TABLES
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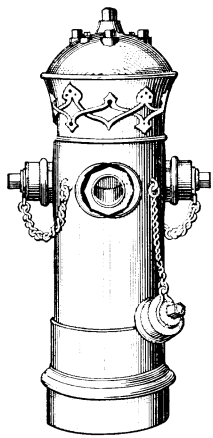

TABLES
USEFUL FOR MACHINISTS.

The speeds required for machining advantageously the different materials, according to the different diameters. may be termed "surface speeds." Roughly speaking, the surface speeds for the different materials vary in comparatively narrow limits. We may assume the following speeds for the following:

TABLE OF SURFACE SPEEDS.

Cast iron.....30 to 45 feet per minute.
Steel.....20 to 25 feet per minute.
Wrought iron....30 feet per minute.
Brass.....40 to 60 feet per minute.

For cast iron as found in Europe, we may assume 20 to 35 feet per minute. This is owing to the fact that European iron is considerably harder.

SPEED OF SAWS, ETC.

Band saws for hot iron and steel run at about 200 to 300 feet per minute. Plain soft iron discs run at a rim velocity of 12,000 feet per minute, and are sometimes used to cut off ends of steel rails, jets of water playing on the circumference of the saw.

Average Cutting Speed for Drills.

The following table represents the most approved practice in rate of cutting speed for drills ranging from $\frac{1}{16}$ inch to 2 inches in diameter.

Diameter of Drills	Speed on Steel	Speed on Cast Iron	Speed on Brass	Diameter of Drills	Speed on Steel	Speed on Cast Iron	Speed on Brass
$\frac{1}{16}$	1,712	2,383	3,544	$1\frac{1}{16}$	72	106	180
$\frac{1}{8}$	855	1,191	1,772	$1\frac{1}{8}$	68	102	170
$\frac{3}{16}$	571	794	1,181	$1\frac{3}{16}$	64	97	161
$\frac{1}{4}$	397	565	855	$1\frac{1}{4}$	58	89	150
$\frac{5}{16}$	318	452	684	$1\frac{5}{16}$	55	84	143
$\frac{3}{8}$	265	377	570	$1\frac{3}{8}$	53	81	136
$\frac{7}{16}$	227	323	489	$1\frac{7}{16}$	50	77	130
$\frac{1}{2}$	183	267	412	$1\frac{1}{2}$	46	74	122
$\frac{9}{16}$	163	238	367	$1\frac{9}{16}$	44	71	117
$\frac{5}{8}$	147	214	330	$1\frac{5}{8}$	40	66	113
$\frac{11}{16}$	133	194	300	$1\frac{11}{16}$	38	63	109
$\frac{3}{4}$	112	168	265	$1\frac{3}{4}$	37	61	105
$\frac{13}{16}$	103	155	244	$1\frac{13}{16}$	36	59	101
$\frac{7}{8}$	96	144	227	$1\frac{7}{8}$	33	55	98
$\frac{15}{16}$	89	134	212	$1\frac{15}{16}$	32	53	95
1	76	115	191	2	31	51	92

Size of Drills for U. S. Standard Taps.

Diam. of Tap	Threads per inch	Diam. of Drill	Diam. of Tap	Threads per inch	Diam. of Drill	Diam. of Tap	Threads per inch	Diam. of Drill
$\frac{1}{4}$	20	$\frac{3}{16}$	$\frac{7}{8}$	9	$\frac{3}{4}$	$1\frac{3}{4}$	5	$1\frac{1}{2}$
$\frac{5}{16}$	18	$\frac{1}{4}$	1	8	$\frac{7}{8}$	$1\frac{7}{8}$	5	$1\frac{5}{8}$
$\frac{3}{8}$	16	$\frac{5}{16}$	$1\frac{1}{8}$	7	$\frac{31}{32}$	2	$4\frac{1}{2}$	$1\frac{3}{4}$
$\frac{7}{16}$	14	$\frac{23}{64}$	$1\frac{1}{4}$	7	$1\frac{1}{32}$	$2\frac{1}{4}$	$4\frac{1}{2}$	$1\frac{31}{32}$
$\frac{1}{2}$	13	$\frac{13}{32}$	$1\frac{3}{8}$	6	$1\frac{3}{16}$	$2\frac{1}{2}$	4	$2\frac{3}{16}$
$\frac{5}{8}$	11	$\frac{17}{32}$	$1\frac{1}{2}$	6	$1\frac{5}{32}$	$2\frac{3}{4}$	4	$2\frac{7}{16}$
$\frac{3}{4}$	10	$\frac{5}{8}$	$1\frac{5}{8}$	$5\frac{1}{2}$	$1\frac{13}{32}$	3	$3\frac{1}{2}$	$2\frac{5}{8}$

TABLE OF EMERY WHEEL SPEEDS.

Diam. Wheel.	Rev. per Minute for Surface Speed of 4,000 ft.	Rev. per Minute for Surface Speed of 5,000 ft.	Rev. per Minute for Surface Speed of 6,000 ft.
1 in.	15,279	19,090	22,918
2 "	7,639	9,549	11,459
3 "	5,093	6,366	7,639
4 "	3,820	4,775	5,370
5 "	3,056	3,820	4,584
6 "	2,546	3,183	3,820
7 "	2,183	2,728	3,274
8 "	1,910	2,387	2,865
10 "	1,528	1,910	2,292
12 "	1,273	1,592	1,910
14 "	1,091	1,364	1,637
16 "	955	1,194	1,432
18 "	849	1,061	1,273
20 "	764	955	1,146
22 "	694	868	1,042
24 "	637	796	955
30 "	509	637	764
36 "	424	531	637

The above table designates the number of revolutions per minute for specific diameters of emery wheels to cause them to run at the respective periphery rates of 4,000, 5,600 and 6,000 feet per minute.

The medium of 5,000 feet is usually employed in ordinary work, but in special cases it is sometimes desirable to run them at a lower or higher rate, according to requirements.

The stress on the wheel at 4,000 feet periphery speed per minute is 48 lbs. per square inch; at 5,000 feet, 75 lbs.; at 6,000 feet, 108 lbs.

U. S. Standard Screw Threads.

Nominal Diameter of Screw.		Number of Threads per inch.	Diameter of Tap at Root of Thread.		Size of Tap Drill, giving a Clearance of 1/8 the Height of the Original Thread Triangle.		Area at Root of Thread.	Safe Load on Threaded Bolt on basis of 6,000 lbs. Stress per sq. in. of Section at Root of Thread.
Inches	Inches		Inches	Nearest 64ths	Inches	Nearest 64ths	Sq. In.	Pounds
1/4	.250	20	.185	3/16 —	.196	13/64 —	.027	162
5/16	.312	18	.240	15/64 +	.252	1/4 +	.045	270
3/8	.375	16	.294	19/64 —	.307	5/16 —	.068	408
7/16	.437	14	.345	11/32 +	.360	23/64 +	.093	558
1/2	.500	13	.400	13/32 —	.417	27/64 —	.126	756
9/16	.562	12	.454	29/64 +	.472	15/32 +	.162	997
5/8	.625	11	.507	1/2 +	.527	17/32 —	.202	1210
11/16	.687	11	.569	9/16 +	.589	19/32 —	.254	1520
3/4	.750	10	.620	5/8 —	.642	41/64 +	.302	1810
13/16	.812	10	.683	11/16 —	.704	45/64 +	.366	2190
7/8	.875	9	.731	47/64 —	.755	3/4 +	.420	2520
15/16	.937	9	.793	51/64 —	.817	13/16 +	.494	2960
1	1.000	8	.838	27/32 —	.865	55/64 +	.551	3300
1 1/16	1.062	8	.900	29/32 —	.927	59/64 +	.636	3810
1 1/8	1.125	7	.939	15/16 +	.970	31/32 +	.694	4160
1 3/16	1.187	7	1.002	1 +	1.032	1 1/32 +	.788	4720
1 1/4	1.250	7	1.064	1 1/16 +	1.095	1 3/32 +	.893	5350
1 3/8	1.375	6	1.158	1 5/32 +	1.215	1 7/32 —	1.057	6340
1 1/2	1.500	6	1.283	1 9/32 +	1.345	1 11/32 +	1.295	7770
1 5/8	1.625	5 1/2	1.389	1 25/64 —	1.428	1 27/64 +	1.515	9090
1 3/4	1.750	5	1.490	1 31/64 +	1.534	1 17/32 +	1.746	10470
1 7/8	1.875	5	1.615	1 39/64 —	1.659	1 21/32 +	2.051	12300
2	2.000	4 1/2	1.711	1 23/32 —	1.760	1 49/64 —	2 302	13800
2 1/4	2 250	4 1/2	1.961	1 61/64 +	2.010	2 1/64 —	3.023	18100
2 1/2	2.500	4	2.175	2 11/64 +	2.230	2 7/64 —	3.719	22300
2 3/4	2.750	4	2.425	2 27/64 +	2.480	2 31/64 —	4.620	27700
3	3.000	3 1/2	2.629	2 5/8 +	2.691	2 11/16 +	5.428	32500
3 1/4	3.250	3 1/2	2.879	2 7/8 +	2.941	2 15/16 +	6.510	39000
3 1/2	3.500	3 1/4	3.100	3 3/32 +	3.167	3 11/64 —	7.548	45300
3 3/4	3.750	3	3.317	3 5/16 +	3.389	3 25/64 —	8.641	51800
4	4.000	3	3.567	3 9/16 +	3.639	3 41/64 —	9.063	59700

Machinery, New York.

Standard Sizes of Wrought Iron Welded Pipe.

Inside diameter, nom.	Actual outside Diameter.	Thickness.	Actual inside Diameter.	External circumference.	Internal circumference.	Length of pipe per square foot of outside surface.	Length of pipe per square foot of inside surface.	External area.	Actual internal area.	Length of pipe containing one cubic foot.	Weight per foot of length.	No. of threads per inch of screw.	Length perfect screw.
⅛	.405	.068	0.269	1.272	0.848	9.440	14.15	.129	.0572	2500.	.243	27	0.19
¼	.54	.088	0.364	1.696	1.144	7.075	10.50	.229	.1041	1385.	.422	18	0.29
⅜	.675	.091	0.493	2.121	1 552	5.657	7.67	.358	.1916	751 5	.561	18	0.30
½	.840	.109	0.622	2.652	1.957	4.502	6.13	.554	.3048	472 4	.845	14	0.39
¾	1.050	.113	0.824	3.299	2.589	3.637	4.635	.866	.5333	270 0	1.126	14	0.40
1	1.315	.134	1.047	4.134	3.292	2.903	3.679	1.357	8627	166 9	1.670	11½	0.51
1¼	1.660	.140	1.38	5.215	4.335	2.301	2.758	2.164	1.496	96.25	2.258	11½	0 54
1½	1.90	.145	1.61	5.969	5.061	2.010	2.371	2.835	2.038	70.65	2.694	11½	0.55
2	2.375	.154	2.067	7.461	6.494	1.611	1.848	4.430	3.355	42.36	3.667	11½	0.58
2½	2.875	.204	2.467	9.032	7.754	1.328	1.547	6.491	4.783	30.11	5.773	8	0.89
3	3.50	.217	3.066	10.996	9.636	1.091	1.245	9.621	7.388	19.40	7.547	8	0.95
3½	4.0	.226	3.548	12.566	11.146	.955	1.077	12.566	9.837	14.56	9 055	8	1.00
4	4 50	.237	4.026	14.137	12.648	.849	0.949	15.904	12.730	11.31	10.728	8	1.05
4½	5.0	.247	4.506	15.708	14.153	.765	0.848	19.635	15.939	9.03	12.492	8	1.10
5	5.563	.259	5.045	17.475	15.849	.629	0.757	24.299	19 990	7.20	14.564	8	1.16
6	6.625	.280	6.065	20.813	19.054	.577	0.630	34.471	28.889	4.98	18.767	8	1.26
7	7.625	.301	7.023	23.954	22.063	.505	0.544	45.663	38.737	3.72	23.410	8	1.36
8	8.625	.322	7.981	27.096	25.076	.444	0.478	58.426	50.039	2.88	28.348	8	1.46
9	9.688	.344	9.00	30.433	28.277	.394	0.425	73.715	63.633	2.26	34.677	8	1.57
10	10.750	.366	10 018	33.772	31.475	.355	0.381	90.762	78.838	1.80	40.641	8	1.68

"Any shop which makes it a fixed rule to discharge any man for any act, not distinctly malicious or revealing incurable habits of carelessness or negligence, will soon lose its best men, and the average of skill and reliability in its force cannot fail to deteriorate.

"It is just the same the other way, too. A man shouldn't be in too much of a hurry about discharging his boss. His job calls for skill as much as any other, and the skill that is required to do a first-class job of bossing is just as rare, and takes as much sifting and training to produce, as any other.

"To retain an employer it is necessary sometimes to overlook some of his shortcomings. As he learns by experience that it will not do to discharge every man whenever he proves that he is not quite perfect, so it is well to remember, on the other side, that you can't run things very well or very long without a boss, even if he may not be the most satisfactory boss in the world It is a rather poor boss who is not generally better than none at all."

TECUMSEH SWIFT.

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FOR THE ADVANCED MACHINIST.

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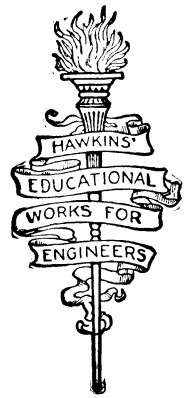

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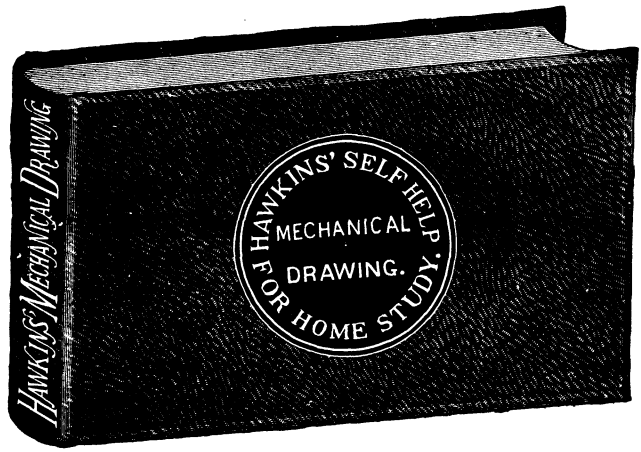

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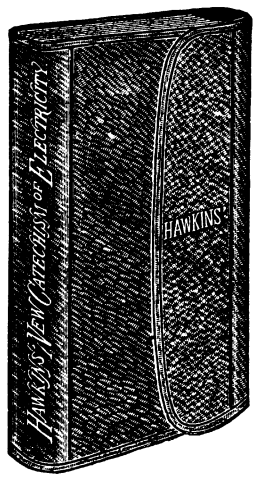

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CONTENTS.

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It contains the annual report of the superintendents of "Steam Boiler Inspection and Certification of Engineers" for the cities of New York and Brooklyn.

It contains various rules, regulations and laws of cities for the examination of boilers and the licensing of engineers.

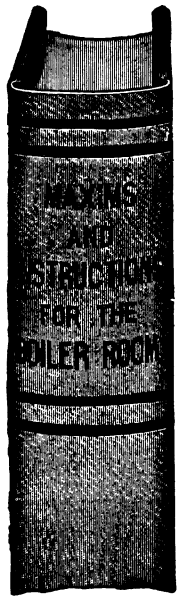
It contains the laws and regulations of the United States for the examination and grading of all marine engineers.

It gives a short chapter on the "Key to Success" in obtaining knowledge necessary for advancement in engineering. This is very important.

The book gives the underlying principles of steam engineering in plain language, with sample questions and answers likely to be asked by the examiner.

It gives a few plain rules of arithmetic with examples of how to work the problems relating to the safety valve, strength of boilers and horse power of the Steam Engine and Steam Boiler.

The main subjects treated, upon which are given detailed information with questions and answers, are as follows:—The Steam Boiler, Boiler Braces, Incrustation and Scale, Firing of Steam Boilers, Water Circulation in Boilers, Construction and Strength of Boilers, The Steam Engine, Engine and Boiler Fittings, Pumps, The Injector, Electricity and Electric Machines, Steam Heating, Refrigeration, Valve



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See next page for further particulars relating to the practical subjects embraced in this valuable volume.

CONTENTS.

Materials; Evaporation; Fire Irons and Tools; Firing of Steam Boilers; Points relating to Fuels; Foaming; Chapter of Don'ts; Full descriptions of the Locomotive, Upright, Water Tube, Horizontal, and Marine Steam Boilers; Parts of a Boiler; Various Specifications for Construction of a Boiler; Riveting; Bracing; Various Repairs; Grate Bars; Boiler Cleaners; Boiler Scales; Boiler Tests; Scumming; Chemical Terms; Inspection of Boilers; Mechanical Stokers; Pumping Machinery; Feed Water Heaters; Steam Heating; Plumbing; Safety Valve Rules.

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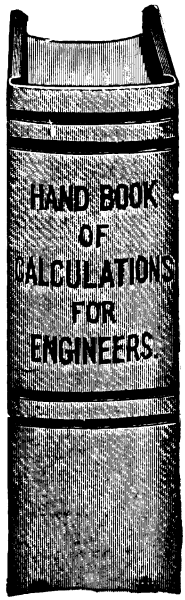

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The work comprises the elements of Arithmetic, Mensuration, Geometry, Mechanical Philosophy, with copious notes, explanations and help rules useful to an Engineer.

And for reference, tables of squares and cubes, square and cube roots, circumference and areas of circles, tables of weights of metals and pipes, tables of pressures of steam, etc., etc.

This is a work of instruction and reference relating to the steam engine, the steam boiler, etc., and has been said to contain every calculation, rule and table necessary to be known by the Engineer, Fireman and steam user.

It is thus a complete course in Mathematics for the Engineer and steam user; all calculations are in plain arithmetical figures, so the average man need not be confused by the insertion of the terms, symbols and characters to be found in works of "higher mathematics," so-called, yet the book is a complete treatise.

It is bound uniform with the "New Catechism of the Steam Engine" and the "Instructions for the Boiler Room" (size 6 x 8¾ inches, weight 2 lbs.); in green silk cloth; printed on heavy, fine surface paper; gold titles, gilt top; with 330 pages and 150 illustrations.

CONTENTS.

The work comprises the elements of Arithmetic, Mensuration, Geometry, Mechanical Philosophy, with copious notes, explanations and help rules useful to an Engineer.

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Mensuration;
Arithmetic;

Description of Algebra and Geometry;

Tables of Weights, Measures,
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The Safety Valve, How to Figure;
The Steam Boiler;
The Steam Pump;

Horse Powers, How to Figure for Engines and Boilers;
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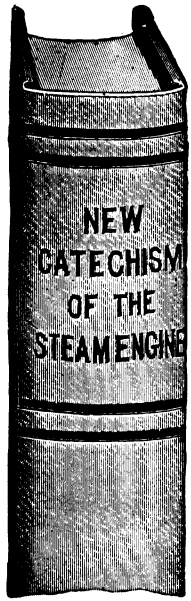

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This will prove a valuable book both for study and reference, being finely illustrated and indexed.

This work is gotten up to fill a long-felt need for a practical book. It gives directions for running the various types of steam engines that are to-day in the market. A list of subjects which are fully yet concisely discussed are found on the next page.

CONTENTS.

The subject matter of the New Catechism of the Steam Engine is not arranged in chapters, but according to the more natural order best designed to explain at greater or less length the different themes discussed. The following are the leading divisions of the 480 pages of the book:

Introduction; The Steam Engine; Historical Facts Relating to the Steam Engine; Engine Foundations; The Steam Piston; Connecting Rods; Eccentric; Governor; Materials; Workmanship; Care and Management; Lining up a Horizontal or Vertical Engine; Lining Shafting; Valve Setting; Condensers; Steam Separators; Air, Gas and Compressing Engines; Compounding; Arithmetic of the Steam Engine; Theory of the Steam Engine; Construction.

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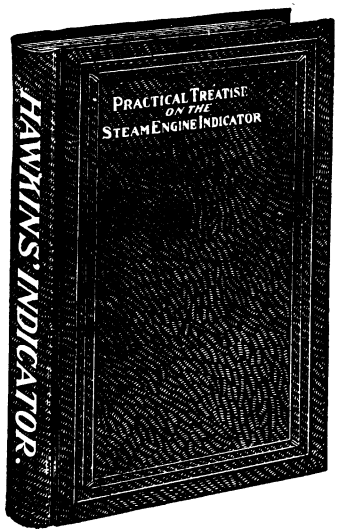
The book also treats generously upon the Marine, Locomotive and Gas Engines.



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