T. M. S. says: I would like to know how many pounds pressure it takes to burst the head of a barrel off. The head was of white oak, 1¼ inches thick, and 1 foot 3 inches across. Answer: We have no means of determining the figures desired. We presume it would vary immensely with different kinds of barrels, and with different examples of similar make. Cannot some of our readers enlighten our correspondent?

J. F. W. asks if there is any way of distinguishing anthracite pig iron from charcoal pig iron? Answer: We do not know of any way to distinguish anthracite from charcoal pig iron, nor do we think it can be done by judging from the appearance of the pig metal. Mechanical tests of the product of the metal say that wrought iron will show greater softness for charcoal iron. Swedish bar iron is much softer than Low Moor and other high class irons made with mineral coal.

S. A. T. says: The manner in which a pantagraph is to be constructed is very plain (see page 99 of your current volume), but I do not know whether one (for ordinary use) should be 6 inches or 36 inches in length of longest stick. Can the stationary or pivoted end be fastened to the table with an awl or screw? Can the casters be dispensed with? What is the piece projecting to the left between C and F, from D, for? Why is it jointed differently at F than at E, D and B, and how is it jointed? Answer: Our own instruments are from 18 inches to 30 inches in total length. In a rough apparatus, an awl will answer to pivot the fixed joint. The casters are used to reduce friction, but may be dispensed with. The arrangement of joints is a matter of indifference. In making the copy, say, three quarters the size of the original, the stick B D is hinged near the end which, in the sketch, projects.

G. N. A. says: I wish to know how the red and blue lights such as are seen at the caters are produced. I want to light a large room without incurring any danger. Answer: It is always better to apply to a pyrotechnist for colored lights, as there is danger in preparing and keeping them, and it would cost less to buy than to attempt to make them.

W. K. asks: Which is the best acid or combination of acids that will entirely destroy the fiber of paper? Answer: The best solvent for paper fiber is cupro-ammonium, known as Schweitzer's reagent.

W. R. J. says: The powder I enclose is the remains of an evaporated gallon of well water. Supposing it to be lime I applied the test for that substance, with no indications. The same kind of water is used in a boiler here and causes some trouble by the deposit. 2. Can a bubble or ball similar to a soap bubble be made of any substance (except glass) that will allow handling? It must be transparent. Could a solution of gelatin be made to serve the purpose by the addition of any material? Answers: The enclosed powder was chiefly composed of carbonate of lime and a little organic matter. The water is evidently impregnated with lime. 2. Soap bubbles of considerable size and strength can be made by mixing glycerin in soap and testing from time to time until the proper proportions are obtained.

J. J. R. asks: Do pure wood ashes contain mineral matter? Answer: It was the opinion of the ancients that the potash of plants was produced from the air during combustion, but as soon as this alkali was discovered in rocks, it was readily traced to plants and shown to be a necessary constituent of all vegetables. It makes no difference how pure wood ashes may be; they necessarily contain mineral matter, chiefly composed of carbonate of potash.

W. H. F. says: 1. I would like to know if there is any way that I can use to get the grime and dirt off of my hands. I am a machinist and I find it very difficult to get my hands clean. 2. I am very desirous of learning to draw, and I would like to know if I can learn without a teacher, and what books you would advise me to get. Answers: 1. Use plenty of soap and elbow grease to clean yourself. 2. With dividers, rule and pencil, practice copying the best engravings in the SCIENTIFIC AMERICAN. You will learn to draw in this way, if you persevere.

S. R. asks: What proportion should there be between the steam port area of a steam engine, and the area of the piston? Also, what should be the relation between the steam pipe and the cylinder? Can poppet valve engines be run at as high a speed as slide valve engines? Answer: Steam ports are made, in good practice, of from one sixteenth to one tenth the area of piston, according to speed. At very high speeds, poppet valves may not seat themselves promptly, and hence a limit of speed is sooner reached than with slide valve engines.

A. B. says: A mercurial siphon gage has one leg twenty times the area of the other; what will be the rise of mercury in the smaller leg per pound pressure? Please give rule. Also a rule to work out the power required to raise a given weight by differential blocks. Answer: The difference of level must be, approximately, two inches per pound. The mercury rising in the smaller leg must be supplied from the larger. This quantity will occupy one twentieth the hight in the larger leg, that it fills in the smaller. Hence the sum obtained by adding the rise in the smaller leg above the original level to one twentieth the same distance is equal to two inches, and the actual rise in smaller leg will therefore be $\frac{20}{21}$ of two inches $= 1\frac{19}{21}$ inches. The exact figure will be $\frac{20}{21} \times 2{\cdot}035 = 1{\cdot}933$. The handiest way to determine the relation of the force exerted to the resistance overcome, in any combination of mechanical powers, is to measure the distances moved by each. For example: If the weight is raised 3 inches, while the fall of the tackle is overhauled a distance of 4 feet, the ratio is as 1 to 16, friction not being considered.

H. P. says: Take a fly wheel ten feet in diameter, with a hollow rim 12 inches depth and 2 feet face (the shell being ½ inch thick), and fill the hollow in the rim half full of water. Will the wheel and water weigh more, or less, when it is in motion and the speed great enough to keep the water next to the face, or when it is standing still? Answer: It will make no difference.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Metal Palladium. By G. J. R.

On the Influence of the Moon on the Tides. By W. S.

On the Formation of the Tides. By S. S. G.

On Steam Engine Economy. By C. H. C.

On the Dredging Machines Used at the Bar of the Mississippi River. By E. B. B.

On Certain Mechanical Enterprises in Newark, N. J. By C. B.

On the Passage of the Sun from one Date to Another. By H. B.

On Lost Arts. By O.

On Perpetual Motion. By W. D. A.

On a Substitute for the Crank and on a Self Operating Water Wheel. By J. B. S.

On Positive and Negative Forces. By E.

On the High Prices of Certain Productions. By J. C. C.

On the Sidereal Day. By J. H.

[OFFICIAL.]

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FOR WHICH

Letters Patent of the United States

WERE GRANTED FOR THE WEEK ENDING

February 4, 1873,

AND EACH BEARING THAT DATE.

(Those marked (r) are reissued patents.)

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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

22,528.—WEBBING.—J. C. Cooke. April 9, 1873.

23,686.—CULTIVATOR.—M. Alden. April 23, 1873.

23,893.—GATE FASTENING.—E. Behr. April 23, 1873.

23,921.—HARVESTING MACHINE.—M. G. Hubbard. April 23.

23,924.—MAIL BAG.—T. J. Lamdin. April 23, 1873.

23,960.—CLOCK DIAL.—S. E. Root. April 23, 1873.

23,960.—LATHE.—C. & A. Spring. April 23, 1873.

23,933.—COOK STOVE.—H. G. Leonard. April 23, 1873.

21,651.—PIN STICKING.—J. W. Naramore. June 18, 1873.

EXTENSIONS GRANTED.

23,001.—ELASTIC TOY.—L. P. Porter.

22,990.—MOP HEAD.—L. Taylor.

22,947.—WRENCH.—D. P. Foster.

DESIGNS PATENTED.

6,378.—CARD RECEIVER.—G. Gill, Taunton, Mass.

6,379 & 6,380.—CAKE BASKETS.—G. Gill, Taunton, Mass.

6,381.—CENTER PIECE.—S. Kellett, San Francisco, Cal

6,382.—URN.—P. P. Meyer, New York city.

6,383.—BEER MUG.—J. Oesterling, Wheeling, W. Va.

6,384.—VASE.—W. H. Wilkinson, New York city.

TRADE MARKS REGISTERED.

1,115.—HAMS, ETC.—Evans Brothers, Cincinnati, Ohio.

1,116.—BEARING METAL.—I X L Metal Co., St. Louis, Mo.

1,117 & 1,118.—GALVANIZED IRON.—McCullough Iron Co. Philadelphia, Pa.

1,119.—BOOTS, ETC.—C. Merritt, South Weymouth, Mass

1,120 to 1,122.—GINS.—F. E. Suire & Co., Cincinnati, Ohio

SCHEDULE OF PATENT FEES:

On each Caveat	$10
On each Trade-Mark	$25
On filing each application for a Patent (17 years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (3½ years)	$10
On an application for Design (7 years)	$15
On an application for Design (14 years)	$30

CANADIAN PATENTS.

OFFICIAL LIST OF PATENTS GRANTED IN CANADA FROM DECEMBER 13, 1872, UP TO AND INCLUDING FEBRUARY 1, 1873.

Patents taken by citizens of the United States are marked U. S.

[NOTE.—Under the new patent law, now in vogue, American citizens may patent their inventions in Canada on favorable terms. For full particulars, address Munn & Co., Office SCIENTIFIC AMERICAN, 37 Park Row, N. Y.]

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Furnace, O. W. Ketchum, Jan. 14	1,984
Iron and steel, J. Webster, Eng., Jan. 14	1,985
Tar burner, J. Burns, Jan. 16	1,986
Shingle machine, G. I. Anderson *et al.*, U. S., Jan. 16	1,987
Lubricator, J. S. Eggleston, U. S., Jan. 16	1,988
Stove drum, R. Lough, Jan. 16	1,989
Animal poke, E. F. Benedict, U. S.	1,990
Boot, W. W. Whitcomb, U. S., Jan. 16	1,991
Locomotive engine, L. Perkins, Eng., Jan.	1,992
Axle and wheels, G. W. Miltimore, *et al.*, U. S., Jan.	1,993
Catching flies, E. L. Goold, J. W. Cuthbertson, Jan. 23	1,994
Burnishing card, etc., E. R. Weston, U. S., Jan. 23.	1,995
Curtain fixture, C. Buckley, L. L. Sawyer, U. S., Jan. 22	1,996
Illuminating gas, C. Ramsdell, U. S., Jan. 22	1,997
Boot, P. West, U. S., Jan. 22	1,998
Cheese hoop, M. B. Fraser, U. S., Jan. 22	1,99