MECHANICS' READY GUIDE

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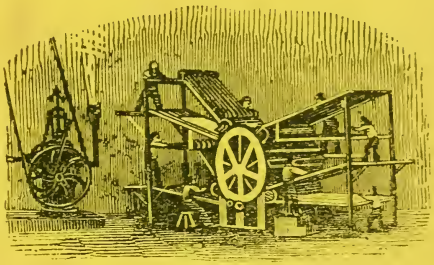

COMPILED BY J. SPOFFORD.

Portland:
BROWN THURSTON,
STEAM PRINTER.
1855.

THE

MECHANICS' READY GUIDE:

CONTAINING

RULES, TABLES AND RECIPES

FOR

READY MECHANICAL REFERENCE;

ALSO—The rules and directions for proceeding with the United States Patent Office, for obtaining Patents, Transferring Patent Rights, Liabilities, Forfeitures, Infringments, &c., &c.

ARRANGED BY

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CONTENTS.

PAGE.

MISCELLANEOUS RECIPES.

PREFACE.

As many mechanical laws, rules and tables, with accompanying observations are obscured by complicated mathematical and unintelligible formulæ, I have resolved to render the matter in this book more acceptable, to dispense with all mathematical problems, solutions and technicalities; and lay down plain rules, tables and observations, for ready reference in the work shop. Being a practical mechanic, I assume to have some knowledge of the want of some ready reference, that will be brief, comprehensive and accurate. The contents of this work will be found to consist of well established, and practically demonstrated rules. I therefore respectfully submit the following to the public.

THE AUTHOR.

Portland, Dec. 12th, 1854.

WEIGHTS AND MEASURES.

Apothecaries Weight.

20 grains	make	1 scruple,	scr.
3 scruples	"	1 dram,	dr.
8 drams	"	1 ounce,	oz.
12 ounces	"	1 pound,	lb.

Averdupois Weight.

16 drams	make	1 ounces,	oz.
16 ounces	"	1 pound,	lb.
18 pounds	"	1 quarter,	qr.
4 quarters	"	1 hundred cwt.	cwt.
20 hundred weight	"	1 ton.	ton.

By this weight are weighed all articles except gold, silver, and jewels.

Troy Weight.

24 grains	make	1 pennyweight,	dwt.
20 pennyweights	"	1 ounce,	oz.
12 ounces	"	1 pound	lb.

By this weight are weighed gold, silver and jewels.

Long Measure.

3	barley corns	make	1 inch,	in.
12	inches	"	1 foot,	ft.
3	feet	"	1 yard,	yd.
6	feet	"	1 fathom,	fth.
5 1-2	yards	"	1 rod, pole or perch.	
40	rods	"	1 furlong,	fur.
8	furlongs	"	1 mile,	mile.
3	miles	"	1 league,	lea.
69 1-6	miles	"	1 degree,	deg.

1 hair breadth is 1-48 of an inch.

Cloth Measure.

2 1-4	inches	make	1 nail,	nl.
4	nails	"	1 quarter of yard,	qr.
4	quarters	"	1 yard,	yd.

Square Measure.

144	inches	make	1	square foot,	ft.
9	square feet	"	1	" yard,	yd.
30 1-4	" yards	"	1	" rod or pole,	rod.
40	" rods or pole		1	" rood,	rd.
4	" roods		1	" acre,	acr.

Dry Measure.

2	pints	make 1 quart,	qt.
8	quarts	" 1 peck,	pck.
4	pecks	" 1 bushel,	bush.
8	bushels	" 1 quuarter,	qr.

Wine Measure.

2 pints	make	1 quart,	qt.
4 quarts	"	1 gallon,	gal.
42 gallons	"	1 tierce,	tier.
63 "	"	1 hogshead,	hhd.
2 tierces	"	1 puncheon,	pun.
2 hogsheads	"	1 pipe or Butt,	pipe.
2 pipes	"	1 tun,	

Ropes and Cables.

6 feet	make	1 fathom,
120 fathoms	"	1 cable length.

Log Lines.

51 feet 1 3-4 inches	make	1 knot.
5 " 1 1-3 "	"	1 fathom.

Using a 30″ glass.

Length of line 150 fathoms, allowing 6 fathoms between chip and first knot.

Shoemaker's Measure.

There are two series of numbers in shoemakers rules, viz: from 1 to 13 in children's measures, and from 1 to 15 in large measures.

No. 1 is 4 1-8 inches in length.

" 2 is 1-3 of an inch added, and so on, adding 1-3 of an inch to each No.

Explanation of Characters

Used in scientific and mathematical tables and calculations.

= equal to,—as; 16 ounces equal to 1 pound.
+ mark of addition,—as; 4+6=10.
— " " substraction,—as; 10—5=5.
× " " multiplication,—as; 10×5=50.
÷ " " division,—as; 50÷5=10.
∴ mark of proportion,—as; 4:8::8:16, that is; as 4 is to 8, so is 8 to 16.

° Degrees, ′ Minutes, ″ Seconds.
A. A. signifies prime; A. second.

ABBREVIATIONS.

A. A. A.	Fellow of the American Academy.
A. B.	Bachelor of Arts.
Acct.	Account.
A. D.	The year of our Lord.
A. M.	Master of Arts.
Atty.	Attorney.
B. D.	Bachellor of Divinity.
B. V.	Blessed Virgin.
Bbl.	Barrel.
Co.	Company.
Com.	Commissioner or Commodore.
C. S.	Keeper of the Seal.
C. P. S.	Keeper of the Privy Seal.
D. D.	Doct. of Divinity.
Dept.	Deputy.
Do, Ditto,	The same.
Ed.	Editor, Edition.

E.	East.
e. g.	For example.
Esq.	Esquire.
Etc.	And so forth.
Exr.	Executor.
Gent.	Gentlemen.
Gov.	Governor.
H. S. S.	Fellow of the Historical Society.
Hon.	Honorable.
Ibid.	In the same place.
i. e.	That is.
Inst.	Instant.
Inst.	The present month.
Jun. or jr.	Junior.
L. L. D.	Doctor of Laws.
L. S.	Place of the Seal.
Math.	Mathematics.
M. B.	Bachelor of Medicine.
M. C.	Member of Congress.
M. P.	Member of Parliament.
M. D.	Doctor of Physic.
Mr.	Master.
MS.	Manuscript.
MSS.	Manuscripts.
N. S.	New Style.
O. S.	Old Style.
P. S.	Postscript.
S. T. P.	Professor of Theology.
Ult.	The last month.

NUMERATION

Teaches us to express numbers by digits or figures which were introduced into Europe by the Moors, about the year of our Lord 1000. The ten digits were formerfy called cyphers; hence the term cyphering was applied to Arithmetic. The ten digits or figures, viz: 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, are all significant figures, and are capable of being transformed into an unlimited number of positions or numbers. The tenth digit signifies nothing of itself, but when placed on the right of any of the first nine, it increases its value ten-fold, as 5 five; with one cypher added make 50 fifty; with one more cypher added 500 five hundred, and so on.

They have also another value, which depends upon the position in which they stand to each other, viz: as follows:

hun. of millions.	tens of millions,	millions,	hun. of thousands,	tens of thousands,	thousands.	hundreds.	tens.	units.
9	8	7	6	5	4	3	2	1
	9	8	7	6	5	4	3	2
		9	8	7	6	5	4	3
			9	8	7	6	5	4
				9	8	7	6	5
					9	8	7	6
						9	8	7
							9	8
								9

NOTATION

Teaches us to express numbers by letters or characters.

I	One.
II	Two.
III	Three.
IV	Four.
V	Five.
VI	Six.
VII	Seven.
VIII	Eight.
IX	Nine.
X	Ten.
XI	Eleven.
XII	Twelve.
XIII	Thirteen.
XIV	Fourteen.
XV	Fifteen.
XVI	Sixteen.
XVII	Seventeen.
XVIII	Eighteen.
XIX	Nineteen.
XX	Twenty.
XXX	Thirty.
XL	Forty.
L	Fifty.
LX	Sixty.
LXX	Seventy.
LXXX	Eighty.
XC	Ninety.
C	One Hundred.
CC	Two Hundred.
CCC	Three Hundred.
CCCC	Four Hundred.
D	Five Hundred.
DC	Six Hundred.
DCC	Seven Hundred.

DCCC	Eight Hundred
DCCCC	Nine Hundred.
M	One Thousand.

A bar —— over any number increases its value one thousand times, viz:

$\overline{V}$	Five Thousand,	$\overline{L}$	Fifty Thousand.
$\overline{VI}$	Six Thousand,	$\overline{C}$	One Hun. Thousand.
$\overline{X}$	Ten Thousand.	$\overline{M}$	One Million.

CIRCLES.

60 seconds	make 1 minute,
60 minutes	" 1 degree,
360 degrees	" 1 circle.

MISCELLANEOUS.

3 inches make 1 palm,	**PAPER.**
4 " " 1 hand,	24 sheets make 1 quire,
9 " " 1 span,	20 quires " 1 ream.

DIAMOND.

16 parts make 1 grain,
4 grains " 1 caret.

COINS.

1 eagle =	258 gr.
1 dollar =	412½ "
1 cent =	168 "

COAL.

1 cubic foot	Anthracite coal	weighs	55 lbs.
1 " "	Bituminous coal	weighs	50 "
1 " "	Cumberland coal	"	53 "
1 " "	Charcoal, hard wood,	weighs	19 "
1 " " "	pine	"	18 "
1 bushel	Bituminous coal	"	80 "

The Conventional rule for purchasers is 29 bushels 1 peck to the ton, or 43½ cubic feet.

Scripture Measures.

1 digit = 9-10 of an in.
1 palm = 3 6-10 " "
1 span = 10 9-10 " "
1 cubit = 1 ft. 10 inches nearly.
1 fathom = 7 ft. 3 1-2 inches.

Jewish Measures.

1 cubit is 1 ft. 8-10 of an inch.
A Sabbath day journey = one-half a Jewish mile.
1 mile is = 7206 feet.
A days journey is 33 miles 864 feet.

CIRCLES.

To find the diameter of any circle.

Rule 1. *Multiply the diameter by* 3.1416 *and the product will be the answer.*

Rule 2. *As* 7 *is to* 22, *so is the diameter to the circumference.*

To find the area of a circle.

Rule. *Multiply half the circumference by half the diameter.*

Circumferences and Areas of Circles.

Diam.	Circum.	Area.	Diam.	Circum.	Area.
1	3,141	,7854	9	28,27	63,617
1/4	3,927	1,227	1/4	29,05	67,200
1/2	4,712	1,767	1/2	29,84	70,882
3/4	5,497	2,405	3/4	30,63	74,662
2	6,283	3,141	10	31,41	78,539
1/4	7,068	3,976	1/4	32,20	82,516
1/2	7,854	4,908	1/2	32,98	86,590
3/4	8,639	5,939	3/4	33,77	90,762
3	9,424	7,068	11	34,55	95,033
1/4	10,21	8,295	1/4	35,34	99,402
1/2	10,99	9,621	1/2	36,12	103,86
3/4	11,78	11,044	3/4	36,91	108,43
4	12,56	12,566	12	37,69	113,09
1/4	13,35	14,186	1/4	38,48	117,85
1/2	14,13	15,904	1/2	39,27	122,71
3/4	14,92	17,720	3/4	40,05	127,67
5	15,70	19,635	13	40,84	132,73
1/4	16,49	21,647	1/4	41,62	137,88
1/2	17,27	23,759	1/2	42,41	143,13
3/4	18,06	25,967	3/4	43,19	138,48
6	18,84	28,274	14	43,98	153,93
1/4	19,63	30,679	1/4	44,76	159,48
1/2	20,42	33,183	1/2	45,55	165,13
3/4	21,20	35,784	3/4	46,33	170,87
7	21.99	38,484	15	47,12	176,71
1/4	22,77	41,282	1/4	47,90	182,65
1/2	23,56	44,178	1/2	48,69	188,69
3/4	24,34	47,173	3/4	49,48	194,82
8	25,13	50,265	16	50,26	201,06
1/4	25,91	53,456	1/4	51,05	207,39
1/2	26,70	56,745	1/2	51,83	213,82
3/4	27,48	60,132	3/4	52,62	220,35

TABLE—(Continued.)

Diam.	Circum.	Area	Diam.	Circum.	Area.
17	53,40	226,98	25	78,54	490,87
¼	54,19	233,70	¼	79,32	500,74
½	54,97	240,52	½	80,10	510,70
¾	55,76	247,45	¾	80,89	520,70
18	56,54	254,46	26	81,68	530,93
¼	57,33	261,58	¼	82,46	541,18
½	58,11	268,80	½	83,25	551,54
¾	58,90.	276,11	¾	84,03	562,00
19	59,69	283,52	27	84,82	572,55
¼	60,47	291,03	¼	85,60	583,20
½	61,26	298,64	½	86,39	593,95
¾	62,04	306,35	¾	87,17	604,80
20	62,83	314,16	28	87,96	615,75
¼	63,61	322,06	¼	88,75	626,79
½	64,40	330,06	½	89,53	637,94
¾	65,18	338,16	¾	90,32	649,18
21	65,97	346,36	29	91,10	660,52
¼	66,75	354,65	¼	91,89	671,95
½	67,54	363,05	½	92,67	683,49
¾	68,32	371,54	¾	93,46	695,12
22	69,11	380,13	30	94,24	706,86
¼	69,90	388,82	¼	95,03	718,69
½	70,68	397,60	½	95,81	730,61
¾	71,47	406,49	¾	96,60	742,64
23	72,25	415,47	31	97,38	754,76
¼	73,04	424,55	¼	98,17	766,99
½	73,82	433,73	½	98,96	779,31
¾	74,61	443,01	¾	99,74	791,73
24	75,39	452,39	32	100,5	804,24
¼	76,18	461,86	¼	101,3	816,86
½	76,96	471,43	½	102,1	829,57
¾	77,75	481,10	¾	102,3	842,39

TABLE—(Continued.)

Diam.	Circum.	Area.	Diam.	Circum.	Area.
33	103,6	855,30	41	128,8	1320,2
¼	104,4	868,30	¼	129,5	1336,4
½	105,2	881,41	½	130,3	1352,6
¾	106,	894,61	¾	131,1	1369,0
34	106,8	907,92	42	131,9	1385,4
¼	107,5	921,32	¼	132,7	1401,9
½	108,3	934,82	½	133,5	1418,6
¾	109,1	943,41	¾	134,3	1435,3
35	109,9	962,11	43	135,	1452,2
¼	110,7	975,90	¼	135,8	1469,1
½	111,5	989,80	½	136,6	1486,1
¾	112,3	1003,7	¾	137,4	1503,3
36	113,	1017,8	44	138,2	1520,5
¼	113,8	1032,0	¼	139,	1537,8
½	114,6	1046,3	½	139,8	1555,2
¾	115,4	1060,7	¾	140,5	1572,5
37	116,2	1075,2	45	141,3	1590,4
¼	117,	1089,7	¼	142,1	1608,1
½	117,8	1104,4	½	142,9	1625,9
¾	118,6	1119,2	¾	143,7	1643,8
38	119,3	1134,1	46	144,5	1661,9
¼	120,1	1149,0	¼	145,2	1680,0
½	120,9	1164,1	½	146,	1698,2
¾	121,7	1179,3	¾	146,8	1716,5
39	122,5	1194,5	47	147,6	1734,9
¼	123,3	1209,9	¼	148,4	1753,4
½	124,	1225,4	½	149,2	1772,0
¾	124,8	1240,9	¾	150,	1790,7
40	125,6	1256,6	48	150,7	1809,5
¼	126,4	1272,3	¼	151,5	1828,4
¼	127,2	1288,2	½	152,3	1847,4
¾	128,	1304 2	¾	153,1	1866,5

TABLE—(Continued.)

Diam.	Circum.	Area.	Diam.	Circum.	Area.
49 .	153,9	1885,7	57	179,	2551,7
¼	154,7	1905,0	¼	179,8	2574,1
½	155,5	1924,4	½	180,6	2596,7
¾	156,2	1943,9	¾	181,4	2619,3
50	157,	1963,5	58	182,2	2642,0
¼	157,8	1983,1	¼	182,9	2664,9
½	158,6	2002,9	½	183,7	2687,8
¾	159,4	2022,8	¾	184,5	2710,8
51	160,2	2042,8	59	185,3	2733,9
¼	161,	2062,9	¼	186,1	3757,1
½	161,7	2083,0	½	186,9	2780,5
¾	162,5	2103,3	¾	187,7	2803,9
52	163,3	2123,7	60	188,4	2827,4
¼	164,1	2144,1	¼	189,2	2351,0
½	164,9	2164,7	½	190,	2874,7
¾	165,7	2185,4	¾	190,8	2898,5
53	166,5	2206,1	61	191,6	2922,4
¼	167,2	2227,0	¼	192,4	2946,4
½	168,	2248,0	½	193,2	2970,5
¾	168,8	2269,0	¾	193,9	2994,7
54	169,6	2290,2	62	194,7	3019,0
¼	170,4	2311,4	¼	195,5	3043,4
½	171,2	2332,8	½	196,3	3067,9
¾	172,	2354,2	¾	197,1	3092,5
55	172,7	2375,8	63	197,9	3117,2
¼	173,5	2397,4	¼	198,7	3142,0
½	174,3	2419,2	½	199,4	3166,9
¾	175,1	2441,0	¾	200,2	3191,9
56	175,9	2463,0	64	201,	3216,9
¼	176,7	2435,0	¼	201,8	3242,1
½	177,5	2507,1	½	202,6	3267,4
¾	178,2	2529,4	¾	203,4	3292,8

TABLE—(Continued.)

Diam.	Circum.	Area.	Diam.	Circum.	Area.
65	204,2	3318,3	70	219,9	3848,4
¼	204,9	3343,8	¼	220,6	3875,9
½	205,7	3369,5	½	221,4	3903,6
¾	206,5	3395,3	¾	222,2	3931,3
66	207,3	3321,2	71	223,3	3959,2
¼	208,1	3447,1	¼	223,8	3987,1
½	208,9	3473,2	½	224,6	4015,1
¾	209,7	3499,3	¾	225,4	4043,2
67	210,4	3525,6	72	226,1	4071,5
¼	211,2	3552,0	¼	226,9	4099,8
½	212,	3578,4	½	227,7	4128,2
¾	212,8	3605,0	¾	228,5	4156,7
68	213,6	3631,6	73	229,3	4185,3
¼	214,4	3658,4	¼	230,1	4214,1
½	215,1	3685,2	½	230,9	4242,9
¾	215,9	3712,2	¾	231,6	4271,8
69	216,7	3739,2	74	232,4	4300,8
¼	217,5	3766,4	¼	233,2	4329,9
½	218,3	3793,6	½	234,	4359,1
¾	219,1	3821,0	¾	234,8	4388,4
			75	235,6	4417,8

Human Strength.

The mean effect of the power of man is estimated at the raising of 70 pounds, 1 foot high in a second, for 10 hours in a day.

Two men, working at right angles, will raise 140 pounds with more ease than one man will raise 60 pounds.

A man with a drawing knife will exert a force of.....100 lbs.
An auger,.....100 "
A screw driver,.....84 "
A chisel, compression of one hand,..72 "
A carpenter's plane,.....60 "
A hand saw,.....36 "
A thumb screw,.....45 "
A bit stock,.....16 "

Experiments have proved that a strong man will raise 18,000 lbs. 1 foot high a minute for 2 1-2 minutes.

4500 pounds raised 1 foot in a minute, is equal to 1-5 the work of a horse.

A man of ordinary strength will exert a force of 30 lbs. in 2 1-2 minutes, for 10 hours in a day.

A man accustomed to traveling will travel

70 yards a minute in common time.
86 " " quick time.
109 " " double quick time.

A soldier occupies in the ranks of an army, a front of 20 inches, and a depth of 13 inches. The space between the ranks is 13 inches.

The strength of 5 men is equal to 1 horse.

A cavalry horse will walk 800 yards in 9 minutes, and at a gallop, in 2 minutes. He occupies in the ranks a front of 3 feet 4 inches, and a depth of 10 feet. He will carry a soldier and his equipments 25 miles in 8 hours.

A Draught Horse

Will draw 1500 lbs. 25 miles in a day, and move at an average of 3 feet in a second.

In a horse mill, the track should be 25 feet in diameter. Six hours constitute a days work, allowing the horse to travel 3 feet per second; consequently 1 horse power engine is equivalent to that of 4 horses.

AIR.

The pressure of the air at the surface of the earth is 15 lbs. to the square inch; at 7 miles from the surface of the earth it is only 3¾ lbs.; at 14 miles from the surface it is 16 times lighter than at the surface.

SOUND.

The mean velocity of sound is 1100 feet per second.

To compute the distance by sound, multiply the time in seconds by 1100 and the product is the distance in feet.

Example.—After observing the flash of a gun it was 3 seconds before I heard the report. What was the distance?

$$1100 \times 3 = 3300 \text{ feet.}$$

Force of Wind.

Miles in an hour.	Observations.	Pressure to square foot.
1 to 3	is just perceptible,	
4 " 10	gentle and pleasant,	
10 " 25	brisk to very brisk,	1 to 3 lbs.
30 " 50	high to very high.	4 " 10 "
60 " 80	great storm to hurricane,	18 " 32 "
100	tornado.	40 " 50 "

Effects of Heat.

Cast Iron melts at	2754°	Farenheit,
Fine Gold " "	1983°	"
Fine Silver " "	1850°	"
Copper " "	2160°	"
Brass " "	1900°	
Zinc " "	740°	"
Lead " "	594°	
Bismuth " "	476?	"
Tin " "	421?	"
Mercury " "	39?	"
Tin and bismuth, equal parts,	283?	"
Tin, 3 parts, bismuth 5, lead 2,	212?	"
Plate glass, working heat,	8490°	"
Charcoal burns,	700°	"
Human blood,	98°	"
Ether boils,	98°	"
Brandy freezes,	7?	"
Strong wine freezes,	20°	"

GUNPOWDER.

For United States service,	For sporting,
75 parts saltpetre,	78 parts saltpetre,
15 " charcoal,	12 " charcoal,
10 " sulphur.	10 " sulphur.

Proof of Powder.—One ounce of powder will throw a 24 lb. ball 280 yards.

Powder ranging below 225 yards is not received at U. S. magazines, and powder ranging as low as 180 yards is worthless.

Fusible and Malleable Metals.

Platina,	Palladium,	Gold,
Copper,	Mercury,	Sodium
Lead,	Potassium,	Tin
Nickel,	Zinc,	Iron,
Silver.		

Fusible Brittle Metals.

Antimony,	Tellurium,
Bismuth,	Arsenic.

Platina is the heaviest of all the metals, besides being so ductile it will admit of being drawn into a wire of less than a two-thousandth part of an inch.

Gold is the most malleable, ductile and brilliant of all metals, and next to platina, the most imperishable. A single grain can be made to cover the space of more than 400 square inches, and a wire of one-sixteenth of an inch will support a weight of over 300 pounds.

Silver is next to gold in malleability and ductility. Its tenacity is such that a wire one-sixteenth of an inch will support a weight of 200 lbs., and can be drawn into wire finer than human hair.

ANNEALING.

Steel is most effectually annealed in a charcoal fire, by making it red hot and allowing the fire to go out of its own accord.

Cast Iron, in large pieces, can be heated either in cinder or charcoal fire, and must be completely enveloped and defended from the air until cool. Small pieces may be buried in dry saw-dust.

Iron and Steel.

Iron is less malleable than gold, silver or copper. It is, of all metals in common use, the most difficult of fusion. The hardness of iron, its great tenacity, malleability, &c., and the great facility with which it can be forged into any peculiar shape, render it one of the most valuable of metals. It is capable of being rendered magnetic, but soon loses its magnetic properties unless it be in the state of hardened steel. Iron is rarely, though sometimes found in its native state. A mass of iron in its native state is found deposited in the Museum of Arts at St. Petersburg, in Russia, weighing 1200 tons.

Cast Iron is the first metal resulting from the ore. The process of fusion is carried on with charcoal, and

a proportionate part of limestone. Cast Iron is divided into three different qualities:

No. 1 runs so fluid in a state of fusion as to be admirably adapted for ornamental work. It will run so fine that in large manufacturing districts it is run into cutlery, forks, scissors, and even fish-hooks and needles. These articles will attain a great degree of malleability when annealed, and are capable of being welded.

No. 2 contains a smaller quantity of carbon, and is preferable for large, heavy work, and where great strength is required; such as wheels, beams, machinery, &c.

No. 3 is of coarser and more brittle qualities, and is adapted only for coarse, clumsy work.

Cast Iron is converted into wrought iron by keeping it in a state of fusion for a considerable time, and repeatedly stirring it in the furnace, until it becomes more stiff and infusible. The workmen become acquainted by its appearance what time to apply the hammer or rollers. After undergoing this process, it is called bar iron. The loss of weight sustained in the process of refining will generally average one-third.

The quality of bar iron is much improved by compression, forging and rolling, but it should not be exposed to a violent heat any lengthy period, as it wil begin to lose its metallic properties.

Blistered steel is made of the purest of malleable bar iron. The process consists in layers of bars upon

layers of charcoal in a furnace arranged for the business and made air-tight. The fire is raised to a considerable heat and kept burning for 8 or 10 days, when it is withdrawn as blistered steel.

Steel should be manufactured altogether with charcoal, on account of the carbon it possesses, as it unites in the most essential degree with the properties of the steel. Earthy and infusible matter will reduce steel to its original standard. Pit-coal should never be used, neither in the forging or tempering of edge tools, as it destroys the finer properties of the steel.

Cast steel is rendered uniform by fusion; hence it is called cast steel, and is wrought with more difficulty than common steel, because it is more fusible. The cast steel of England is made from the fragments of crude steel. The furnace is heated with coke, and five hours are required for the fusion. It is then cast into ingots and forged with more precaution and less heat than other steel, as it is more liable to break. The surest method for securing a fine, keen edge in tempering is to enclose the tools to be tempered in an iron box and slowly heat them to a cherry red and then suddenly immerse them in cold water in such a manner as to exclude the air as much as possible from them. This method causes the heat to be more equally diffused and prevents the scaling which occurs in allowing the heated steel to come in contact with the air.

Various methods have been adopted for hardening steel, such as oil, tallow and urine, but when it is de-

sirable to procure a degree of extreme hardness it may be cast into mercury, which will make it hard enough to cut glass like a diamond.

For case-hardening iron, the most effectual method is to take an iron box and burn on the articles to be hardened animal matter, such as horns, hoofs, skins, leather, &c. The depth of the steel hardened will depend upon the time occupied in heating. It will require more than half an hour to produce a hardened surface the thickness of a three cent piece.

A very handy and easy way of case-hardening is to put on the article to be hardened, prussiate potash, and slowly heating to its required heat and immersing suddenly in cold water.

Cast Iron can be hardened by simply heating to a red heat and casting it into cold water, but when once hardened it cannot be softened again like wrought iron and steel, unless by the regular process of annealing.

Weight of Square Foot of Iron, Copper & Lead.

Thickness.	Cast Iron.		Sheet Iron.		Copper.		Lead.	
	lbs.	oz.	lbs.	oz.	lbs.	oz.	lbs.	oz.
1 sixteenth.	2	6	2	7	2	15	3	11
2 "	4	13	4	15	5	14	7	6
3 "	7	4	7	7	8	13	11	1
4 "	9	10	9	15	11	12	14	12
5 "	12	1	12	7	14	11	18	9
6 "	14	8	14	14	17	10	22	2
7 "	16	14	17	6	20	9	25	13
8 "	19	5	19	14	23	8	29	8
9 "	21	12	22	6	26	7	33	3
10 "	24	2	24	14	29	9	36	4
11 "	26	9	27	6	32	5	40	9
12 "	29	00	29	13	35	4	44	4
13 "	31	6	32	5	38	3	47	15
14 "	33	13	34	13	41	2	51	10
15 "	36	4	37	5	44	1	55	5
1 inch,	38	10	39	13	49	0	59	0

Weight of Round Iron.

FROM 1-4 INCH TO 8 INCHES, AND 1 FOOT IN LENGTH.

Dia. in.	Weight lbs.	Diam. in.	Weight lbs.	Diam. in.	Weight lbs.	Diam. in.	Weight lbs.
1/4	0.165	2	10.616	3 3/4	37.332	6 3/4	103.704
3/8	0.373	2 1/8	11.988	3 7/8	39.864	7	112.160
1/2	0.663	2 1/4	13.440	4	42.464	7 1/4	120.960
5/8	1.043	2 3/8	14.975	4 1/4	47.952	7 1/2	130.048
3/4	1.493	2 1/2	16.988	4 1/2	53.760	7 3/4	139.544
7/8	2.032	2 5/8	18.293	4 3/4	59.900	8	149.328
1	2.654	2 3/4	20.076	5	66.752		159.456
1 1/8	3.360	2 7/8	21.944	5 1/4	73.172		
1 1/4	4.172	3	23.888	5 1/2	80.304		
1 3/8	5.019	3 1/8	25.926	5 3/4	87.776		
1 1/2	5.972	3 1/4	28.040	6	95.552		
1 5/8	7.010	3 3/8	30.240	6 1/4			
1 3/4	8.128	3 1/2	32.512	6 1/2			
1 7/8	9.333	3 5/8	34.886				

Weight of Flat Rolled Iron.

From 1-8 by 1 inch to 1 by 6 inches, and one foot in length.

Thick in.	Width in.	Weight in lbs.	Thick in.	Width in.	Weight in lbs.	Thick in.	Width in.	Weight in lbs.
1/8	1	0.422	1/2	1 1/2	2.535	5/8	2	4.224
1/4	"	0.845	5/8	"	3.168	3/4	"	5.069
3/8	"	1.267	3/4	"	3.802	7/8	"	5 914
1/2	"	1.690	7/8	"	4 435	1	"	6.758
5/8	"	2.112	1	"	5.069	1/8	2 1/8	0.898
3/4	"	2.534	1/8	1 5/8	0.686	1/4	"	1.795
7/8	"	2.956	1/4	"	1.372	3/8	"	2.693
1/8	1 1/8	6.475	3/8	"	2.059	1/2	"	3.591
1/4	"	0.950	1/2	"	2.746	5/8	"	4.488
1/8	"	1.425	5/8	"	3.432	3/4	"	5.386
1/2	"	1.901	3/4	"	4.119	7/8	"	6.283
5/8	"	2.375	7/8	"	4.805	1	"	7.181
3/4	"	2.850	1	"	5.492	1/8	2 1/4	0.950
7/8	"	3.326	1/8	1 3/4	0.739	1/4	"	1.900
1/8	1 1/4	0.528	1/4	"	1.479	3/8	"	2.851
1/4	"	1.056	3/8	"	2.218	1/2	"	3.802
3/8	"	1.584	1/2	"	2.957	5/8	"	4.752
1/2	"	2.112	5/8	"	3.696	3/4	"	5.703
5/8	"	2.640	3/4	"	4.435	7/8	"	6.653
3/4	"	3.168	7/8	"	5.178	1	"	7.604
7/8	"	3.696	1	"	5.914	1/8	2 3/8	1.003
1	"	4.224	1/8	1 7/8	0.792	1/4	"	2.006
1/8	1 3/8	0.580	1/4	"	1.584	3/8	"	3.009
1/4	"	1.161	3/8	"	2.376	1/2	"	4.013
3/8	"	1.742	1/2	"	3.168	5/8	"	5.016
1/2	"	2.325	5/8	"	3.960	3/4	"	6.019
5/8	"	2.904	3/4	"	4.752	7/8	"	7.022
3/4	"	3.484	7/8	"	5.544	1	"	8.025
7/8	"	4.065	1	"	6.336	1/8	2 1/2	1.056

Table of Flat Iron—(Continued.)

Thick in.	Width in.	Weight in lbs.	Th'k in.	Width in.	Weight in lbs.	Th'k in.	W'th in.	Weight in lbs.
1	$\frac{3}{8}$	4.646	$\frac{1}{8}$	2	0.845	$\frac{1}{4}$	$2\frac{1}{2}$	2.112
$\frac{1}{8}$	$1\frac{1}{2}$	0.633	$\frac{1}{4}$	"	1.689	$\frac{3}{8}$	"	3.168
$\frac{1}{4}$	"	1.266	$\frac{3}{8}$	"	2.534	$\frac{1}{2}$	"	4.224
$\frac{3}{8}$	"	1.900	$\frac{1}{2}$	"	3.379	$\frac{5}{8}$	"	5.280
$\frac{3}{4}$	$2\frac{1}{2}$	6.336	$\frac{1}{8}$	$3\frac{1}{4}$	1.373	$\frac{3}{4}$	$4\frac{1}{4}$	10.772
$\frac{7}{8}$	"	7.392	$\frac{1}{4}$	"	2.746	1	"	14.364
1	"	8.448	$\frac{3}{8}$	"	4.119	$\frac{1}{4}$	$4\frac{1}{2}$	3.802
$\frac{1}{8}$	$2\frac{5}{8}$	1.109	$\frac{1}{2}$	"	5.492	$\frac{1}{2}$	"	7.604
$\frac{1}{4}$	"	2.218	$\frac{5}{8}$	"	6.865	$\frac{3}{4}$	"	11.406
$\frac{3}{8}$	"	3.327	$\frac{3}{4}$	"	8.237	1	"	15.208
$\frac{1}{2}$	"	4.436	$\frac{7}{8}$	"	9.610	$\frac{1}{4}$	$4\frac{3}{4}$	4.013
$\frac{5}{8}$	"	5.545	1	"	10.983	$\frac{1}{2}$	"	8.026
$\frac{3}{4}$	"	6.654	$\frac{1}{8}$	$3\frac{1}{2}$	1.479	$\frac{3}{4}$	"	12.039
$\frac{7}{8}$	"	7.763	$\frac{1}{4}$	"	2.957	1	"	16.052
1	"	8.872	$\frac{3}{8}$	"	4.436	$\frac{1}{4}$	5	4.224
$\frac{1}{8}$	$2\frac{3}{4}$	1.162	$\frac{1}{2}$	"	5.914	$\frac{1}{2}$	"	8.449
$\frac{1}{4}$	"	2.323	$\frac{5}{8}$	"	7.393	$\frac{3}{4}$	"	12.673
$\frac{3}{8}$	"	3.485	$\frac{3}{4}$	"	8.871	1	"	16.897
$\frac{1}{2}$	"	4.647	$\frac{7}{8}$	"	10.350	$\frac{1}{4}$	$5\frac{1}{4}$	4.436
$\frac{5}{8}$	"	5.808	1	"	11.828	$\frac{1}{2}$	"	8.871
$\frac{3}{4}$	"	6.970	$\frac{1}{8}$	$3\frac{3}{4}$	1.584	$\frac{3}{4}$	"	13.307
$\frac{7}{8}$	"	8.132	$\frac{1}{4}$	"	3.168	1	"	17.742
1	"	9.294	$\frac{3}{8}$	"	4.752	$\frac{1}{4}$	$5\frac{1}{2}$	4.647
$\frac{1}{8}$	$2\frac{7}{8}$	1.215	$\frac{1}{2}$	"	6.336	$\frac{1}{2}$	"	9.294
$\frac{1}{4}$	"	2.429	$\frac{5}{8}$	"	7.921	$\frac{3}{4}$	"	13.940
$\frac{3}{8}$	"	3.644	$\frac{3}{4}$	"	9.505	1	"	18.587
$\frac{1}{2}$	"	4.858	$\frac{7}{8}$	"	11.089	$\frac{1}{4}$	$5\frac{3}{4}$	4.858
$\frac{5}{8}$	"	6.072	1	"	12.673	$\frac{1}{2}$	"	9.716
$\frac{3}{4}$	"	7.287	$\frac{1}{8}$	4	1.690	$\frac{3}{4}$	"	14.574
$\frac{7}{8}$	"	8.502	$\frac{1}{4}$	"	3.380	1	"	19.432

Table of Flat Iron—(Continued.)

Thick in.	Width in.	Weight in lbs.	Th'k in.	W'th in.	Weight in lbs.	Th'k in.	W'th in.	Weight in lbs.
1	2 7/8	9.716	1/2	5	6.759	1	6	20.324
1/8	3	1.267	3/4	"	10.138			
1/4	"	2.535	1	"	13.518			
3/8	"	3.802	1/8	4 1/2	1.795			
1/2	"	5.069	1/4	"	3.591			
5/8	"	6.337	1/2	"	7.181			
3/4	"	7.604						
7/8	"	8.871						
1	"	10.138						

Weight of Copper Rods or Bolts.

From 1-4 inch to 3 inches diameter, and 1 foot in length.

Diam. inches.	Weight in lbs.	Diam. inches.	Weight in lbs.	Diam. inches.	Weight in lbs.
1/4	0.1892	1	3.0270	1 7/8	10.6420
5/16	0.2956	1 1/16	3.4170	2	12.1082
3/8	0.4256	1 1/8	3.8312	2 1/8	13.6677
7/16	0.5794	1 3/16	4.2688	2 1/4	15.3251
1/2	0.7567	1 1/4	4.7298	2 3/8	17.0750
9/16	0.9578	1 5/16	5.2140	2 1/2	18.9161
5/8	1.1824	1 3/8	5.7228	2 5/8	20.8562
11/16	1.4307	1 7/16	6.2547	2 3/4	22.8913
3/4	1.7027	1 1/2	6.8109	2 7/8	25.0188
13/16	1-9982	1 9/16	7.3898	3	27 2435
7/8	2.3176	1 5/8	7.9931		
15/16	2.6605	1 3/4	9.2702		

Weight of Superficial foot of Sheet Iron, Copper and Brass. Thickness by the Wire Guage.

No.	Iron.	Copper.	Brass.	No.	Iron.	Copper.	Brass.
1	12.5	14.5	13.75	16	2.5	2.9	2.75
2	12	13.9	13.2	17	2.18	2.52	2.4
3	11	12.75	12.1	18	1.86	2.15	2.04
4	10	11.6	11 .	19	1.7	1.97	1.87
5	8.74	10.1	9.61	20	1.54	1.78	1.69
6	8.12	9.4	8.93	21	1.4	1.62	1.54
7	7.5	8.7	8.25	22	1.25	1.45	1.37
8	6.86	7.9	7.54	23	1.12	1.3	1.23
9	6.24	7.2	6.86	24	1	1.16	1.1
10	5.62	6.5	6.18	25	0.9	1.04	0.99
11	5	5.8	5.5	26	0.8	0.92	0.88
12	4.38	5.08	4.81	27	0.72	0.83	0.79
13	3.75	4.34	4.12	28	0.64	0.74	0.7
14	3.12	3.6	3.48	29	0.56	0.64	0.61
15	2.82	3.27	3.1	30	0.5	0.58	0.55

Capacity of Cylindrical Vessels, Cisterns, &c.

Rule.—Reduce the diameter to inches, Multiply the area of the diameter by the length or height, and the product divided by 231 will give the standard gallons.

231 cubic inches make the standard gallons
221.184 " " " " N. Y. State. "
277.274 " " " " Imperial. "

Capacity of Cylindrical Vessels, Cisterns, &c.

From 1 foot to 10 feet in diameter. To each 10 inch in depth.

Diameter in feet.	Contents in gallons.	Diameter in feet.	Contents in gallons.
1	$4\frac{2}{3}$	$4\frac{1}{4}$	$88\frac{1}{3}$
$1\frac{1}{4}$	$7\frac{1}{2}$	$4\frac{1}{2}$	99
$1\frac{1}{2}$	11	$4\frac{3}{4}$	$110\frac{1}{2}$
$1\frac{3}{4}$	15	5	$122\frac{1}{2}$
2	$19\frac{1}{2}$	$5\frac{1}{2}$	$148\frac{1}{8}$
$2\frac{1}{4}$	$24\frac{1}{2}$	6	$176\frac{1}{4}$
$2\frac{1}{2}$	$30\frac{1}{2}$	$6\frac{1}{2}$	$206\frac{2}{4}$
$2\frac{3}{4}$	37	7	$239\frac{3}{4}$
3	44	$7\frac{1}{2}$	$275\frac{1}{2}$
$3\frac{1}{4}$	$51\frac{1}{2}$	8	$313\frac{1}{3}$
$3\frac{1}{2}$	60	$8\frac{1}{2}$	$353\frac{3}{4}$
$3\frac{3}{4}$	$68\frac{2}{3}$	9	$396\frac{1}{2}$
4	78	$9\frac{1}{2}$	$461\frac{1}{2}$
		10	$489\frac{1}{4}$

To Find the Solidity of a Cube.

RULE.—Multiply the side of a cube, in inches, by itself, in inches, and that product again by the side, in inches; and this last product will be the solidity: and this solidity divided by 231 will be its contents in standard gallons.

To find the solidity of a Parallelopipedon.

RULE.—Multiply the length in inches by the breadth in inches, and that product by the depth in inches, and that product will be the solidity. And that solidity divided by 231 will be its contents in standard gallons.

Weight of Square Rolled Iron.

FROM 1-4 INCH TO 8 INCHES. AND 1 FOOT IN LENGTH.

Size in.	Weight lbs.	Size in.	Weight lbs.	Size in.	Weight. lbs.	Size. in.	Weight. lbs.
1/4	0.211	2	13.520	3 3/4	47.534	7	165.632
3/8	0.475	2 1/8	15.262	3 7/8	50.756	7 1/4	177.672
1/2	0.845	2 1/4	17.112	4	54.084	7 1/2	190.136
5/8	1.320	2 3/8	19.066	4 1/4	61.055	7 3/4	203.024
3/4	1.901	2 1/2	21.120	4 1/2	68.448	8	216.336
7/8	2.588	2 5/8	23.292	4 3/4	76.264		
1	3.380	2 3/4	25.560	5	84.480		
1 1/8	4.278	2 7/8	27.939	5 1/4	93.168		
1 1/4	5.280	3	30.416	5 1/2	102.204		
1 3/8	6.390	3 1/8	33.010	5 3/4	111.756		
1 1/2	7.604	3 1/4	35.704	6	121.664		
1 5/8	8.926	3 3/8	38.503	6 1/4	132.040		
1 3/4	10.352	3 1/2	41.408	6 1/2	142.816		
1 7/8	11.883	3 5/8	44.418	6 3/4	154.012		

Speaking Trumpets.

The efficiency of speaking trumpets depends upon their length. A man's voice may be heard three miles, through an instrument 20 to 24 feet long.

BRICKS.

Common bricks measure from 7¾ in. to 8 in. in length, 4¼ in width, and 2½ in. in thickness. Front brick, 8¼ in. length, 4⅛ in. in width and 2½ in. in thickness. A foot of 8 in. wall contains when laid 15 bricks, and 100 square feet contains 1500 bricks.

HAY.

10 cubic yards of fine hay weigh 1 ton. 12 cubic yards of coarse hay weigh 1 ton.

Hills in an Acre.

An acre of ground contains at

1 foot apart,	43,560	3 feet apart,	4,840
2 " "	10,890	3½ " "	3,556
2½ " "	6,969		

EARTH.

23 cubic feet of	sand	make 1 ton.
18 " "	" earth	" 1 "
17 " "	" clay	" 1 "
18 " "	" solid earth	" 1 "
27 " "	" loose "	" 1 "

Table of Compositions in Relative Parts.

Copper.	Tin.	Lead.	Zinc.	Bismuth.	Antimony	
2			1			Yellow Brass.
3			1			Spelter.
80	8					Bronze.
80	4		5			Bell Metal.
3	1					Brass.
18	2					Gun Metal.
6	1		1			Shaft Journals.
8	1					Wheels.
5	112	15				Pewter.
6			1			Pinchbeck.
		4			1	Type Metal.

SOLDERS.

Tin 1 part, lead 2 parts, with rosin, for lead.

" 5 " " 1 " . bismuth 1 part, with rosin, for tin.

Spelter with Borax, for Iron.

Gold " " " Platina.

7 parts silver, 1 copper, with borax, for gold.

2 " gold, 1 silver, 1 copper, for gold.

2 " silver, 1 brass, with borax, for silver.

4 " " 3 " 1-16 zinc, with borax for silver.

3 " copper, 1 zinc, with borax, for brass.

ALLOYS.

For Gold, 22 parts gold, 2 parts copper, is 22 carats fine.

20 parts gold, 4 parts copper, is 20 carats fine.

18 parts gold, 6 parts cppper, ia 18 carats fine.

For Silver, 11 oz., 2 dwts. pure silver, 22 dwts. copper, English standard.

Table of Size and Strength of Chains.

		Weight of Fathom.
8 sixteenths will carry	3 tons.	14 lbs.
9 " "	$4\frac{1}{2}$ "	17 "
10 " "	6 "	24 "
11 " "	$7\frac{1}{2}$ "	27 "
12 " "	9 "	30 "
13 " "	11 "	36 "
14 " "	13 "	42 "
15 " "	15 "	50 "
1 inch "	17 "	56 "
1 " 1 " "	19 "	60 "
1 " 2 " "	$21\frac{1}{2}$ "	70 "
1 " 3 " "	24 "	78 "
1 " 4 " "	27 "	86 "
1 " 5 " "	30 "	96 "
1 " 6 " "	33 "	104 "
1 " 7 " "	36 "	115 "
1 " 8 " "	40 "	125 "

Hemp Cables.

Circumfere ice in inches.	Weig it per fathom.	Weight to bear in safety.
3	2,1	1080 lbs.
4	4,	1920 "
$4\frac{1}{2}$	4,6	2160 "
$5\frac{1}{2}$	6,5	3250 "
6	8,4	4320 "
7	11,	5880 "
$7\frac{1}{2}$	13,	5750 "
8	15,	7680 "
9	18,9	9720 "
$9\frac{1}{2}$	21,	10830 "
10	26,7	12000 "
11	28,2	14520 "
12	23,6	17280 "

Turning and Boring Iron.

Diam, in inches.	Revolutions per minute.	Diam. in inches.	Revolutions per minute.
1	25.	10	2.5
2	12.5	16	1.66
3	8.33	20	1.25
4	6.25	25	1.
5	5.	30	.833
6	4.16	35	.714
7	3.57	40	.625
8	3.125	45	.56
9	2.77	50	.5

Turning requires double the velocity of boring. It will be observed the surface bored is always the same, viz : 78.54 inches per minute. Consequently turning will admit of cutting with a stationary tool double the surface, viz : 157.08inches.

In turning soft brass the velocity may be increased one-half, and in using hand tools, the velocity may be still greater increased.

In boring pipes and cylinders, a cast iron shaft should be used, as it is subject to less vibration than wrought iron, and three cutters placed at tri-angles. Cutters placed at right angles are likely to chatter.

Dies and Taps should have only three cutting points at tri angles. A screw or nut is cut with more ease and uniformity ; consequently, taps and dies are less liable to be broken.

Cast steel tools should always be forged with charcoal, and annealed in a charcoal fire, which should be allowed to go out of itself, annealing in lime, or any earthy matter is injurious to the steel.

Specific Gravities.

The specific gravity of any body of known density is the relative weight it bears to any other body. Water is well adapted and is adopted for the standard; its weight is 1000 ounces the cubic foot, and is taken as the unit.

To find the Specific Gravity.

RULE.— *Weigh the body out of water and then in the water. Then as the difference lost in water is to the whole weight, so is* 1000 *to the specific gravity of that body.*

Example. What is the specific gravity of a body that weighs 20 lbs. out of the water, and 15 lbs. in the water ?

Diff. Whole weight. Grav. of Water.

5 : 20 : : 1000 : 4000 *Ans.*

Table of Specific Gravities.

METALS.	Specific Gravity.		Specific Gravity.
Arsenic,	5.763	Sand,	1.800
Antimony, cast,	6.702	Brick,	2.000
Bismuth,	7.823	Granite,	2.652
Bronze,	8.700	Slate,	2.672
Brass,	7.820	Chalk,	2.784
Copper,	8.788	Limestone,	3.179
Gold, pure cast.	19.258	Nitre,	1.900
Silver, " "	10.474	Glass, White	2.892
Platinum,	22.069	RESINS, &c.	
Steel, soft,	7.833	Wax,	.897
Tin,	7.291	Bone, ox	.1658
Zinc,	7.190	Tallow,	.945
Lead,	11:352	India Rubber,	.933
Mercury,	13.568	Spermaceti,	.943
Iron, wrought,	7.778	Indigo,	1.009
Iron, cast,	7.207	LIQUIDS.	
Nickel, cast,	7.807	Blood, human	
WOODS.		Alcohol,	
Alder,	.800	Vitriol,	
Ash,	.760	Oil, olive	
Beech,	696	Milk,	
Walnut,	.671	Vinegar,	
Pitch Pine,	.560	Proof spirit,	
Maple,	.750	Ether,	.715
Teak,	.745	Acid, nitric	1.217
Ebony,	1.331	Water, fresh	1.000
Cedar,	.596	Wine,	.992
Cork,	.245	ELASTIC FLUIDS.	
Elder,	1.695	Air at earths sur-	
Lignum Vitæ,	1.333	face,	.12-7
Hacmetac,	.592	Carbonic acid,	1.524
Mahogany,	1.063	Hydrogen,	.070
White Pine,	.554	Oxygen,	1.104
STONES.		Steam at 212°	.490
Marble,	2.686	Alcohol vapor,	1.613
Porcelain,	2.385	Smoke, Bit. coal	.102
Paving Stone,	2.410	" wood	.090

Miscellaneous Observations.

Still water curves 8 inches to the mile; which shows the convexity of the earth's surface.

Observations on Sounds.

If a person apply his ear to a long piece of timber the scratch of a pin at the other end may be distinctly heard, while it could not be heard through air.

By placing the ear to a long, dry brick wall, and causing a person to strike with a hammer at the other end the sound will be heard twice, because the wall will convey it with greater rapidity than the air; though each will bring it to the ear.

Sound passing through the air moves at the rate of 1142 feet in a second.

The air is a better conductor of sound when humid than when dry. A bell can be heard more distinctly just before a rain or in the night, because the atmosphere is more damp. Music always sounds best in the night.

Heat or Caloric

Implies the sensation produced by bringing one body in contact with another of a higher temperature. On touching a hot body, caloric passes from it and excites the feeling of warmth. When we place our hand upon a body of lower temperature, heat passes from the hand to it, and that produces the sensation of cold. Caloric passes through different bodies with different degrees of velocity.

The relative conducting power of different bodies may be found in the following

TABLES.

Gold,	1000	Lead,	180
Platinum,	981	Marble,	24
Silver,	973	Porcelain	12
Copper,	898	Fire brick,	11
Iron,	374	Fire clay,	11
Zinc,	363	Brass,	770
Tin,	304		

With Water as the Standard.

Water,	10	Elm,	32
Pine,	39	Ash,	31
Lime,	39	Apple,	28
Oak,	33	Ebony,	22

Relative Conducting Power of different Substances Compared with Each Other.

Hare's Fur,	1,315	Cotton,	1,046
Eider down,	1,305	Lint,	1,032
Beaver's Fur,	1,296	Charcoal,	,937
Raw Silk,	1,294	Wood Ashes,	,927
Wool,	1,118	Sewing Silk,	,917
Lamp Black,	1,117	Air,	,576

FLUIDS.

Mercury,	1,000	Proof Spirit,	,312
Water,	,357	Alcohol,	,232

Radiation of Heat.

Bodies which radiate heat best, absorb it best. Radiation is affected by the nature of the bodies; thus, black bodies radiate more heat than light.

Radiating Power of Different Bodies.

Water	100	Blackned Tin,	100
Lamp Black,	100	Clean "	10
Writing Paper,	100	Scraped "	16
Glass,	90	Ice,	85
Bright Lead,	19	Mercury,	20
India Ink,	88	Polished Iron,	15
Silver,	12	Copper,	12

Radiation is the reverse of Reflection; the one diminishes as the other increases.

Observations on Metals.

The metals are distinguished by their possessing the following properties: tenacity, malleability, ductility, lustre, fusibility and opacity. They are good conductors of caloric, electricity and galvanism.

Metals are generally found in mountainous countries.

All metals are fusible and susceptible of crystalization.

Cast iron will run like water at a heat that will not soften platina.

PLATINA

Holds the pre-eminence of all other bodies in point of weight. The strongest acids have no effect on it, and

it requires the strongest fire assisted by oxygen gas to melt it. It is found in the gold mines of Peru.

GOLD

Is next to platina in point of weight and indestructibility, and is the most malleable of all metals. One grain can be made to cover a surface of more than 400 square inches.

MERCURY

Is next in point of weight to platina. It ceases to be fluid at the temperature of 39°, when it has the appearance of polished silver. Mercury, when frozen, produces the same sensation to the touch that red hot iron does.

PALLADIUM

Has very much the appearance of platina. It takes a good polish, and is very malleable. It is found with platina.

LEAD

Is the softest and least elastic and sonorous of all metals. Lead ore frequently contains silver, and often bismuth and antimony.

SILVER

Is found in most all countries containing mines. It is often found in its native state, but is most commonly found combined with copper. The celebrated mountain of Potosi is represented by travellers to be studded from top to bottom with veins of silver. It is

generally alloyed with copper for the purpose of coinage.

COPPER

Is sometimes found native. It is not much inferior to silver in malleability. Copper unites freely with antimony, and forms an alloy of a beautiful violet color.

TIN

Is a metal intermedial between lead and silver. It cannot be fused with any metal lighter than itself. Its ores are generally found in granite. It exhibits a crackling noise in bending.

ZINC.

Zinc fuses with most of the metals. It is neither malleable or ductile. When united with other metals in equal quantities it makes a very hard, white metal, capable of taking a fine polish, and not liable to tarnish.

BISMUTH.

Bismuth is also known by the name of Isinglass; it combines with most of the metals. Its use is to increase the fusibility of other metals. Bismuth is often used in the manufacture of Pewter or Brittania ware. Used in small quantities, it makes harder and brighter metal, and is more sonorous. Bismuth, 8 parts, and lead, 5 parts, forms a metal that will melt in boiling water.

ANTIMONY

Is an exceedingly brittle metal; neither malleable nor ductile. It may be reduced to powder. Antimony will combine with most metals. It is used as the best ingredient with lead, for printing types, as it gives a lively, sharp impression. 3 parts tin, 2 parts lead and 1 part antimony, will make good nails for soft woods.

Relative Degrees of Hardness and Lustre of Metals.

Hardness.	Lustre.
Iron,	Splendent.
Platina,	Shining,
Copper,	Glistening,
Silver,	Glmmering,
Gold,	Dull,
Tin,	
Lead	

800 degrees of heat give all solid bodies a luminous appearance.

Glass can be drilled, like metal, by using a solution of camphor in turpentine on the common cast steel drill.

Equal parts of copper and nickel make a fine, white metal, susceptible of a fine polish.

German Silver.

Copper, 4 parts; nickel, 1, and zinc 1 — *melt.*

Silver Imitation.

One ounce of tin to one pound of copper, melted, will make a pale bell metal that will roll and ring very much like sterling silver.

Imitation of Gold Bronze.

Melt two ounces of tin, and mix with one ounce of mercury. When this is cold, pulverize it, and add one ounce of muriate of ammonia and one ounce of sulphur; grind all together. Put the compound in a clear fire, (carefully avoiding the fumes,) till the mercury sublimates and rises in a vapor. When the vapor ceases to rise, take the flask from the fire. A flaky, gold colored powder will remain in the flask, which can be applied to ornamental work the same as gold bronze.

Bronzing Metals.

A solution of sal-ammoniac and salt of sorrel, in vinegar, for metals, the more coats applied the deeper the color.

For wood, plaster figures, &c, a composition of yellow ochre, Prussian Blue and lampblack, dissolved in glue water.

Steam Engine.

The author of this work will only give a synopsis of mechanical rules and observations, which have been practically tested; therefore, he will not enter into the detail and unnecessary formulæ which generally

accompany mechanical works. Nearly all scientific laws in mechanical operations need the modifying assistance of practical workmen to render mechanical construction more available for practical uses.

A general rule for estimating the power of a high pressure steam engine:

It is common, in calculating the power of engines, to suppose a horse to draw 200 lbs. at the rate of 2½ miles or 220 feet per minute, with a continual drawing the weight over a pulley. Consequently $200 \times 220 = 44000$ lbs. in one minute, or one pound 44000 per minute, is an estimated horse power for this work.

Watt's estimate is 32,000 feet per minute, and Smeaton's 27,000 feet per minute.

TABLE.

Length of stroke.	Number of strokes.	Feet per minute.
2	43	172
3	32	192
4	25	200
5	21	210
6	19	228
7	17	238
8	15	240
9	14	252

The *stroke* of an engine is twice the length of the crank.

RULE. — *Multiply the area of the cylinder by the effective pressure; say* 10 *lbs., the product is the weight the engine can raise. Multiply this weight by the*

number of feet the piston travels per minute, which will give the momentum, or weight the engine can lift one foot high per minute; divide this momentum by a horse power, as before given, and the quotient will be the horse power.

EXAMPLE. — What is the power of an engine, the diameter of the cylinder being 42 inches, and the stroke 5 feet?

$1385.4 \times 210 \div 44000 = 66.11$, horse power.

STEAM WAYS. — The induction of the steam pipe ought to be one twentieth the area of the cylinder — the eduction pipe should be a little larger than the induction.

OPENING VALVES should be one twenty-fifth the area of the cylinder.

FORCE PUMPS should be one fiftieth part of the area of the cylinder.

PISTON RODS should be one eighth the diameter of the cylinder.

CONNECTING RODS. — Their diameter in the neck should be the same as the piston; the centre size should be found in the following manner: — As .75, the stroke of the piston, is to the length of the body of the rod, so is the area of the neck to the area of the centre.

CRANKS. — When of cast iron, their hubs should be twice the diameter of the shaft upon which they are placed — their depth half their diameter.

The balance or fly wheel is used to bring the crank past the centres.

RULE. — To find its weight, *Multiply the number of horse power of the engine by* 2000, *and divide by the square of the velocity of the circumference of the wheel per second; the quotient will be the weight in hundrad weights.*

CYLINDERS.

The relative thickness of cylinders should be as follows:

Diameter in inches.	Pressure in pounds.	Thickness in inches
6	75	$\frac{5}{8}$
10	75	$\frac{3}{4}$
12	75	$\frac{7}{8}$
20	75	1
24	75	$1\frac{1}{8}$

Cylinders require greater thickness when set in a horizontal position than when inclined or vertical.

The length of journals should be in proportion to their diameter as 5 to 4, and sometimes it may be increased in the ratio of 3 to 2, to advantage.

BOILERS.

ANTHRACITE COAL, WITH A BLOWER.

For a pressure of steam of 50 lbs. to the square inch, with a cut-off at half stroke, internal furnace and flues, there should be from 60 to 65 square feet of fire and flue surface, for every cubic foot in the cylinder.

GRATES. — Their area should be four times the cubic feet in the cylinder.

STEAM ROOM. — There should be from 8 to 10 times the space there is in the cylinder.

BOILERS WITH EXTERNAL FURNACE AND RETURN FLUES.

For 100 lbs. pressure to the square inch, cut off at half stroke, there should be from 35 to 45 square feet for every cubic foot in the cylinder.

GRATES. — Four times the square feet to the cubic feet in the cylinder.

STEAM ROOM. — Eight to ten times the amount in the cylinder.

CYLINDER BOILERS, WITH EXTERNAL FURNACE AND FLUE.

For a pressure of 100 lbs. per square inch, cut off at one half stroke, their length not exceeding 30 feet, there should be from 35 to 45 square feet of surface.

GRATES should be 6 times in square feet to the cubic feet of the cylinder.

STEAM ROOM. — There should be from 6 to 8 times the space there is in the cylinder.

These calculations are based upon the evaporation of fresh water; if sea water is used, the fire surface must be somewhat increased.

FURNACES for coal should be from 2½ to 3 feet in height, over grate bars. For wood, from 4½ to 5 feet, over grate bars.

NOTE. — The preceding Rules are all variable, according to the necessity of the case or the judgment of the mechanic.

MISCELLANEOUS RECIPES.

Etching on Iron, Copper, &c.

Melt a thin coat of beeswax on the article to be marked, then mark, or draw with a steel point, your object, and apply aquafortis, and in ten minutes clean the whole, and your object is accomplished.

Brown Mortar.

Thomaston lime,	1 part,
Clean river sand,	2 "

With a small quantity of hair. Mix with water.

CEMENTS.

For cast iron pipes, 14 lbs. of cast iron boring, ½ lb. of powdered sal-ammoniac, 2 oz. flour of sulphur and water to mix. If not used within a few hours, it should be covered with water until wanted.

ANOTHER. — For flanges of pipes, 10 lbs. cast iron boring, ½ lb. muriate ammoniac, 2 oz. sulphur, linseed oil and white lead, or water to mix.

For bells, dissolve in good brandy a sufficient quantity of isinglass to render it as thick as molasses, and let it harden.

For glass, isinglass dissolved in gin.

For mending stone and casing walls, clean river sand 20 parts, litharge, 2 parts, and quicklime 2 parts, mix with linseed oil to a thin putty. It soon becomes as hard as stone.

For steam boilers, steam engines, &c., white lead in oil, 4 parts, cast iron borings, 4 parts, with a small proportion of sal-ammoniac.

For leather, isinglass, dissolved in good brandy, and thickened to the consistency of paste with gum arabic dissolved in water.

For glass and china ware, dissolve isinglass in alchohol, to which add a little gum resin. When used, it should be gently warmed, and when laid by it should be tightly corked.

A cement that will resist the weather equal to marble, may be made of ashes, 2 parts, clay, 3 parts, and sand, 1 part, mixed with linseed oil.

For crockery and china ware, common white lead in good linseed oil, is an excellent cement for common crockery and crockery and china ware. After cementing, lay the articles by until they become perfectly hard, when they are fit for use.

Fire-Proof Cement.

Vinegar, 1 pint, and milk in an equal quantity.—Mix, and pour off the whey from the curd, and add to the whey 5 or 6 eggs. When mixed, add a little quicklime through a seive, to the consistency of paste. Broken vessels, cemented with this, will resist the action of water as well as fire, to a great degree.

Lacker for Fire-Arms.

Beeswax, 18 parts; boiled linseed oil 4 parts. Mix with spirits of turpentine. Heat the whole with a gentle fire, being careful not to get too hot until well mixed.

Lacker for Bright Iron Work.

Boiled linseed oil, 80 parts; white lead in oil, 11 parts; litharge, 5 parts; pulverized rosin, 2 parts. Simmer the oil and litharge over a slow fire, for two or three hours. Strain it, and add the white lead and rosin, and stir it over a gentle fire until the rosin is dissolved.

To Petrify Wood.

Gem salt, rock alum, white vinegar, chalk, and pebbles powder, in equal quantities, mixed, will petrify wood or any porous substance, in four or five days.

To Write a permanent Black on Silver.

Pulverized burnt lead mixed with sulphur and vinegar. Write, then apply it to the fire, to heat the plate a little, when the writing is made permanent.

To prevent Iron from Corroding.

Burn in, with a gentle heat, clean white wax, and rub it well with a woolen cloth. This will prevent iron from rusting.

Water-proof Mixture for Leather, Boots and Shoes.

Dissolve in neat's foot oil, a sufficient quantity of india rubber to form a varnish. The oil must be kept in a warm place, for three or four days, and the india rubber put in in thin shavings, and when thoroughly dissolved, apply it to the boots.

Ivory.

To soften ivory, take 15 parts pure rain water, 3 parts spirits of nitre, and mix. Put in your ivory, and in three or four days it will yield to the pressure of the fingers.

Lacker for Brass.

Seed lac,	1 ounce,	Mix.
Stick lac,	½ "	
Alcohol,	1 quart.	

Place the whole in a glass bottle, where it will keep warm, for 24 hours, during which time it should be well shaken, when it should be strained through a close flannel. When applied, the work should be warm, and laid on with a camel's hair brush.

ANOTHER.— Seed lac, 3 oz., spirits of wine, 1 pint. After straining, sometime, pour it off, and keep it for use in well stopped bottles.

Iron Blacking.

Dissolve one pound of asphaltum in one quart of spirits of turpentine, in a warm place, taking care not

to get it on fire. When it cools, if too thick, add more spirits of turpentine. This is a cheap, simple and most excellent blacking. When not in use, it should be excluded from the air as much as possible, as it evaporates easy.

Black Varnish for Iron.

Asphaltum, 1 lb., litharge, 2 oz., lampblack, 1 oz., spirits of turpentine, 3 pints. Dissolve with a gentle heat, after which add one quart of Japan. If too thick, reduce with spirits of turpentine. Keep this, also, excluded from the air.

Hardening Large Steels.

Heat the article in a charcoal furnace (using any quantity of old horns, hoofs, &c.) moderately, so that the heat may be equally diffused. When cherry red, lower as suddenly as possible, about three inches below the surface of water, (a little salted,) with the face up, then have water ready, sufficient to pour a continual stream upon the centre of the face, until it is completely cool, when it will come out as hard in the centre as on the edges. But for this process, the heat in large bodies is so long retained in the centre; that it is an extremely difficult matter to accomplish a thorough hardening.

To Remove Mildew from Linen.

Rub it well with soap and powdered chalk. Then spread it in the sun to dry, and as it dries, wet with

water a little two or three times, when it will be completely removed.

A Gilding Varnish.

Spirits of wine, half a pint, saffron, one drachm, dragon's blood, half a drachm, soccotrine aloes. Mix.

ANOTHER. — Spirits of wine, half a pint; saffron, one drachm; dragon's blood, half a drachm; soccotrine aloes, two drachms. Add a proportionate quantity of shellac varnish, place it on a gentle fire, and simmer well together, and it is fit for use.

Tinning Iron.

Clean the iron well, either by scraping or filing; then rub sal-ammoniac powder over it, or muriatic acid. Place it in the melted tin and stir until it is well coated.

Soldering Iron.

Clean the iron well with the file, and warm the iron. Apply muriatic acid to the part to be soldered, and use the common soft solder, with the soldering copper. Powdered rosin used instead of muriatic acid, if more convenient, will do.

Scaling Cast Iron.

Take vitriol, one part; water, two parts. Mix, and lay on the diluted vitriol with some old cloth made in the form of a brush, enough to wet the surface well.

Let it stand eight or ten hours, and wash off with water, when the hard scaly surface will be completely removed. This method is universally adopted by machinists in cleaning their castings.

Cast Iron Ornaments.

Diluted sulphuric acid, applied to cast iron ornaments, or castings of any description, oxidizes the surface, and renders it susceptible of being finished with a scraper, where it cannot be reached with files. Care should be taken to keep it free from hands and clothing. This recipe alone has been sold for five dollars. Sulphuric acid 1 part; water 2 to 3 parts.

Iron Lustre.

Is obtained by dissolving a piece of zinc with muriatic acid, and mixing the solution with the spirit of tar, and applying it to the surface of iron.

Silver Plating.

The process is similar for copper, brass or iron. After smoothing the surface of the article to be plated, it should be made red hot and plunged into very dilute nitric acid, till it be bright and clean. It should then be warmed to such a degree that would cause a slight hissing sound in water, and in that state it is dipped in a very weak aquafortis. It is then heat to a blue color, and the silver leaf applied in double thicknesses, and fixed with steel burnishers. After

applying two silver leaves, the piece must be heated as before, and 4 additional leaves applied, with the burnisher, and so on, 4 or 6 leaves at a time, until 30, 40, 50 or 60 leaves have been applied, according to the desired solidity of the plating. It is then burnished down with great pressure and skill, until a uniform silvery aspect has been acquired.

Silver Wash.

One part of silver precipitate, with 10 parts of cream tartar, mixed and applied with a wet soft leather, after which it should be washed and varnished.

Another.

A mixture of 1 part of silver powder, precipitated by copper; 2 parts of cream tartar, and as much common salt. This should be applied as before, and washed in weak soap suds, and wiped dry before the fire.

Another.

The white curd obtained by adding a solution of common salt, to one of nitrate of silver. Is to be well washed and dried: one part of this powder is to be mixed with 3 parts of good pearl ash, one of washed whiting, and 1½ of sea salt. After cleaning the surface of the article, it should be rubbed with a soft leather or cork, moistened with water, and dipped in the powder. The silvering should then be washed, dried and varnished.

Leather is Silvered by applying a coat of spirit varnish to the surface, and then silver leaf with pressure.

Staining Woods.

YELLOW. — Diluted nitric acid produces a yellow surface.

RED. — A solution of dragon's blood in spirits of wine produces a red surface.

BLACK.—A strong solution of nitric acid produces a black.

MAHOGONY. — Madder and logwood dissolved in hot water produces mahogany.

GREEN.—A solution of verdigris in nitric acid produces a green.

Then dipped into a hot solution of pearlash, produces a blue.

PURPLE.—A solution of sal-ammoniac in nitric acid produces a purple.

Indelible Ink.

Two drachms of nitrate of silver added to a weak solution of tincture of galls; to be used with a pen.

To be used with a brush or type, add gum arabic, to thicken it.

ANOTHER.—Three drachms of nitrate of silver to half a pint of pure rain water. Moisten the cloth in either case, with salt of tartar, or alum-water. Dry and iron smooth. Write with a pen.

For Hardening a Whitewash.

With half a pailful of common whitewash, add half a pint of flour. Pour on boiling water in a sufficient quantity to thicken it. Then add to six gallons of the lime and water, and stir well.

Shoe Blacking.

Ivory black, 3 oz., vinegar, 1 qt., oil of vitriol, 1-2 oz., loaf sugar, 1-2 lb., sweet oil, 1 oz. Mix together.

To Soften Horn.

Wood ashes, 1 lb., quicklime, 2 lbs. Boil in one quart of water until reduced to one third; then dip a feather into it, and if the plumes come off on drawing it out, it is boiled enough. When it settles, filter it off, and in the strained liquor add shavings of horn. Let them soak for three days, when by rubbing a little oil on your hands, you can work and 'mould the horn into any shape you wish.

Watchmaker's Oil.

A slip of sheet lead, immersed in a bottle of pure olive oil, and placed in a window, where it may receive the sun's rays, has the effect to raise upon the surface of the oil a curdy mass, which soon settles to the bottom, leaving a limpid and colorless oil, which being decanted off for use, is unsurpassed.

Iron Rust.

To extract iron rust from linen: purchase an ounce of oxalic acid, at any apothecary's; put a few of the crystals on the iron spot to be removed, and pour hot water on them, and the iron rust will immediately disappear. It is a poison, and should be labeled and placed beyond the reach of children.

Suffocation.

A wet silk handkerchief placed over the face, is a good security against suffocation and smoke; it permits free breathing, and excludes the smoke from the lungs.

Ether for Tooth Ache.

On pouring a little ether upon the hand and applying it to the forehead or cheek, the pain will immediately cease.

Hedge Fence.

Cherokee Rose makes the most magnificent and durable hedge fence. No animal without wings can get over or through it, and when in bloom fills the air with the most delicious perfume.

Alleviation from Cough.

A small piece of resin placed in warm water upon a stove, adds a peculiar property to the atmosphere in

a room, and will give great relief to persons troubled with a cough. The experiment is simple, and worth trying.

Earthen Ware.

Earthern ware is glazed with lead. Acids dissolve it, and is therefore dangerous to use it for some purposes. Pickles and vinegar should be kept in glass jars. Preserves likewise.

Marble Fire Places,

Should never be washed with soap suds, but rubbed with a nice oiled cloth, and then with a dry soft rag. Good furniture treat in the same way. A silk rag is best. The result is a very fine polish.

The Cook's Weights and Measures.

Wheat Flour, 1 pound is 1 quart. Indian Meal, 1 pound, 2 ounces, is 1 quart. Butter, when soft, 1 pound, 1 ounce, is 1 quart. Loaf Sugar, 1 pound, broken, is 1 quart. White Sugar, 1 pound, 1 ounce, powdered, is 1 quart. Best Brown Sugar, 1 pound, 2 ounces, is 1 quart. Eggs, average size, 10 Eggs 1 pound.

Liquid Measure.

16 large table-spoonsful, ½ pint.
8 " " 1 gill.

4 large spoonsful, 1 glass.
A common sized tumbler holds ½ a pint.
A common sized wine glass holds ½ a gill.

Keeping Fresh Beef.

In keeping fresh beef, the ribs will keep longest, the middle of the loin next, the rump next, and the shortest of all, the brisket.

RULES AND DIRECTIONS FOR PROCEEDINGS IN THE PATENT OFFICE.

¶ The following information and regulations are mainly intended for the benefit of persons having business with the Patent Office. They are designed to be in strict accordance with the acts of Congress applicable to the subject; which acts are printed in pamphlet form, and will be forwarded by the office to any one who may desire them.

Who Entitled to a Patent.

1. Any person, whether citizen or alien, may obtain a patent for any invention or improvement made by him, and not before known. For greater particularity, see act of 1836, sections 6 and 7; act of 1842, section 3.

2. The assignee of any invention may have the patent issue to him directly, (act of 1837, section 6;) but this is held to apply only to the assignees of entire interests; so that although, when the inventor assigns his *entire* interest to two or more, a pateut will issue to them jointly, still if he yet retains a portion in himself, a joint patent will not be issued to him and them. The reason of this is not very evident, but the Attorney General has so decided.

3. In case of the death of the inventor, the patent will issue to his legal representatives. (Act of 1836, section 10.)

4. Joint inventors are entitled to a joint patent; but neither can claim one separately.

What will prevent the granting a Patent.

5. Even although the applicant has in good faith actually made an invention, a patent therefor will not be gra

him if the whole or any part of what he claims as new had before been patented or described in any printed publication in this or any foreign country, or even if it had before been invented or discovered *in this country*, (act of 1836, section 7 ;) or if he has once abandoned his invention to the public; or if, with his consent and allowance, it has been for more than two years in public use or on sale. (Act of 1836, section 6 ; act of 1839, section 7.)

6. The mere fact of prior invention or discovery abroad will not prevent the issue of the patent, unless the invention had been patented or described in some printed publication. (Act of 1836, section 7 ; also act of 1836, section 15.)

7. Merely conceiving the idea of an improvement or machine in this country, is not such an "invention" or "discovery" as is above contemplated. The invention must have been reduced to a practical form, either by the construction of the machine itself, or of a model thereof, or at least by making a full drawing of it, before it will prevent a subsequent inventor from obtaining a patent. (See Hildreth *vs.* Heath, and Perry *vs.* Cornell, decided by Judge Cranch on an appeal from the Commissioner.)

Mode of proceeding to obtain a Patent.

8. The application must be made by the actual inventor, if alive, (act of 1836, section 6,) even although the patent is to issue to the assignee, (act of 1837, section 6 ;) but where the inventor is dead, the application and oath may be made by the executor or administrator. (Act of 1836, section 10.

9. The application must be made in writing, signed by the applicant, and addressed to the Commissioner of Patents.

The following is the usual form, to be varied according to circumstances :

Petition.

To the Commissioner of Patents;

The petition of John Fitch, of Philadelphia, in the county of Philadelphia, and State of Pennsylvania,

Respectfully represents:

That your petitioner has invented a new and improved mode of preventing steam-boilers from bursting, which he verily believes has not been known or used prior to the invention thereof by your petitioner. He therefore prays that letters patent of the United States may be granted to him therefor, vesting in him and his legal representatives the exclusive right to the same, upon the terms and conditions expressed in the act of Congress in that case made and provided; he having paid thirty dollars in the treasury, and complied with the other provisions of the said act.

JOHN FITCH.

10. The applicant must set forth in his specification the precise invention for which he claims a patent.

If claimed as a mere improvement on another invention, that fact should be clearly stated; and if claimed as substantially differing from another invention with which it appears to be coincident, the difference must be clearly pointed out.

11. Two or more separate machines will not be allowed to be the subject of one patent, whatever be the purpose for which they are used. This is intended to change the practice of the office in those respects, wherein in certain cases all the machines used in the manufacture of one article are allowed to be claimed in one application.

12. The specification must be signed by the inventor, (or by his executor or administrator if the inventor be dead.) It should describe the sections of the drawings (when there are drawings) and refer by letters and figures to the different parts. The substantial requisites of the specification

are set forth in the act of Congress of 1836, section 6. The following may be taken as a specimen of the proper form;

Specification.

To all whom it may concern:

Be it kuown that I, John Fitch, of Philadelphia, in the county of Philadelphia, in the State of Pennsylvania, have nvented a new and improved mode of preventing steam-boilers from bursting; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

The nature of my invention consists in providing the upper part of a steam-boiler with an aperture in addition to that for the safety-valve; which aperture is to be closed by a plug or disk of alloy, which will fuse at any degree of heat, and permit the steam to escape, should the safety-valve fail to perform its functions.

To enable others skilled in the art to make and use my invention, I will proceed to describe its constructioa and operation. I construct my steam-boiler in any of the known forms, and apply thereto guage-cocks, a safety-valve, and the other appendages of such boilers; but, in order to obviate the danger arising from the adhesion of the safety-valve, and from other causes, I make a second opening in the top of the boiler, similar to that made for the safety-valve, as shown at A, in the accompanying drawing; and in this opening I insert a plug or fusible disk of alloy, securing it by a metal ring and screws, or otherwise. This fusible metal, I in general, compose of a mixture of lead, tin, and bismuth, in such proportions as will ensure its melting at a given temperature, which must be that to which it is intended to limit the steam; and will, of course, vary with the pressure the boiler is intended to sustain.

I surround the opening containing the fusible alloy by a

tube, B, intended to conduct off any steam which may be discharged therefrom. When the temperature of the steam in such a boiler rises to its assigned limit, the fusible alloy will melt, and allow the steam to escape freely, thereby securing it from all danger of explosion.

What I claim as my invention, and desire to secure by letters patent, is the application to steam boilers of a fusible alloy, which will melt at a given temperature, and allow the steam to escape, as herein described, using for that purpose the aforesaid metallic compound, or any other substantially he same, and which will produce the intended effect.

JOHN FITCH.

Witnesses—

ROBERT FULTON,
OLIVER EVANS.

When the application is for a machine, the specification should commence thus:

Be it known that I, ——, of ——, in the county of ——, and State of ——, have invented a new and useful machine for [stating the use and title of the machine; and if the application is for an improvement, it should read thus: a new and useful improvement on a, or on the, machine, &c.]—and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same; reference being had to the annexed drawings, making a part of this specification, in which figure 1 is a perspective view; figure 2 a longitudinal elevation; figure 3 a tranverse section, &c.; (thus describing all the sections of the drawings, and then referring to the parts by letters. Then follows the description of the construction and operation of the machine; and lastly the claim, which should express the nature and character of the invention and identify the parts claimed separately or in combination.

If the specification is for an improvement, the original invention should be disclaimed, and the claim confined to the improvement.)

13. The specification must be signed by the inventor and attested by two witnesses. (Act of 1836, section 6.)

14. The applicant must then make oath or affirmation as required by the act of 1836, section 6, which must be substantially as follows:

Oath.

CITY AND COUNTY OF PHILADELPHIA, } *ss.*
State of Pennsylvania. }

On this ——— day of ———, 185 , before me, the subscriber, a ———, personally appeared the within named John Fitch, and made solemn oath (or affirmation) that he verily believes himself to be the original and first inventor of the mode herein described for preventing steam-boilers from bursting; and that he does not know or believe the same was ever before known or used; and that he is a citizen of the United States.

(Signed) A. B.
Justice of the Peace.

In the case of an alien, who has taken the requisite steps to become naturalized, the following form should be adopted:

CITY AND COUNTY OF PHILADELPHIA, } *ss.*
State of Pennsylvania. }

On this ——— day of ———, 185 , before me, the subscriber, a ———, personally appeared the within named John Fitch, and made solemn oath (or affirmation) that he verily believes himself to be the original and first inventor of the mode herein described for preventing steam-boilers from bursting, and that he does not know or believe the same was ever before known or used; and that he is a native of the Kingdom of Great Britain; that he has resided

within the United States for the whole of the past year, and has taken the oath prescribed by law for becoming naturalized in this country.

(Signed) A. B.

Justice of the Peace.

15. If the applicant is an alien not residing in the United States, or if he has not taken the requisite steps to become naturalized, the oath must be modified accordingly. (See act of 1836, section 9.)

16. The oath may be taken before any person authorized by law to administer oaths. When taken before a justice of the peace not having the seal of office, the fact of his being an acting justice of the peace should be certified to by the clerk of the proper court, attested by his seal of office.

17. When the oath is taken in a foreign country, the oath may be taken before any minister plenipotentiary, charge d' affairs, consul or commercial agent, holding commission under the government of the United States, or before any notary public of the country in which the oath is taken, being attested in all cases by the proper official seal.

18. The drawings required by law (see act of 1836, section 6) should generally be in perspective. Such parts as cannot be shown in perspective must, if described, be represented in plans, sections, or details.

19. Duplicate drawings should be sent to the office in the first instance. They should be neatly executed on sheets separate from the other papers—from eighteen to nineteen inches from top to bottom, and not less than thirteen across, nor more than twenty-five, unless more space is necessary to exhibit the device or machine with clearness. One of these drawings, which is to be kept in the office for reference, should be on stiff drawing paper. The other, which is to be attached to the patent, should have a margin of one inch at least for that purpose on the right-hand side, and

should be on some material that will bear folding and transportation. Each part should be distinguished by the same number or letter, wherever that part is delineated in the drawings, and should be referred to in the specification by such letter or number. These drawings should be signed by the applicant and attested by two witnesses.

20. The model must be neatly and substantially made of durable material, and not more than one foot in length or height, except when a larger model is permitted by the office for special reasons to be shown by the applicant. If made of pine or other soft wood, it should be painted, stained, or varnished.

A working model is always desirable, in order to enable the office fully and readily to understand the precise operation of the machine. The name of the inventor, and also of the assignee (if assigned,) must be fixed upon it in a permanent manner.

21. When the invention is of a composition of matter, a specimen of the ingredients and of the composition, which the law requires, must accompany the application (see act of 1836, section 6,) and the name of the inventor and assignee (if there be one) must be permanently affixed thereto.

22. Models or specimens forwarded without a name are liable to be lost or mislaid, as they cannot be entered upon the record.

23. No application can be examined, nor can the case be placed upon the files for examination, until the fee is paid and the model or specimen deposited, and a specification together with a petition, oath, and drawings (when required,) are filed.

24. The following persons are appointed agents to receive and forward to this office, models, specimens, and manufac-

tures, in accordance with the tenth section of the act of 1837:

The collector of the port of Portsmouth, New Hampshire.
The collector of the port of Portland, Maine.
The collector of the port of Burlington, Vermont.
The collector of the port of Providence, Rhode Island.
The collector of the port of Boston, Massachusetts.
The collector of the port of Hartford, Connecticut.
The collector of the port of New York.
The collector of the port of Philadelphia, Pennsylvania.
The collector of the port of Baltimore, Maryland.
The collector of the port of Richmond, Virginia.
The collector of the port of Charleston, South Carolina.
The collector of the port of Savannah, Georgia.
The collector of the port of New Orleans, Louisiana.
The collector of the port of Detroit, Michigan.
The collector of the port of Buffalo, New York.
The surveyor at St. Louis, Missouri.
The collector of the port of Cleveland, Ohio.
The surveyor at Chicago, Illinois.
The surveyor at Cincinnati, Ohio.
The surveyor at Louisville, Kentucky.

Of the Examination.

25. All cases in the Patent Office are arranged in classes, which are taken up for examination in regular rotation.

Those in the same class are examined and disposed of, as far as is practicable, in the order in which the respective applications are completed. When, however, the applicant has a foreign patent for his invention, or when such invention is deemed of peculiar importance to some branch of the Public service, and when, for that reason, the head of some department of the government specially requests immediate action, the case will be taken up out of its order. These, with applications for additional improvements and reissues,

are the only exceptions to the rule above stated in relation to the order of examination.

26. A defective specification or drawing is amendable at any time before the patent issues. But where any substantial change is made by describing or representing a new invention—not included as a part of the invention originally described—a second affidavit must be made to the specification as amended, and the signature of witnesses will also be required anew.

27. When the change thus made is very considerable, the case may be placed at the foot of the list, to await its turn anew in the order of examination.

27. After a case has been examined and the claim allowed, no alteration will be permitted in the character of the invention without a withdrawal of the case and the filing of a new application, or (if the patent be granted) an application for a reissue, or for an additional improvement, as the case may require.

29. The personal attendance of the applicant at the Patent Office is unnecessary. The business can be done by correspondence or by attorney. All correspondence must be addressed to the Commissioner.

30. When an application has been finally decided, the office will retain the original papers furnishing the applicant copies—if he desires them—at the usual expense.

31. If the patent is granted, it will be transmitted to the inventor, or to his agent, in case he has full power of attorney authorizing him to receive it. If an assignment be made of the entire patent right, the patent will be sent to the assignee or to his attorney.

Of Withdrawal.

32. If, when an application is rejected, the applicant relinquishes his claim, in pursuance of the 7th section of the act of 1836, and the 12th section of the act of 1837, he must

notify the Commissioner of the fact of such withdrawal, sending at the same time his receipt for two-thirds of the fee paid by him, which will thereupon be returned. The model and papers will be retained by the office. The applicant may, however, have the duplicate drawing if he desires it.

33. No money will be refunded when the withdrwal is made after an appeal has been taken to either of the judges of the circuit court of the District of Columbia.

34. In withdrawing an application the following forms may be followed:

To the Commissioner of Patents:

Sir: I hereby withdraw my application for a patent for improvements in the cotton-gin now in your office, and request that twenty dollars may be returned to me, agreeably to the provision of the act of Congress, authorizing such withdrawal.

ELI WHITNEY.

Cabotsville, Mass., *February* 16, 1853.

Received of the Treasurer of the United States, per Charles Mason, Commissioner of Patents, twenty dollars being the amount refunded on withdrawing my application for a patent for improvements in the cotton-gin.

ELI WHITNEY.

Cabotsville, Mass., *February* 16, 1854.

35. Particular instructions should be given by the person withdrawing money from the office as to the manner in which the money shall be paid—whether to his order at this office, or remitted by mail.

36. When caveats have been filed, withdrawals can be made the same as in other cases; but no part of the fee will be returned to the applicant until after he has completed his application by filing his specification and model.

Retaining Patents in the Secret Archives.

37. No application upon which a patent has been ordered to issue shall be retained in the secret archives of the office more than six months after the patent was ordered to issue. The request to have the application placed in the secret archives shall in all cases be made by the patentee, or the assignee of all the interest therein, in writing, and filed with the chief clerk, before the patent shall be recorded.

Of Appeals.

38. If the applicant, instead of withdrawing, chooses to persist in his claim, he must make his oath or affirmation anew. (Act of 1836, section 7.) After which, he may appeal to the chief justice or to either of the associate justices of the circuit court of the District of Columbia. (Acts of 1836, section 7; 1839, section 11; 1852, section 1.)

39. The mode of appeal is by giving notice thereof to the Commissioner, filing in the Patent Office, within such time as the Commissioner shall appoint, his reasons for appeal, and paying to him the sum of twenty-five dollars. (Act of 1839, section 11.) Blanks for the notice of appeal, the reasons of appeal, the petition, and copies of the appellate judge's rules, will be forwarded on request.

Of Interferences.

40. When each of two or more persons claims to be the first inventor of the same thing, an "interference" is declared between them, and a trial is had before the Commissioner. Nor does the fact that one of the parties has already obtained a patent prevent such an interference; for although the Commissioner has no power to cancel a patent already issued, he may, if he finds that another person was the prior inventor, give him also a patent, and thus place them on an equal footing before the courts and the public. (Act of 1836, section 8.)

41. Upon the declaration of an interference, a day will be fixed for closing the testimony, and a further day fixed for the hearing of the cause. Previous to this latter day, the arguments of counsel must be filed, if at all.

42. If either party wishes a postponement of either the day for the closing of the testimony or the day of hearing, he must, before the day he thus seeks to postpone is past, show by affidavit a sufficient reason for such postponement.

43. Appeals lie in all cases of interference, whoever may be the parties and whichever way the decision may be. (Act of 1836, section 8.) As to remedy by bill in equity, see act of 1836, section 16.

Of Reissues, and Additional Improvements.

44. A reissue is granted to the original patentee, his heirs or assigns, when by reason of an insufficient or defective specification the patent is invalid, provided the error has arisen from inadvertency, accident or mistake, without any fraudulent or deceptive intention. (Act of 1836, section 13.)

45. The general rule is, that whatever is really embraced in the original invention, and so described or shown that it might have been embraced in the original patent, may be the subject of a reissue.

46. A modification of a patent so as to include an additional improvement is allowed in favor of the original patentee only, and may embrace any improvement made by him *subsequent to the issuing of the patent*, but none other. (Act of 1836, section 13.)

47. In each of the above cases the modified patent expires at the same time the original patent would have done. For this reason such applications will be acted upon immediately after they are completed.

48. Where a reissue is granted, the applicant may, at his option, have separate patents issued for the several distinct parts of the thing patented, by paying the requisite additional fees, and complying with the other requirements of the law as in original applications. (Act of 1837, section 5.)

49. In all cases of application for reissues and for additional improvements. the original claim is subject to re-examination, and may be revised and restricted in the same manner as in original applications. (Act of 1837, section 8.)

50. But in all such cases, after the action of the Patent Office has been made known to the applicant, if he prefers the patent originally granted to that which will be allowed by the decision of the office, he has the privilege of abandoning it, and retaining the old one.

51. The following are appropriate forms of application for reissues and for additional improvements.

Surrender of a patent for reissue.

To the Commissioner of Patents:

The petition of Samuel Morey, of Philadelphia, in the county of Philadelphia, and State of Pennsylvania,

Respectfully Represents:

That he did obtain letters patent of the United States for an improvement in the boilers of steam-engines, which letters patent are dated on the first day of March, 1835; that he now believes that the same is inoperative and invalid by reason of a defective specification, which defect has arisen from inadvertence and mistake. He therefore prays that he may be allowed to surrender the same, and requests that new letters patent may issue to him, for the same invention, for his residue of the period for which the original patent was granted, under the amended specification herewith pre-

sented, he having paid fifteen dollars into the treasury of the United States, agreeably to the requirements of the act of Congress in that case made and provided.

SAMUEL MOREY.

Form of oath to be appended to applications for reissue.

CITY AND COUNTY OF PHILADELPHIA, } ss.
State of Pennsylvania. }

On this —— day of ———, 185 , before the subscriber, a ———, personally appeared the above named Samuel Morey, and made solemn oath (or affirmation) that he verily believes that by reason of an insufficient or defective specification, his aforesaid patent is not fully valid and available to him; that the said error has arisen from inadvertency, accident, or mistake, and without any fraudulent or deceptive intention, to the best of his knowledge or belief.

(Signed,) —— ———.

Addition of new improvements.

TO THE COMMISSIONER OF PATENTS:

The petition of James Rumsey, of the county of Berkeley, and State of Virginia,

RESPECTFULLY REPRESENTS:

That your petitioner did obtain letters patent of the United States for an improvement in the boilers of steam-engines, which letters patent are dated March, 1835; that he has since that date made certain improvement on his said invention, and that he is desirous of adding the subjoined description of his said improvements to his original letters patent, agreeably to the provisions of the act of Congress in that case made and provided, he having paid fifteen dollars into the treasury of the United States, and otherwise complied with the requirements of the said act.

JAMES RUMSEY.

A specification and claim should then follow substantially as in case of an original application. The oath must also be the same, except that he need not swear to citizenship, but instead thereof should state as follows: "And that said new improvement was made by him subsequent to the date of his aforesaid patent."

Of Disclaimers.

52. Where, by inadvertence, accident, or mistake, the original patent is too broad, a disclaimer may be filed either by the original patentee or by any of his assignees. (Act of 1837, section 7.)

By the English law, as well as by the act of 1636, (section 15,) if the patent were too broad it was wholly invalid. The case is now different here, but still the necessity of a disclaimer is manifest. (See act of 1837, section 9.)

53. The following is a sufficient form for a disclaimer:

To the Commissioner of Patents:

The petition of Sebastian Cabot, of Cabotsville, in the county of Hampden, and State of Massachusetts,

Respectfully Represents:

That he has, by assignment, duly recorded in the Patent Office, become the owner of a right for the several States of Massachusetts, Connecticut, and Rhode Island, to certain improvements in the steam-engine, for which letters patent of the United States were granted to John Doe, of Boston, in the State of Massachusetts, dated on the first day of March, 1835; that he has reason to believe that, through inadvertance and mistake, the claim made in the specification of said letters patent is too broad, including that of which the said patentee was not the first inventor. Your petitioner, therefore, hereby enters his disclaimer to that part of the

claim in the aforenamed specification, which is in the following words, to wit: "I also claim the particular manner in which the piston of the above described engine is constructed, so as to insure the close fitting of the packing thereof to the cylinder, as set forth; which disclaimer is to operate to the extent of the interest in said letters patent vested in your petitioner, who has paid ten dollars into the treasury of the United States, agreeably to the requirements of the act of Congress in that case made and provided."

SEBASTIAN CABOT.

When the disclaimer is made by the original patentee, it must, of course, be so worded as to express that fact.

Of Extensions.

54. The power of extending a patent for seven years from the day on which it would expire, is now vested in the Commissioner of Patents. (Act of 1836, section 18, and act of 1848, section 1.)

55. To justify the office in thus extending a patent, the two following questions must be first decided in the affirmative: 1st. Was the invention new and patentable when originally patented?

2d. Has the patentee, without neglect or fault on his part, failed to obtain from the use and sale of his invention a reasonable remuneration for the time, ingenuity, and expense bestowed upon his invention, and the introduction thereof into use? (Act of 1836, section 18; 1848, section 1.)

56. The applicant for an extension should file his petition and pay in the requisite fee at least three months prior to the expiration of his patent, to give time for the sixty days' notice required to be given, and to allow a sufficien t time to the Commissioner to examine the case fully afte the expiration of those sixty days, and previous to the day on which the patent is to expire. There is no power in the Patent Office to renew a patent after it has once expired.

(Act of 1836, section 18; 1848, section 1.)

57. The applicant for an extension must furnish to the office a statement in writing, under oath, of the ascertained value of the invention, and of his receipts and expenditures. This statement should be made particular and in detail, unless sufficient reason is set forth why such a statement cannot be furnished. (Act of 1836, section 18; 1848, section 1.)

This statement must be filed within thirty days after filing his petition, as contemplated in the preceding section.

58. Any person opposing the extension of a patent, must file his reasons in the Patent Office at least twenty days before the day of hearing, as set forth in the notices published. He may also, at any time after the application for an extension has been made, give notice to the applicant of his intention to oppose the said extension. After this notice, he will be regarded as a party in the case, and be entitled to notice of the time and place of taking testimony, as well as to a list of the names and residences of witnesses whose testimony may have been previously taken.

59. The person opposing the extension will be entitled to a copy of the application, and any other papers on file, upon paying the costs of copying.

60. In contested cases no testimony will be received, unless by consent, which has been taken more than thirty days previous to the day fixed for closing the testimony.

61. The notice of the application for an extension will fix a day for the closing of the testimony, and also a day for the hearing. The depositions and other papers relied upon as testimony, must be filed in the office on or before the morning of the day next after that fixed for closing the testimony; and the arguments (if any) must be filed within ten days thereafter, unless some other time be fixed by the office.

62. Applications for a postponement of the hearing must be made and supported according to the same rules as

are to be observed in the case of interferances. But they will not be granted in such a manner as to cause a risk of preventing a decision in season.

Of Designs.

63. In making an application to patent a design, the same course is to be pursued as in case of an application for patenting a machine; but in case of rejection, no part of the fee is refunded.

64. Nor can a patent for a design be obtained by any alien unless he has resided one year within the United States, and taken an oath of his intention to become a citizen thereof. (Act of 1842, section 3.)

65. The following, or other equivalent forms, are proper to be observed in applications of this nature:

Form of application for patents for design.

To the Commissioner of Patents.

The petition of Benjamin West, of the city and county of Philadelphia, and State of Pennsylvania,

Respectfully represents:

That your petitioner has invented or produced [a new and original design for a composition in alto-relievo,] which he verily believes has not been known prior to the production thereof by your petitioner. He therefore prays that letters patent of the United States may be granted to him therefor, vesting in him and his legal representatives the exclusive right to the same, upon the terms and conditions expressed in the act of Congress in that case made and provided, he having paid fifteen dollars into the treasury, and complied with the other provisions of the said act.

BENJAMIN WEST.

Form of specification.

To all whom it may concern:

Be it known, that I, Benjamin West, of the city of Phila-

delphia, in the county of Philadelphia, and State of Pennsylvania, have invented or produced a new and original design for a composition in alto relievo, and I do hereby declare that the following is a full and exact description of the same:

[Here follows a description of the design, with reference to the specimen or drawing, the specification to conclude with declaring what the inventor claims, in terms characteristic of the design, &c.]

BENJAMIN WEST.

Witnesses—
NOAH WEBSTER,
NATHANIEL BOWDITCH.

Form of oath.

CITY AND COUNTY OF PHILADELPHIA, } ss.
State of Pennsylvania }

On this ——— day of ———, 185 , before the subscriber, a ———, personally appeared the within named Benjamin West, and made solemn oath (or affirmation, as the case may be) that he verily believes himself to be the origina and first inventor or producer of the design for a composition in alto relievo, and that he does not know or believe that the same was ever before known or used, and that he is a citizen of the United States.

(Signed,) B. A.

Of Foreign Patents.

66. The taking out of a patent in a foreign country does not prejudice a patent previously obtained here; nor does it prevent obtaining a patent here subsequently.

When the patent is applied for here, after being obtained abroad, it will only extend fourteen years from the date of the foreign patent. For this reason such cases will be acted upon out of their order, and as soon as the application is completed. (Act of 1839, section 6.)

67. Where an applicant seeks to make his a preferred case, in consequence of his having obtained a foreign patent, he should (temporarily) file in the office the patent so obtained, with the specifications (provisional or complete) attached, or a sworn copy of those. But where such papers or copies cannot be conveniently furnished, it will be sufficient if the reasons of such inability be set forth by affidavit, and also the fact that a foreign patent has actually been obtained, (giving its date,) and showing clearly that the invention so patented, covers the whole ground of his present application.

Of Patents obtained by Aliens.

68. If an alien neglect to put his invention on public sale within eighteen months after the patent is granted, and continue it on sale to the public on reasonable terms, his patent will cease to protect him. (Act of 1836, section 15.)

Of Caveats.

69. Any citizen or alien who has resided for one year last past in the United States, and has made oath of his intention to become a citizen thereof, can file a caveat in the secret archives of the Patent Office. And if at any time within one year thereafter another person applies for a patent for the same invention, the caveator will be entitled to notice, to complete his specification, and to go into interference with the applicant for the purpose of proving priority of invention, and obtaining the patent if that fact be proved. (Act of 1836, section 12.)

70. The caveator will not be entitled to notice of any application pending at the time of filing his caveat, nor of any application filed after the expiration of one year from the date of filing the caveat. But he may renew his caveat at the end of one year by paying a second caveat fee, which will continue it in full force for one year longer, and so on from year to year as long as the caveator desires.

No caveat can be filed in the secret archives of the office unless accompanied by an oath of the caveator that he is a citizen of the United States, or that he is an alien and has resided for one year last past within the United States, and has made oath of his intention to become a citizen thereof; nor unless the applicant also states, under oath, that he believes himself the original inventor of the art, machine, or improvement set forth in his caveat.

71. A caveat need not contain as particular a description of the invention as is requisite in a specification; but still the description should be sufficiently precise to enable the office to judge whether there is a probable interference when a subsequent application is filed.

72. Caveat papers cannot be withdrawn from the office nor undergo alteration after they have once been filed, but additional papers relative to the invention may be appended to the caveat, (their date being noted,) provided they are merely amendatory of the original caveat.

73. In the case of filing papers supplementary to an original caveat, the right to notice in regard to the subject of those papers expires with the caveat; and any additional papers not relating to the invention first caveated, will receive no notice.

74. The caveator, or any other person properly authorized by him, can at any time obtain copies of the caveat papers at the usual rates.

75. It is desirable that the caveat should be accompanied by drawings or sketches, and even by a model if convenient.

76. The following will give a general idea of the proper form of a caveat:

To the Commissioner of Patents:

The petition of Sebastian Cabot, of Cabotsville, in the county of Hampden, and State of Massachusetts,

Respectfully represents:

That he has made certain improvements in the mode of

constructing the boilers for steam-engines, and that he is now engaged in making experiments for the purpose of perfecting the same preparatory to his applying for letters patent therefor. He therefore prays that the subjoined description of his invention may be filed as a caveat in the confidential archives of the Patent Office, agreeably to the provisions of the act of Congress in that case made and provided; he having paid twenty dollars into the treasury of the United States, and otherwise complied with the requirements of the said act.

SEBASTIAN CABOT.

CABOTSVILLE, *March* 1, 1838.

Here should follow a description of the general principles of the invention, so far as it has been completed.

Penalties for Certain Acts.

77. Patentees or their assignees are required to affix the date of the patent on each article vended or offered for sale, under a penalty of not less than one hundred dollars. (Act of 1842, section 6.)

78. Stamping or affixing the name of any patentee on any article without authority to do so, or affixing the word "patent" or "letters patent," or the stamp, mark, or device of any patentee on any unpatented article, is forbidden under a like penalty. (Act of 1842, section 5.)

Of the Repayment of Money.

79. Money paid by actual mistake will be refunded, (act of 1842, section 1;) but a mere change of purpose after the payment of money will not enable the person to obtain his money and withdraw his papers.

Of Assignments.

80. An inventor can assign his entire right before a patent is obtained, so as to enable the assignee to take out a patent in his own name, (see section 2d of these instruc

tions;) but the assignment must first be recorded and the specification sworn to by the inventor. (Act of 1837, section 6.)

In the case of an assignment by a foreigner, the same fee will be required as if the patent issued to the inventor.

81. After a patent is obtained, the patentee may assign the right to make or use the thing patented in any specified portion of the United States, (act of 1836, section 11;) but no such assignment to specified portions of the United States, made prior to obtaining the patent, will enable the assignees to take out the patent in their own names.

82. Every assignment should be recorded within three months from its date; but if recorded after that time, it will protect the assignee against any one purchasing after the assignment is placed on record.

83. When the patent is to issue in the name of the assignee, the entire correspondence should be in his name.

84. The receipt of assignments is not generally acknowledged by the office. They will be recorded in their turn within a few days after their reception, and then transmitted to persons entitled to them.

85. Form of assignment of the entire interest in letters patent before obtaining the same, and to be recorded preparatory thereto:

Whereas I, Jethro Wood, of Scipio, in the county of Cayuga, and State of New York, have invented certain new and useful improvements in ploughs, for which I am about to make application for letters patent of the United States; and whereas, David Peacock, of Burlington, New Jersey, has agreed to purchase from me all the right, title, and interest which I have, or may have, in and to the said invention, in consequence of the grant of letters patent therefor, and has paid to me, the said Wood, the sum of five thousand dollars, the receipt of which is hereby acknowledged: Now this indenture witnesseth, that for and in consideration of the said

sum to me paid, I have assigned and transferred, and do hereby assign and transfer, to the said David Peacock, the full and exclusive right to all the improvements made by me, as fully set forth and described in the specification which I have prepared and executed preparatory to the obtaining of letters patent therefor. And I do hereby authorize and request the Commissioner of Patents to issue the said letters patent to the said David Peacock, as the assignee of my whole right and title thereto, for the sole use and behoof of the said David Peacock and his legal representatives.

In testimony whereof I have hereunto set my hand and affixed my seal, this sixteenth day of February, 1853.

JETHRO WOOD. [SEAL.]

Sealed and delivered in the presence of—
GEORGE CLYMER,
DAVID RITTENHOUSE.

Form of assignment of a partial right in a patent.

Whereas I, Jethro Wood, of Scipio, in the county of Cayuga, and State of New York, did obtain letters patent of the United States for certain improvements in ploughs, which letters patent bear date the first day of March, 1848; and whereas, David Peacock, of Burlington, New Jersey, is desirous of acquiring an interest therein: Now, this indenture winesseth, that for and in considerntion of the sum of two thousand dollars, to me in hand paid, the receipt of which is hereby acknowledged, I have assigned, sold, and set over, and do hereby assign, sell, and set over, unto the said David Peacock, all the right, title, and interest which I have in the said invention, as secured to me by said letters patent, for, to, and in the several States of New York, New Jersey, and Pennsylvania, and in no other place or places: the same to be held and enjoyed by the said David Peacock, for his own use and behoof, and for the use and behoof of his legal rep-

resentatives, to the full end of the term for which said letters patent are or may be granted, as fully and entirely as the same would have been held and enjoyed by me had this assignment and sale not been made.

In testimony whereof, I hereunto set my hand and affix my seal, this sixteenth day of February, 1853.

JETHRO WOOD. [SEAL.]

Sealed and delivered in presence of—

JACOB PERKINS,

BENJAMIN FRANKLIN.

Of the Office Fees, and how Payable.

86. Nearly all the fees payable to the Patent Office are positively required by law to be paid in advance. For the sake of uniformity and convenience, the remaining fees will be required to be paid in the same manner—that is to say before the labor is performed for which they are to be received in payment.

87. The following is the tariff of fees established by law:

On every application for a design,	$15 00
On every caveat,	20 00
On every application for a patent, if made by a citizen, or a foreigner who has resided here one year, and made oath of his intention to become a citizen,	30 00
On every application, if by a subject of Great Britain,	500 00
On every application, if by any other foreigner,	300 00
On every filing a disclaimer	10 00
On every application for adding new improvement,	15 00
On every application for a reissue,	15 00
On every additional patent granted on a reissue,	30 00
On every application for an extension,	40 00
On every appeal,	25 00
On every copy of patent, or other instrument, for every 100 words,	10

On every copy of drawings, the cost of having it made.
For recording every assignment of 300 words, or under 1 00
Far recording every assignment, if over 300 and not over 1,000 words, 2 00
For recording every assignment, if over 1,000 words, 3 00

88. It is recommended that the money for the payment of fees should be deposited with an assistant treasurer, or other officer authorized to receive the same, taking his certificate and remitting the same to this office. When this cannot be done without much inconvenience, the money may be remitted by mail at the risk of the owner, and in every case the letter should state the exact amount enclosed.

89. In case of deposite made with the assistant treasurers, or other persons authorized to receive public moneys, *a duplicate receipt* should be taken, stating by whom the payment was made, and for what object. The particular invention should be referred to, to enable the applicant to recover back the twenty dollars in case of the withdrawal of the petition.

The certificate of deposite may be made in the following form:

OFFICE OF THE ——.

The Treasurer of the United States has credit at this office for ——— dollars in specie, deposited by ———, of the town of ———, in the county of ——, and State of ———, the same being for a patent (or whatever the object may be) for a steam-boiler.

A. B.

90. The following officers are authorized to receive patent fees on account of the Treasurer of the United States, and to give receipts or certificates of deposite therefor, to wit:

Assistant Treasurer of the United States, Boston, Massachusetts.

Assistant Treasurer of the United States, New York, New

York.

Treasurer of the Mint, Philadelphia, Pennsylvania.

Surveyor and Inspector, Pittsburgh, Pennsylvania.

Assistant Treasurer of the United States, Charleston, South Carolina.

Collector, Baltimore, Maryland.

Collector, Richmond, Virginia.

Collector, Norfolk, Virginia.

Collector, Buffalo Creek, New York.

Collector, Wilmington, North Carolina.

Collector, Savannah, Georgia.

Collector, Mobile, Alabama.

Treasurer branch mint, New Orleans, Louisiana.

Assistant Treasurer United States, St. Louis, Missouri.

Surveyor of the Customs, Nashville, Tennessee.

Surveyor of the Customs, Cincinnati, Ohio.

Receiver of Public Moneys, Little Rock, Arkansas.

Receiver of Public Moneys, Jeffersonville, Indiana.

Receiver of Public Moneys, Chicago, Illinois.

Receiver of Public Moneys, Detroit, Michigan.

Collector, San Francisco, California.

Depositary, Tallahassee, Florida.

Any person wishing to pay a patent or other fee may deposite it with either of the officers above named, and forward the receipt or certificate to this office as evidence thereof.

91. All money sent by mail, either to or from the Patent Office, will be at the risk of the owner. In no case should money be sent enclosed with models.

92. All payments to or by the office must be made in specie. But the office will endeavor, in all proper methods, to diminish the inconvenience and risk resulting from a rigid adherence to this rule.

Such bills received at this office as are held equivalent to cash by the banks of this city, will be sent to a bank and

exchanged for specie, and the person sending it will be credited accordingly. Those that cannot be so exchanged will be returned to the owners. On the other hand, when the person to whom money is due from the office prefers a draft on New York, and makes a special request to that effect, such draft will be procured and sent whenever it can be done without expense to the office.

Taking and Transmitting Testimony.

93. In contested cases, the following rules have been established for taking and transmitting evidence:

1. That all statements, declaration, evidence, &c., shall be in writing, setting forth minutely and particularly the point or points at issue, and shall be verified by oath or affirmation.

2. That, before the deposition of a witness or witnesses be taken by either party, notice should be given to the opposite party of the time and place when and where such deposition or depositions will be taken; so that the opposite party, either in person or by attorney, shall have full opportunity to cross-examine the witness or witnesses.

And such notice shall, *with proof of service of the same*, be attached to the deposition or depositions, whether the party cross-examine or not; and such notice shall be given in sufficient time for the appearance of the opposite party, and for the transmission of the evidence to the Patent Office before the day of hearing.

3. That all evidence, &c., shall be sealed and addressed to the Commissioner of Patents, by the persons before whom it shall be taken, and so certified thereon.

4. That the certificate of the magistrate taking the evidence shall be substantially in the following form and written upon the envelope, viz:

"I hereby certify, that the depositions of A. B., C. D., &c., relating to the matter of interference between E. F. and

G. H., were taken, sealed up, and addressed to the Commissioner of Patents by me.

A. B.,
"*Justice of the Peace.*"

5. In cases of extension, where no opposition is made, ex-parte testimony will be received from the applicant; and such testimony as may have been taken by the applicant prior to notice of opposition, shall be received: *Provided*, The applicant shall give prompt notice to the opposing party or parties of the names and residences of the witnesses whose testimony has been thus taken.

6. That no evidence, statement, or declaration, touching the matter at issue, will be *considered* upon the said day of hearing, which shall not have been taken and filed in compliance with these rules: *Provided*, That if either party shall be unable, for good and sufficient reasons, to procure the testimony of a witness or witnesses within the stipulated time, then it shall be the duty of said party to give notice of the same to the Commissioner of Patents, accompanied by statements, *under oath*, of the cause of such inability, and of the *steps* which have been taken to procure said testimony, and of the *time* or *times* when efforts have been made to procure it; which last mentioned notice to the Commissioner shall be received by him previous to the day of hearing aforesaid.

94. The notice for taking testimony must be served by delivering to the adverse party a copy.

If he is not found, such service may be made upon his agent or attorney of record, or by leaving a copy at the party's usual place of residence, with some member of the family who has arrived at the years of discretion.

It must be annexed to the deposition, with a certificate, duly sworn to, stating the manner and time in which the ervi ce was made.

95. The testimony must (if either party desires it) be taken in answer to interrogatories—having the questions and answers committed to writing in their regular order by the magistrate, or, under his direction, by some person not interested in the issue, or the agent or attorney of one who is. The deposition, when complete, must be signed by the witness.

96. The magistrate must append to the deposition his certificate, stating the time and place at which it was taken, the names of the witnesses, the administration of the oath, at whose request the testimony was taken, the occasion upon which it is intended to be used, the names of the adverse party (if any,) and whether they were present.

97. No notice will be taken, at the hearing, of any merely formal or technical objection, unless it may reasonably be presumed to have wrought a substantial injury to the party raising the objection; nor even then, unless, as soon as that party became aware of the objection, he immediately gave notice thereof to this office, and also to the opposite party, informing him at the same time that unless corrected, he should urge his objection at the hearing.

98. The following forms are recommended for observance in the taking of depositions:

A. B. being duly sworn, doth depose and say, in answer to interrogatories proposed to him by C. D., counsel for E. F., as follows, viz:

1. *Interrogatory.* What is your name, your residence and occupation?

1. *Answer.* My name is A. B.; I am a carpenter, and reside in Boston, Massachusetts; and in answer to cross-interrogatories proposed to him by G. H., counsel for I. K., as follows, viz:

1. Cross-interrogatory.

(Signed) A. B.

STATE OF NEW YORK, } ss.
Rensellaer County, }

At Troy, in said county, on the ——— day of ———, A. D. 1853, before me personally appeared the above named A. B., and made oath that the foregoing deposition, by him subscribed, contains the whole truth, and nothing but the truth.

The said deposition is taken at the request of E. F., to be used upon the hearing of an interference between the claims of the said E. F. and those of I. K., before the Commissioner of Patents of the United States, at his office, on the ——— day of ——— next. The said I. K. was duly notified, as appears by the original notice hereto annexed, and attended by G. H., his counsel.

Certified by me, L. M.,
Justice of the Peace.

The magistrate must then seal up the deposition when completed, and endorse upon the envelope a certificate, according to the form prescribed in section 93, and sign it.

Rules of Correspondence.

99. All correspondence must be in the name of the Commissioner of Patents; and all letters and other communications intended for the office must be addressed to him. If addressed to any of the other officers they will not be noticed, unless it should be seen that the mistake was owing to inadvertence.

100. Where an agent has filed his power of attorney, duly executed, the correspondence will, in ordinary cases, be held with him only. A double correspondence with him and his principal, if generally allowed, would largely enhance the labor of the office. For the same reason, the assignee of the entire interest in an invention is alone entitled to hold correspondence with the office, to the exclusion of the inventor. If the principal becomes dissatisfied, he must revoke his

power of attorney, and notify the office, which will then communicate with him.

101. All communications to and from the Commissioner upon official business are carried in the mail free of postage.

Of the Filing and Preservation of Papers.

102. All claims and specifications filed in this office (including amendments) must be written in a fair, legible hand, without interlineations or erasures, except such as are clearly stated in a marginal or foot note written on the same sheet of paper.

103. Every paper filed in the office must be endorsed in such a manner as to show its general character on the outside. It must also show the exact date on which it was filed. But where several papers are permanently fastened together, one "filing" for the whole will be sufficient.

Letters going on the files of any particular case must, in addition to the filing above directed, be endorsed with the name of the writer and the date when written. (The above rule is intended for the guidance of the employes in this office alone.)

104. All papers thus "filed" will be regarded as permanent records of the office, and must never, on any account, be changed, further than to correct mere clerical mistakes.

Of Amendments.

105. All amendments of specifications or claims must be made on separate sheets of paper from the original, and must be filed in the manner above directed.

When amendments are required, the papers themselves are generally returned to the applicant; but it is only to enable him to make those amendments so as to be in harmony with the context. Even when the amendment consists in striking out a portion of the specification or other paper, the same course should be observed. No erasure must be made. The

papers must remain forever just as they were when filed, so that a true history of all that has been done in the case may be gathered from them.

106. The following are given as specimens of the forms proper to be observed in such cases:

"I hereby amend my specification by inserting the following words after the word ——— in the ——— line of the ——— page thereof," [here should follow the words that are to be inserted;] or, 'I hereby amend my specification by striking out the ——— line of the ——— page thereof," or "by striking out the first and fourth claims appended thereto," or whatever may be the amendment desired by the applicant.

107. The forms of other amendments will readily suggest themselves. In each case the exact words to be struck out or inserted should be clearly described, and the precise point where any insertion is to be made.

108. Where papers are returned to the applicant for amendment, the original papers must in all cases be returned to the office for preservation, together with the amendments.

109. In some cases amendments will be permitted to be made by writing out the entire paper anew; but even when this is done, the original paper must be returned and preserved.

110. No paper will be allowed to be taken from this office unless receipted for, or unless a written request be filed by the party entitled to control the case, nor until all interlineations and erasures are clearly noted on the paper in such a manner as to prevent the possibility of any change being made without the certainty of immediate detection.

111. The practice which has been sometimes pursued of placing the affidavit of the applicant on one piece of paper, and the signature to the specification on another, so that both may be detached and applied to other papers, will be

looked upon with suspicion, and any such substitution will be carefully guarded against.

No such specifications will be received unless attached together by a tape, both the ends of which are secured by the seal of the officer who administered the oath, or unless that officer at least has subscribed his name upon each separate sheet of paper, so as to show that the specification presented is the same that was subscribed and sworn to.

Rules for Reconsiderations.

The following rules will be strictly observed, except when, for cause shown, in special cases a modification shall be allowed by the Commissioner:

112. Upon the rejection of an application for a patent for the want of novelty, the applicant will be furnished with references to the cases on which the rejection was made, with a brief explanation of the cause of rejection. If he desires a copy of the cases so referred to, or of the plates or drawings connected with them, these will all be forwarded to him on payment of the cost of making such copies.

113. If the applicant feels able to remove the objections raised by the office, he may himself, or by his agent, come before the proper examiner between two and three o'clock P M., on any Monday, Wednesday, or Friday of the week, for the purpose of making the desired explanations, or he may forward his reasons in writing, to be laid before the examiner.

114. Should there be—notwithstanding these reasons—a second rejection, the applicant may in person, or by his agent or in writing, as above contemplated, bring the matter before the Commissioner, who will, if possible, examine the case in person; but should he not be sufficiently at leisure, it will be referred to a board of examiners.

The decision attained in either of these modes will be final, so far as the action of this office is concerned. The only remaining remedy will be by appeal in those cases allowed by law.

Of Giving or Withholding Information.

115. Aside from the caveats, which are required by law to be kept secret, all pending applications are, as far as practicable, preserved in like secrecy. No information will therefore be given to those inquiring whether any particular patent is before the office, or whether any particular person has applied for a patent.

116. But information is given in relation to any case after a patent has issued, or after a patent has been refused, and the further prosecution of the application is abandoned.

The models in such cases are so placed as to be subject to general inspection; the specifications and drawing in any particular case can be seen by any one having particular occasion to examine them, and copies thereof, as well as of patents granted, will be furnished to any one willing to pay the bare expense of making them. Copies will be made on parchment at the request of an applicant, upon his paying the additional cost

117. Even after a case is rejected, the application is regarded as pending until after the decision of an appeal thereon, or until after the party has withdrawn the case from the further consideration of the office; but if a party, whose application has been rejected, allows the matter to rest for two years without taking any further steps therein, he will be regarded as having abandoned his application so far at least that it will no longer be protected by any rule of secrecy.

The specification, drawings, and model, will then be subject to inspection in the same manner as those of patented or withdrawn applications.

118. Information in relation to pending cases is given so far as it becomes necessary in conducting the business of the office, but no further. Thus when an interference is declared between two pending applications, each of the contestants

is entitled to a knowledge of so much of his antagonist's case as to enable him to conduct his own understandingly.

And where the rejection of an application is founded upon another case previously rejected, but not withdrawn or abandoned, the rejected applicant will be furnished with all information in relation to the previously rejected case which is necessary for the proper understanding and management of his own.

119. When an applicant claims a certain device, and the same device is found *described* but not *claimed* in another pending application which was previously filed, information of the filing of such second application is always given to the prior applicant, with a suggestion that if he desires to claim a patent for that device, he should forthwith modify his specification accordingly.

120. But where the application which thus describes a device without claiming it is subsequent in date to that wherein such device is claimed, the general rule is, that no notice of the claim in the previous application is given to the subsequent applicant. But where there are any special reasons to doubt whether the prior applicant is really the inventor of the device claimed, or where there are any other peculiar and sufficient reasons for departing from the rule above stated, the office reserves to itself the right of so doing without its being regarded as a departure from established rule.

121. The office cannot respond to inquiries as to the novelty of an alleged invention, in advance of an application for a patent, in manner pointed out in this pamphlet, (see section 23) for obvious reasons; nor to inquiries founded upon brief and imperfect descriptions propounded with a view of ascertaining whether such alleged improvements have been patented, and if so, to whom; nor can it act as an expounder of the patent law, or as counsellor for individuals, except as to questions arising within the office.

122. All business with the office should be transacted in writing, unless, by the consent of all parties, the action of the office will be predicated exclusively on the written record. No attention will be paid to any alleged verbal, promise or understanding, in relation to which there is any disagreement or doubt.

CHARLES MASON,
Commissioner.

PATENT OFFICE, 20*th February*, 1854.

MECHANICS.

Many persons are too apt to sneer at the mechanic, as deemed unworthy of association with the magnates of the land. What individual possessing the genius of an Eckford or a Rhodes, would exchange it for the tinselled glories of a rent roll, which lead to the idle dissipations of a fashionable life? The Great Mechanic of the universe not only clothed his divine Son with the garb of humanity, but he was even an humble carpenter. Benjamin Franklin was a printer, Roger Sherman a shoemaker. Every youth should be taught some trade, for without such knowledge he is more or less dependent upon the freaks of fortune. "Riches have wings," is an adage as trite as it is true, and with the experience of life before us, who would not, when the flood of misfortune or the fire of adversity sweeps away human hopes, sincerely wish he, too, were a mechanic? The progress of our country in the scale of nations — the march of mind on the land and water is hastened by the improvements developed in the mechanical arts. Who can observe the power of the steam engine, not only impelling the massive vessel with speed through the waters, successfully combatting with the mountain wave and the furious gale, without being lost in wonder at that intel-

ligent mind which has wrought out machinery so complicated, yet so perfectly simple, as by obeying the power of steam, to annihilate space, and reveal to the eye of commerce nations and people but little known.

Look, too at the benefit to the human race conferred by machinery, in manufactures, in preparing the tree of the forest for the ship builder and the house wright. We speak not here of the press, without which the mind would be clipped of those wings enabling it to take its eagle flight and soar beyond those confines from which the art of printing has released it. Its prison-house has been demolished, and the light of science, like the light of the solar system, pierces into the hovel of the poor man, at it irradiates the palaces of the wealthy. A writer has truthfully observed:— "Mechanics are the palace-builders of the world: not a stick is hewn nor a stone shaped in all the lordly dwellings of the rich, that does not owe its beauty and fitness to the mechanic's skill; the towering spires that raise their giddy height among the clouds, depend upon the mechanic's art for their strength and symmetry; not an edifice for devotion, business or comfort, but bears the impress of their handiwork.

How exalted their calling; how sublime their vocation! Who dares to sneer at such a fraternity; who dares to cast odium upon such a patriotic and honorable class of men? Their path is one of true glory, and it is their own fault if it does not lead them to the highest post of honor and renown. Who can estimate, who can appreciate the aggregate benefits to

a country, which mechanics confer? May we not with just pride anticipate the period when the highest passport to the circles of the refined, the intelligent and the good, will be that he is a well bred, an educated mechanic."

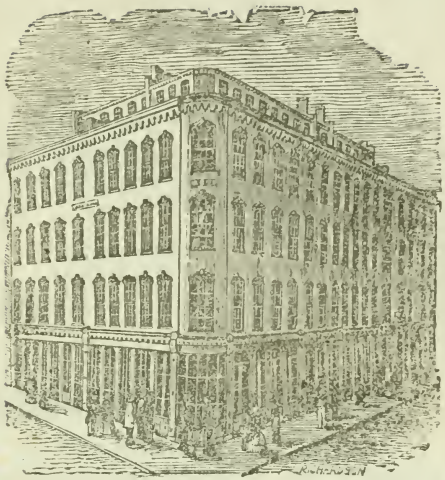
THE DIGNITY OF LABOR.

Some treat the subject of manual labor in synonomous terms with brute force, and that in severe toil lay the man with dignity buried. Others treat the subject with a sort of crazy disrespect for every kind of labor but agricultural or mechanical. Others again, and by far the most consequential class, look upon all kinds of physical labor as indicative of an inferior understanding, and an inferior race of beings.

It is almost needless for us to say that all these impressions are erroneous. We wish that we could impress the mind of every man and woman, with Pope's idea of a man: "Worth makes the man, the want of it the fellow." All kinds of honest labor are alike respectable. We have nothing to say about drones; they are not worth a paragraph. Apart from personal worth, no occupation or profession should gild a man with false dignity. We may talk about the dignity of labor as we may, but what we want is the appreciation of its value, to make the workman feel himself, that he is a nobleman, when an honest man. It is the absence of this feeling among themselves

that makes them too lightly esteemed by more wealthy men. It is no doubt true that poverty robs a man of his independence; this is a fact, and one on which all our people should deeply ponder. If our mechanics' self respect is to be maintained, they must always be well remunerated; without this the laborer will lose his dignity of feeling. It makes no matter how much people may talk about the dignity of labor, experience has established the fact, that worth, however much admired in the abstract, never looks very graceful in rags. It is true that this is not right, that it says little for our common sense or humanity; but while it is a fact, it is the better part of wisdom to prevent the effect, by the removal or absence of the cause.

In America, the mechanical classes know not the philosophy nor the religion that succumbs to power or wealth; may they never be subordinate to either. If the past is of any use at all as experience to guide, if the present in other nations is of any use at all to warn and exhort, we would bid those who lecture so zealously, and talk of the dignity of labor, never to forget that where labor is not duly rewarded, it is a sure sign that it is not properly respected — that it is robbed of its dignity and shorn of its independence. Let those who think well of their country, think of these things.



CORNER VIEW OF THURSTON'S STEAM PRINTING OFFICE.

B. THURSTON

DOES ALL KINDS OF

Printing, Electrotyping and Stereotyping,

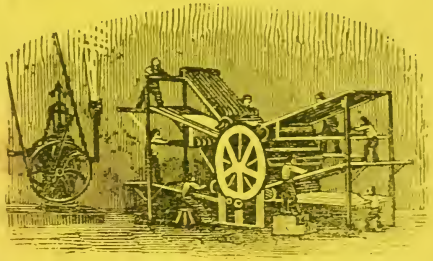
AT HIS

STEAM PRINTING ESTABLISHMENT.

Fox Block, 82 Exchange Street.

PORTLAND.

THE MECHANIC'S READY GUIDE.



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