	5.524	1.091	1.672	18.56
3 1/2	4.	3.716	.642	0	12.566	8.553	12.566	5.794	6.772	.955	1.406	22.75
4	4.5	4.063	.682	0	14.137	9.852	15.904	7.724	8.18	.840	1.217	27.48
4 1/4	5.563	4.818	.75	0	17.477	12.764	24.306	12.965	11.34	.687	.940	38.12
4 1/2	6.625	4.875	.875	0	20.813	15.315	34.472	18.666	15.896	.577	.784	53.11

SEAMLESS DRAWN BRASS AND COPPER TUBES.
(Pounds per Lineal Foot.)

The upper figures denote copper, the lower brass, tubes.

Thickness, Decimal of an Inch.	Frac- tion of an Inch (Close- ly)	Gauge Num- ber.	Outside Diameters in Inches. Brown & Sharpe or American Gauge.									
			1/2	3/4	1	1 1/4	1 1/2					
0.081	5-64	12	0.41	0.65	0.80	1.14	1.38	1.86	2.37	2.86	3.84	4.52
0.064	1-16	14	0.34	0.54	0.69	0.88	1.08	1.43	1.80	2.23	3.06	3.88
0.051	.....	16	0.27	0.43	0.59	0.73	0.90	1.20	1.51	1.89	2.44	3.04
0.045	3-64	17	0.25	0.39	0.52	0.66	0.80	1.07	1.34	1.69	2.16	2.72
0.040	.....	18	0.22	0.35	0.47	0.59	0.71	0.96	1.20	1.45	1.89	2.43
0.036	.....	19	0.20	0.31	0.42	0.52	0.64	0.85	1.07	1.28	1.72	2.15
0.032	1-32	20	0.18	0.27	0.38	0.47	0.57	0.77	0.96	1.14	1.51	1.92
0.285	.....	21	0.16	0.25	0.34	0.42	0.50	0.60	0.68	0.85	1.02	1.36
0.033	.....	22	0.146	0.226	0.30	0.37	0.45	0.54	0.61	0.77	0.91	1.22
	.....		0.139	0.211	0.285	0.358	0.430	0.58	0.73	0.87	1.16	.....

HORSEPOWER OF BOILERS.

Thirty pounds of water evaporated at 70 pounds steam pressure per hour from feed water at 100° = 1 horsepower. In calculating horsepower of steam boilers, consider for:
Tubular boilers 15 square feet of heating surface equivalent to one horsepower.
Fire boilers 12 square feet of heating surface = 1 horsepower.
Cylinder boilers 10 square feet of heating surface = 1 horsepower.

HORSEPOWER OF BELTING.

A simple rule of ascertaining transmitting power of belting, without first computing speed per minute that it travels, is as follows: Multiply diameter of pulley in inches by its number of revolutions per minute, and this product by width of the belt in inches; divide this product by 3,300 for single belting, or by 2,100 for double belting, and the quotient will be the amount of horsepower that can be safely transmitted.

TEMPERATURE OF FIRE.

By reference to the table of fuels (p. 777), it will be seen that the temperature of the fire is nearly the same for all kinds of combustibles under similar conditions. If the temperature is known, the conditions of combustion may be inferred. The following table, from M. Pouillet, will enable the temperature to be judged by the appearance of the fire:

Appearance.	Temperature F.	Appearance.	Temperature F.
Red, just visible.....	977°	Orange, deep	2010°
Red, dull	1290°	Orange, clear	2190°
Red, cherry, dull	1470°	White heat	2370°
Red, cherry, full	1650°	White, bright	2550°
Red, cherry, clear	1830°	White, dazzling	2730°

To determine temperature by fusion of metals, etc.:

Substance.	Temperature F.	Metal.	Temperature F.	Metal.	Temperature F.
Tallow	91°	Bismuth	518°	Silver, pure....	1830°
Spermaceti	110°	Lead	630°	Gold coin	2156°
Wax, white	154°	Zinc	793°	Iron, cast, med.	2010°
Sulphur	239°	Antimony	810°	Steel	2550°
Tin	455°	Brass	1650°	Wrought-iron..	2910°

IRON PIPE SIZE BRASS TUBES.

Made to correspond with Iron Tubes, and to fit Iron Tube Fittings.

List of Sizes, Lengths, Etc.

Outside Diameter.	Same as Iron Size.	Weight Per Foot.	
		Brass.	Copper.
13-32 inch.	1-8 inch.	.30 pounds.	.31 pounds.
9-16 "	1-4 "	.43 "	.45 "
11-16 "	3-8 "	.58 "	.61 "
13-16 "	1-2 "	.80 "	.84 "
1 1-16 "	3-4 "	1.17 "	1.23 "
1 5-16 "	1 "	1.67 "	1.75 "
1 5-8 "	1 1-4 "	2.42 "	2.54 "
1 7-8 "	1 1-2 "	2.92 "	3.07 "
2 3-8 "	2 "	4.17 "	4.38 "
2 7-8 "	2 1-2 "	5. "	5.25 "
3 1-2 "	3 "	8. "	8.40 "
4 "	3 1-2 "	10. "	10.50 "
4 1-2 "	4 "	12. "	12.00 "

MEASUREMENTS AND WEIGHTS OF MERCHANDISE AS USUALLY STORED IN WAREHOUSES.

MATERIAL.	MEASUREMENTS.		WEIGHTS.		
	Floor space.	Cubic feet.	Gross.	Per square ft.	Per cubic ft.
COTTON, ETC.					
Bale	8.1	44.2	515	64	12
Bale, compressed	4.1	21.6	550	134	25
Bale, jute	2.4	9.9	300	125	30
COTTON GOODS.					
Jute bagging	1.4	5.3	100	70	24
GRAIN.					
Wheat in bags	4.2	4.2	165	39	39
Wheat in bulk .....	.....	.....	.....	.....	44
Wheat in bulk, mean .....	.....	.....	.....	.....	39
Barrels flour on side	4.1	5.4	218	53	40
Barrels flour on end	3.1	7.1	218	70	31
Corn in bags	3.6	3.6	112	31	31
Cornumeal in barrels	3.7	5.9	218	59	37
Bale in bags	3.3	3.6	96	29	27
Oats in bags	5.0	20.0	284	57	24
Hay, Dederick compressed..	1.75	5.25	125	72	24
Straw, Dederick compressed..	1.75	5.25	100	57	19
Tow, Dederick compressed..	1.75	5.25	150	86	29
Excelsior, Dederick compr'd	1.75	5.25	100	57	19
DYE STUFFS, ETC.					
Hogshead bleaching powder	11.8	39.2	1200	102	31
Hogshead soda ash	10.8	29.2	1800	167	62
Barrel starch	3.0	19.5	250	83	23
Barrel lime	3.6	4.5	225	63	50
Barrel cement, American ..	3.8	5.5	325	86	59
Barrel plaster	3.7	6.1	325	88	53
Barrel rosin	3.0	9.0	430	143	48
Rope .....	.....	.....	.....	.....	42
MISCELLANEOUS.					
Bale leather	7.3	12.2	190	26	16
Barrel granulated sugar	3.0	7.5	317	106	42

TABLE GIVING THE PRESSURE IN POUNDS DUE TO ANY CERTAIN HEIGHT OF A COLUMN OF WATER.

Head in Feet.	Pressure in Pounds Per Square In.	Head in Feet.	Pressure in Pounds Per Square In.	Head in Feet.	Pressure in Pounds Per Square In.	Head in Feet.	Pressure in Pounds Per Square In.
1	0.43	20	8.66	55	23.83	90	38.90
2	0.88	25	10.83	60	25.90	95	41.07
3	1.30	30	12.	65	28.06	100	43.33
4	1.74	35	15.16	70	30.55	125	54.17
5	2.18	40	17.33	75	32.72	150	65.
10	4.33	45	19.50	80	34.66	175	76.05
15	6.50	50	21.66	85	36.83	200	86.67

1 lb. pressure per square inch is equivalent to a head of water of 2.3093 feet, or 27.71 inches.

14.7 lbs. pressure per square inch, or 1 atmosphere, is equivalent to a head of water of 33.947 feet.

14.7 lbs. pressure per square inch, or 1 atmosphere, is equivalent to a head of water of 33.947 feet, or 10.347 meters.

COMPARATIVE TABLE OF BEAUME DEGREES AND
SPECIFIC GRAVITY ACCORDING TO
BOURGOUNNON.

FOR LIQUIDS HEAVIER THAN WATER.

Deg. B.	Sp. Gr.	Deg. B.	Sp. Gr.	Deg. B.	Sp. Gr.	Deg. B.	Sp. Gr.
0	1.0000	19	1.1516	38	1.3574	57	1.6527
1	1.0069	20	1.1608	39	1.3703	58	1.6719
2	1.0140	21	1.1702	40	1.3834	59	1.6915
3	1.0212	22	1.1798	41	1.3968	60	1.7115
4	1.0285	23	1.1895	42	1.4104	61	1.7321
5	1.0358	24	1.1994	43	1.4244	62	1.7531
6	1.0433	25	1.2095	44	1.4386	63	1.7748
7	1.0509	26	1.2197	45	1.4530	64	1.7968
8	1.0586	27	1.2301	46	1.4678	65	1.8194
9	1.0665	28	1.2407	47	1.4829	66	1.8427
10	1.0744	29	1.2514	48	1.4983	67	1.8665
11	1.0825	30	1.2624	49	1.5140	68	1.8909
12	1.0906	31	1.2735	50	1.5301	69	1.9161
13	1.0989	32	1.2849	51	1.5465	70	1.9418
14	1.1074	33	1.2964	52	1.5632	71	1.9683
15	1.1159	34	1.3081	53	1.5802	72	1.9955
16	1.1246	35	1.3201	54	1.5978	73	2.0235
17	1.1335	36	1.3323	55	1.6157	74	2.0523
18	1.1424	37	1.3447	56	1.6340	75	2.0819

FOR LIQUIDS LIGHTER THAN WATER.

Deg. B.	Sp. Gr.	Deg. B.	Sp. Gr.	Deg. B.	Sp. Gr.	Deg. B.	Sp. Gr.
10	1.000	23	0.918	36	0.849	49	0.789
11	0.993	24	0.913	37	0.844	50	0.785
12	0.986	25	0.907	38	0.839	51	0.781
13	0.980	26	0.901	39	0.834	52	0.777
14	0.973	27	0.896	40	0.829	53	0.773
15	0.967	28	0.890	41	0.825	54	0.768
16	0.960	29	0.885	42	0.820	55	0.764
17	0.954	30	0.880	43	0.816	56	0.760
18	0.948	31	0.874	44	0.811	57	0.757
19	0.942	32	0.869	45	0.807	58	0.753
20	0.936	33	0.864	46	0.802	59	0.749
21	0.930	34	0.859	47	0.798	60	0.745
22	0.924	35	0.854	48	0.794		

BIBLIOGRAPHY.

Under this head has been collected the titles of the original contributions to the science and practice of brewing, published in the United States, with the names of the publications in which they appeared. In so far as this list may be incomplete, the respective files were not accessible. The writers on topics concerning brewing, and the publishers of the periodicals devoted to the brewing trade were invited to favor the editors with lists of articles written or published by them, and in most cases the request was fulfilled with the greatest kindness, for which the editors take this opportunity of thanking their correspondents. An effort has been made to give a complete list regardless of prevailing divergences of opinion as to the correctness of various theories or the expediency of practical suggestions advanced by the different writers.

Abbreviations:

A. B. R.,	American Brewers' Review	Brm.,	Der Braumeister.
Am. Br.,	American Brewer.	Ice & R.,	Ice and Refrigeration.
Am. Ch. R.,	American Chemical Review	Pr. Bb.,	Der praktische Bierbrauer
Br. J.,	Brewers' Journal.	W. Br.,	Western Brewer.
Br. & M.,	Brewer and Maltster.		

*Roman numerals indicate volume.
Arabic numerals indicate page.*

HISTORICAL AND MISCELLANEOUS.

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