Business and Personal.

The Charge for Insertion under this head is $1 a Line.

Reliable Steam Engines, Boilers, &c., 2 to 200 H.P. High grades—for sale at two thirds cost. E. E. Roberts, 52 Broadway, New York.

Wanted—Machine for m'f'g Paper Bags. Send circular or information to W. J. G., L. B. 426, Prov., R. I.

Situation Wanted—To take charge of a Boiler Shop or turn Flanges, where good wages can be obtained. Address E. D. Rahilly, St. Cloud Hotel, Pittsburgh, Pa.

Perfection of Hay Rakes—Patent for Sale—unloads from both wheels—turning either way. No connection to be made—always running in gear. W.C. Martindale, Byberry P. O., Penna.

Wanted—A Cylinder, 6 or 8 ft. in dia. and 50 to 80 ft. long, suitable for treating wood. Address Baugh & Sons, Philadelphia, Pa.

Wanted—A Machine for finishing Linen Collars. Address Empire Steam Laundry, corner 7th and Walnut Streets, Cincinnati, Ohio.

Syrup Barrels and Packing Casks. Houghton & Co., Portland, Me.

Sugar Mill—New and complete. Rolls are 24 by 34 inches. Also several new and second hand Engines for sale cheap. Watts, Campbell & Co., Newark, N.J.

Engines, &c., received for repairs and sale. 10 per cent commission and cost of repairs deducted when sold. E. E. Roberts, 52 Broadway, New York.

Workshop Receipts—For the use of Manufacturers, Mechanics, and Scientific Amateurs, edited by Ernest Spon. 450 pp., 8vo., cloth, with illustrations. $2. E. & F.N. Spon, 446 Broome Street, New York.

Sewing Machine Needle Machinery—Groovers, Reducers, Wire Cutters, Eye Punches, &c. Hendey Brothers, Wolcottville, Conn.

Machine Shop & Foundry for sale—For particulars, address Wagoner & Matthews, Westminster, Md.

$500 will buy the Right of a Toy Gun, hunting scene combined. Address George Stackhouse, Mount Washington, Pa.

English Roof Paint, all mixed in oil ready for use, 50c. a gallon, 116 Maiden Lane, New York.

Patent Petroleum Linseed Oil works in all paints as Boiled Linseed Oil. Price only 50cts. a gallon, 116 Maiden Lane, New York.

Patent Chemical Metallic Paint—All shades ground in oil, and all mixed ready for use. Put up in cans, barrels, and half barrels. Price, 50c., $1, and $1.50 per gal. Send for card of colors. New York City Oil Company, Sole Agents, 116 Maiden Lane, New York.

2nd hand Engines, &c., Bought, Sold, and Exchanged—500 on hand. E.E. Roberts, 52 Broadway, N.Y.

We sell all Chemicals, Metallic, Oxides, and Imported Drugs; also, "Nickel Salts" and Anodes for Plating, with full printed directions on Nickel, in pamphlet form, which we mail, on receipt of fifty cents, free. A Treatise on "Soluble Glass" we mail for $1 also. Orders will receive prompt attention by addressing L. & J. W. Feuchtwanger, 55 Cedar Street, New York.

The Leclanché Battery Co. supply the best battery for Burglar Alarums, Bells, &c., No. 40 West 18th Street, New York.

Mica, 100 Tuns, Cuttings and Blocks, for sale, cheap. Address P. O. Box 78, E., London, Ont., Ca.

Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

The New Remedy retains the Rupture in ease and comfort, night and day, till cured. Sold cheap. Fitted without charge, by the Elastic Truss Co., 683 Broadway.

Mercurial Steam Blast & Hydraulic Gauges of all pressures, very accurate. T. Shaw, 913 Ridge av., Phil.

For patent Electric Watch-clocks, address Jerome Redding & Co. 30 Hanover Street, Boston, Mass.

Cabinet Makers' Machinery. T.R. Bailey & Vail.

Catalogue on Transmission of Power by Wire Rope. T. R. Bailey & Vail.

The Olmsted Oiler is the best; it is self-righting, strong and cheap. All Hardware and Tin Houses have it.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

Key Seat Cutting Machine. T.R. Bailey & Vail.

Portable Hoisting and Pumping Engines—Ames Portable Engines—Saw Mills, Edgers, Burr Mills, Climax Turbine, Vertical and Horizontal Engines and Boilers; all with valuable improvements. Hampson, Whitehill & Co., Newburgh Steam Engine Works, Depot 38 Cortlandt Street, New York.

Address Gear, Boston, Mass., for Machinery Catalogue.

Lathes, Planers, Drills, Milling and Index Machines. Geo. S. Lincoln & Co., Hartford, Conn.

For Solid Emery Wheels and Machinery, send to the Union Stone Co., Boston, Mass., for circular.

All Fruit-can Tools, Ferracute, Bridgeton, N.J.

For best Presses, Dies and Fruit Can Tools Bliss & Williams, cor. of Plymouth & Jay, Brooklyn, N.Y.

Stave & Shingle Machinery. T.R. Bailey & Vail.

Five different sizes of Gatling Guns are now manufactured at Colt's Armory, Hartford, Conn. The larger sizes have a range of over two miles. These arms are indispensable in modern warfare.

Machinists—Price List of small Tools free; Gear Wheels for Models, Price List free; Chucks and Drills, Price List free. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

Buy Gear's New Emery Grinding Machine for Stove purposes, Boston, Mass.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Bookkeepers should try the Olmsted Patent Bill File and Letter Clip. They are admirable for all papers. Save their cost in one day's business. Sold by all Stationers. J.H. White, Newark, N.J., Sole Manufacturer.

Hydraulic Presses and Jacks, new and second hand. E. Lyon, 470 Grand Street, New York.

Bolt Makers, send for descriptive cuts of Abbe's Bolt Machine, to S. C. Forsaith & Co., Manchester, N. H.

Lightning Mill For Sale—A Walker Bros. Percussion Mill for pulverizing hard substances. Thos Waring & Bro., Colora, Cecil Co., Md.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable W.D. Andrews & Bro. 414 Water st. N. Y.

Damper Regulators and Gage Cocks—For the best, address Murrill & Keizer, Baltimore, Md.

Steam Fire Engines, R.J. Gould, Newark, N.J.

Gauge Lathe for Cabinet and all kinds of handles. Shaping Machine for Woodworking. T. R. Bailey & Vail, Lockport, N. Y.

Peck's Patent Drop Press. For circulars, address Milo, Peck & Co., New Haven, Conn.

Boring Machine for Pulleys—no limit to capacity. T. R. Bailey & Vail, Lockport, N. Y.

Notes & Queries

C. A. P. asks: How can I braze a broken cast iron vise?

H. asks: How can I make the best bleaching liquid for washing clothes?

J. W. R. asks: What is a good artificial bait for sunfish? "Grubs are scarce in my locality."

T. W. B. asks: As Professor Wise doubtless ascertained the tensile strength of the material composing his balloon, as well as the pressure to be borne by it (determined by the required weight to be raised), what was the amount of the explosive force?

W. H. B. asks: Is there a substance or combination of substances which is combustible, and easily ignited with a match, either with or without the use of a wick? It must produce as intense a heat as possible, be easily melted, and if poured in that state upon a flat piece of ordinary solder must adhere so firmly as, when hardened, not to become removed by ordinary handling or by transportation, and be reasonably cheap.

Answers to Correspondents

W. P. H.'s query is incomprehensible.—J. J. H.'s question is a professional one; he should consult some good engineer.—J. S. B. should read the description of lead pencil making on p. 84, vol. 27.

F. O. B. asks: Would it not be a good idea to place air pumps on a locomotive engine, so that, in descending a grade, instead of putting on the brakes of a train to arrest the motion, that the air pumps could be used to force air into the boiler, thereby increasing the pressure in the boiler and utilizing the power which is usually wasted in applying the brakes? And could not the steam cylinders themselves be used for that purpose? Answer: Both plans are old.

B. A. K. asks: Will a broad gage locomotive run 200 miles in a shorter time than one built on the narrow gage plan, each being built alike and proportioned to the gage, the broad gage, of course, being much the larger? 2. Does a broad gage locomotive carry more dead weight in proportion to its size than the narrow gage? Answers: 1 and 2. We can see that there might be differences between the performances of the two engines, but one would not necessarily have any advantages over the other.

F. O. C. asks: 1. Who was the first inventor and builder of the locomotive engine, and who laid down the first railroad? 2. Would a leaden tank do for storing muriatic acid in large quantities? 3. What metal is used in place of nickel in plating? Answers: 1. Cugnot, a Frenchman, built the first locomotive, in 1769. The Stockton and Darlington Railroad, in England, was built in 1825. This was the first. 2. It probably would, 3. Read the article on page 307 of our volume XXVII.

E. L. asks: What is the highest degree at which water can be boiled? If I have 15 lbs. of steam in a boiler and build a large fire in order to get it up to 80 lbs., is the water any hotter at 30 lbs. than at 15 lbs.? Answer: The boiling point of water depends upon the pressure to which it is subjected. See article on "Properties of Saturated Steam," on page 81 of our current volume.

G. asks: How can I calculate the horse power of engine? From what book can I learn all about engines and pumps? Answer: We cannot answer the question about horse power without more data. You will find rules given in former answers to correspondents. Probably the best book for you to commence with will be Bourne's "Catechism of the Steam Engine," which can be obtained from D. Van Nostrand. There are many things relating to engines and pumps that cannot be learned from books, and can only be discovered by observation.

C. G. H. asks: When out of sight of land, how will Professors Wise and Donaldson know in what course they are moving? The compass will point out the north; but as the balloon has no stem or stern, they can not tell which way they are going. Answer: Mr. Donaldson informed us that he proposed to obtain the course by dropping something from the balloon, and observing the direction with reference to that.

W. B. asks: If a horizontal pipe, of 6 inches inside diameter, about a foot long, having connected on one side a half or three quarter inch (inside diameter) pipe, standing erect, about 4 feet long: and at the other side simply a prop or bolt, which slides out in proportion to the water pressure from above, and pushes against an object in its immediate front: will there be a horizontal forward pressure, and none backward? 2. If so, how much, by a pipe 4 feet long and half an inch bore, standing erect, with a 6 inch bore of a foot long horizontal pipe? 3. If the water is forcibly driven in, will the force, resulting in the forward pressure, be equal to the force above expended, or greater? Answers: 1. There will be both a forward and backward pressure. The latter pressure can be resisted by a plug in the pipe. 2. The amount of this pressure will be about 49 pounds. 3. If the water is pressed above, the forward pressure will be increased.

W. C. B. asks: 1. What is the limit of the hight to which a siphon will draw water, or what is the highest point at which it can be worked? Will it do any good to let the pump down in the ground 10 feet, and let the pipe run over the top of the hill on the surface of the ground? Answer: From 30 to 32 feet is the greatest hight in practice, and any lift above 28 feet causes great difficulty. If the pump is lowered, the whole pipe must be lowered as well, to get the benefit of the decreased lift.

E. G. F. asks: Is there a book devoted exclusively to stationery and portable engines, their construction, management, etc.? Answer: Yes. See catalogues of some of the leading publishers who advertise in this paper.

A. L. K. says: Is it possible to produce an artificial frost over an area of some square miles? Answer: Not in the present state of science.

S. J. O. asks: Where can I obtain the "Table of Change Wheels for the Screw Cutting Lathe," recently reviewed in your columns? Answer: We are unable to add any information to that already published in our notice of the work.

M. O'R. asks: 1. Where can I find a description of Professor Boyle's experiment or device for correcting the form of lenses, to which experiment or device allusion is made on page 43, current volume. 2. Is there any method or process for depositing nickel on glass, similar or analogous to the process by which silver is deposited on glass? I want to get a bright metallic coat of pure nickel on glass, which may be polished for reflecting purposes. Can it be done, and how? Answer: 1. Professor Boyle arranged a pair of six inch achromatics as a binocular telescope. The novelty of his machine for local retouches consisted in the employment of a lozenge-shaped local polisher instead of the usual round one. Robert Browning of London makes silvered glass mirrors, and sends a pamphlet for a shilling. Mr. Clark tried one of his 13 inch specula and found that the diffraction around the three strips of steel supporting the diagonal mirror caused the image of a star to appear with six wings. 2. Professor Draper has completed with his own hands a silvered glass mirror, twenty-eight inches in diameter. It is supported on an india rubber air cushion. Professor Smith recommends nickel-plating cast iron specula, but these require careful annealing. The silver coating tarnishes wherever the air contains compounds of sulphur. In towns, therefore, the silver coating of glass mirrors should be nickel-plated by the battery after polishing.

J. F. S. asks: Would the collection and condensation of the gas or gases arising from hot muriatic acid, after it has done its work in clearing tin scrap, be patentable? Answer: Whether your method is new depends upon how you collect and condense the gas. If you condense by means of an ordinary condenser or worm, or receive the gas into cold water, there is nothing new in it. But this plan of collecting and saving the hydrochloric acid gas might be combined with your process of cleaning tin scraps and be patentable, as might also improved machinery for effecting either result. Improvements for preventing the escape of gas into a room would also be patentable.

C. E. F. asks for directions for preparing cupro-ammonium. Answer: Ammonio-cupric oxide or cupro-ammonium consists of a solution of cupric oxide or black oxide of copper in aqua ammonia. It may be produced by precipitating a solution of a copper salt, as the sulphate, by strong ammonia, and then adding ammonia in excess so as to dissolve the precipitated oxide. In this case, however, it is not pure, as the acid of the copper salt, when the oxide of copper is precipitated, combines with the ammonia, forming an ammonia salt, which remains in solution. To form pure ammonio-cupric oxide, dissolve pure black oxide of copper in the strongest aqua ammonia.

W. R. asks: Is there any kind of air pump that will produce a stronger pressure of air against any object than a good strong wind? If so, how much would such an air pump weigh, and how heavy an engine would it take to run it? Could they both be taken up in a balloon? Would it be practicable thus to drive a balloon against the wind? Answer: Such air pumps are made, but the machinery would be too heavy to be practicable for use in a balloon.

W. B. asks: Why do music boxes squeak after they have been cleaned? The noise is not in the running machinery, but in the steel reeds which the pegs of the roller strike on. Answer: Probably the noise is due to friction between some of the reeds and pegs.

A. asks: Why cannot we do away with sails on lake boats, and run them with windmills, so constructed as to work a screw? Answer: The idea is old and impracticable. By no manner of device can you make the wind drive a boat directly against the wind. You can sail obliquely, and for this purpose the ordinary sails would give you more propelling power, in a more convenient form, than any windmill.

G. V. H. says: My house is stone, with walls 18 inches thick. The roof is tin, with ordinary pine sheathing, and I shall ceil it with pine. What material would be best to put in between the roof and the ceiling to keep the upper story cool in summer and warm in winter? Would sawdust answer the purpose? Answer: Sawdust filling in this case is objectionable: first, on account of its tendency to induce decay of the timber, either rot or dry rot; second, because it will decay itself and find its way through the joints of the boarding, thus filling the rooms with dust and deteriorating the air. The usual course in such cases is to suspend strips at from one to three feet below the roof joists and at about two feet apart, and to put the ceiling upon these, thus depending upon a large air space between the ceiling and the roof, as a non-conductor of heat. The strips are made firm by being braced at short intervals to the joists; and if a plastered ceiling is required, a series of narrow cross strips are nailed to the others at 12 inches apart, to which the lath are secured.

R. B. C. says: In regard to D. B. M.'s answer to inquiries respecting a noon mark, I wish to ask: 1. Why do the observations have to be taken 12 hours apart? 2. How am I to tell when it is noon? Is it when the shadows of the two plumb lines coincide? 3. What kind of an almanac will tell how much the sun is fast or slow? 4. Can you give a rule for calculating the true meridian from the results obtained by the plumb line arrangement? 5. Is there any more reliable apparatus for determining the meridian than by using plumb lines? Answers: 1. No. In 11 hours and 58 minutes, the north star completes half a revolution about the pole. The pole star is on the meridian about seventeen minutes after the plumb line covers both it and Alioth, (*epsilon Ursæ Majoris*) fifth star of the Dipper, beginning with the pointers. The plumb lines may also be ranged with the north star at its greatest eastern or western elongation. Then, if the lines are 100 inches apart, one of them must be moved two and six tenths inches to range with the pole. 2. Look at the almanac for "sun at noon mark," which is the required correction. 3. A "newspaper almanac." 4. The plumb lines are placed in the true meridian, that is, they range due north and south. 5. Yes; by using the solar compass, transit, etc.

G. R. asks: Is there any difference made, in the amount of water discharged by an hydraulic ram, by increasing the size of discharge pipe from one inch to one foot in diameter? The fall to the ram is 10 feet; hight to raise, 60 feet. Of course the size of pipe (1 inch) is already sufficient to allow a discharge of fifty times more water than is elevated by the ram. Does the size of the pipe, by exposing more or less surface to water, offer more or less friction, and thereby vary the amount discharged? Answer: Unless the supply pipe is very long, a diameter of one inch will probably give better results than a diameter of one foot. This is on the supposition that the ram is properly designed for a pipe one inch in diameter.

W. G. A. asks: Would not one bumper on a railroad car do as well as two bumpers? Answer: No. One might but not as well as two.

J. W. H. asks: 1. How can I determine when water is foaming in a steam boiler? 2. What is generally used for cementing gristmill stones, and for fastening smaller sized stones in iron cups? 3. I have a 30 inch corn mill. The top stone is broken in two in the center, and the cement, from exposure to the weather, has rotted. I made a thin solution of plaster of Paris, set the burr or stone, and then poured the solution around the burr in the cup. It is a failure and does not become hard. What shall I do? 3. Can you give me instructions how to temper mill picks? Answers: 1. Violent foaming is sometimes shown in the glass gage. It is generally indicated by trying the gage cocks, and observing whether solid water or a mixture of steam and water issues therefrom. 2. Set the stone in the cup, filling up the back with a cement composed of plaster of Paris. Fill the interstices between the stones with a cement composed of powdered alum and a powder made from small pieces of the millstone. 3. Picks are frequently tempered in brine.

D. B. says: Suppose I have a steam cylinder, with 50 inches area, and 20 lbs. constant pressure, and insert two pistons, admitting steam in center between the pistons, so that they are both forced outwards, would each piston overcome a resistance of 1,000 lbs. (less friction), or the two only 1,000 lbs. collectively? Answer: Each would exert a pressure of 1,000 pounds.

C. M. N. asks how to precipitate sal ammoniac and nitrate of silver. Answer: The latter can be precipitated by hydrochloric acid or any chloride. If in a solution by itself, it will crystallize out on concentrating the solution by evaporation. The two salts cannot exist in the same solution, as the sal ammoniac would precipitate the silver. Sal ammoniac is precipitated by the bichloride of platinum in concentrated solutions. If C. M. N. will give a more precise explanation of what he wants, we may be able to assist him.

W. M. F. asks: 1. What is the use of a storm glass? 2. How is it used? 3. Should the long and narrow bottle be full, or does it make no difference? 4. How can I tell the approach of a storm by the use of the storm glass and thermometer combined? 5. How can I make muriate of ammonia? 6. How can I make malic acid? Answers: 1, 2, 3, 4. It is not necessary that the phial should be full. When the liquid is clear it is a sign of fair weather. If the solid particles rise in the liquid, it signifies rain. Before a storm or very high wind, the liquid will become thick. 5. From the ammoniacal liquors formed in the manufacture of coal gas. 6. It is generally obtained from the berries of the mountain ash. You would do well to consult some standard work on practical chemistry, as we have not space to give details of manufacture in these columns.

G. B. D. asks: 1. What is the most economical speed in feet per minute to run a rotary steam engine, which is constructed on the old plan of hollow shaft and arms, through which the steam passes, exhausting at the curved ends of said arms, always in an opposite direction? 2. What percentage of economy can be realized from the above plan, compared with the best form of reciprocating engine? 3. Would there be any gain of power if the steam, in exhausting from the curved arms, came directly in contact with the inner ratcheted face of another wheel, causing it to revolve in the opposite direction, the two emitting their power by means of one cross and one straight belt, leading to another shaft at suitable distance? 4. What is your opinion in regard to a series of feet being connected to each other by means of links or hinges, their inner faces being provided with rollers, the whole forming an endless traction device, revolving around an endless track and propelled by engines mounted on the frame? Some twenty patents have been allowed to different inventors for certain improvements on this form of traction engine during the last 12 years, and yet there seem to be none in use, either because the whole machine combined is too complicated, or the connections, being constantly exposed to grit and dirt, are not durable. Suppose these revolving feet to be 4 feet x 14 inches each, and they are so connected that one does not leave the ground until the next one relieves it; if we construct a traction engine with two traction wheels 6 feet diameter by 2 feet face, both being secured to one shaft which is driven by engines of the same power as the ones employed to drive the endless traction machine, which of these plans will draw the greatest load at the same speed, and which would be the most practicable for every day use? 5. What is the object in the rubber tire used on road steamers? Is it to give increased traction or is it for the purpose of relieving the body of the machine of the shock or concussion which would occur if the wheels struck a stone or other obstacle? Answers: 1. Generally speaking, the most economical speed for an engine depends upon its mode of construction, system of counterbalancing employed, etc., and no rule can be given that will apply to every case. 2. We have no record of tests that will enable us to answer this question. 3. If applied on the principle of the compound engine, there might be a gain. 4. Traction engines are largely used in England, and their introduction into this country is now fairly accomplished. There are several forms of traction wheels in use which have more adhesion than the engines of the machines can overcome. 5. Mainly for the purpose of gaining adhesion.

N. A. P. says: Two forms of screw propeller are tried on the same vessel, each screw or wheel being of the same diameter, and the pressure of steam in each trial being 60 lbs. It is found that, with wheel A, 4,000 revolutions are required to propel the vessel 1 mile in 8 minutes: while with wheel B, 3,000 revolutions make the 1 mile in 8 minutes. Is there a difference of power actually expended? If so, what? Does the furnace consume more fuel with wheel A on the shaft? If so, how much more? Answer: If we understand your question rightly, wheel B has 25 per cent more efficiency than wheel A, and consequently 25 per cent less fuel is required with this wheel.

A. F. B. says: 1. Is the pressure of steam on every square inch of the flues the same as it is on the shell of the boiler, or has steam the same pressure towards the center as it has from the center of the boiler? 2. Is the law that action and reaction are equal and in opposite directions applicable to the first query? Answers: 1. Steam presses equally in every direction. 2. Yes.

J. G. D. T. asks: 1. Does gunpowder, when ignited within an enclosure (as in a gun barrel, for instance) create pressure by producing air? 2. If so, is there a gradual expansion of its atoms, so as to create a gradual force? Answers: 1. The solid grains of the powder are converted into gases, principally nitrogen and carbonic acid. 2. There is an expansion, commencing with a pressure of nothing and rapidly increasing.

A. M. B. asks: Is it an uncommon occurrence to launch steam vessels with their engines and boilers in? Was not the Dictator launched with her machinery complete? Answer: It is not usual. The Dictator and most of the monitors were launched with their engines and boilers in.

C. E. H. asks: Is there any way of removing coal tar from the bottom of a sail boat, the boat having collected it by laying in a dock near the gas works? Scraping will not answer. Answer: After scraping off as much tar as practicable, try naphtha as a solvent for the remainder. Rub with a sponge or cloth soaked in the naphtha.

P. asks: What is the best cheap preparation for preserving pine shingle roofs, to be applied either before or after laying the shingles? Answer: The article advertised as slate paint may answer your purpose.

J. B. S. E. asks: Is amorphous phosphorus soluble in any of the ethers? If so, what is the process? If not, what is it soluble in? Will the addition of another substance, not deleterious, make it soluble? Answer: Red or amorphous phosphorus is insoluble in the ordinary solvents of common phosphorus. According to Möhler, red amorphous phosphorus may be rendered colorless and perfectly transparent by fusing it in a concentrated solution of bichromate of potash mixed with sulphuric acid. After this treatment it usually remains liquid after cooling, but solidifies instantly when touched by a solid body.

E. L. says: Suppose four canals, each one mile long and thirty feet wide, to be six feet deep at discharge end, with water below, level with the bottoms. At the entrance ends, the depths are 5, 6, 7 and 8 feet respectively, with full supply of water at these depths, and regular grades between inlet and outlet: How much will each canal discharge in 24 hours? Answer: You can find approximately the velocity of discharge in feet per second, and from this the quantity discharged per second, by the following formula: V = velocity in feet per second, f = total fall in feet, A = cross section of canal in feet, l = length of canal in feet, p = length of wet perimeter in feet. $V = \sqrt{(10{,}000 \times f \times A) \div (l \times p)}$; or the velocity of discharge in feet per second is equal to the square root of the product of 10,000 by the total fall in feet and the area of cross section, divided by the product of the length and wet perimeter.

J. D. W. asks: Does the term steam engine include a boiler, or can an engine be complete without a boiler? I do not refer to portable engines. Answer: A steam engine does not include a boiler unless it is so stated expressly.

P. D. W. asks: What is magilp composed of? Answer: Magilp is a mixture of pale linseed oil and mastic varnish, used by artists as a vehicle for their colors. The proportions vary according to the work. It is thinned with turpentine.

C. M. L. asks: What can I put over silver leaf to keep its color? Answer: Try a varnish composed of pale shellac 8 ozs., rectified spirit, 1 quart; dissolve.

J. W. H. asks: Is it true that, the warmer water is, the more gas it will absorb? I mean any gas that can be absorbed by water. Answer: The general law is that the colder the water, the greater the quantity of the gas taken up and retained by it. Hydrogen is an exception, about the same amount being absorbed at all temperatures of the water.

H. H. M. asks: What is the name of some book that treats of the manufacture of carbolic acid, or how is that article manufactured? Answer: Carbolic acid is made from coal tar. The tar is distilled until anthracene comes over. The resulting oil is rectified, collecting separately the oil which distils over between 302° and 392° Fahr. This oil is mixed with saturated potash ley and powdered hydrate of potash, by which it is converted into a white crystallized mass. This substance is dissolved in hot water; the oil which rises to the surface is removed, and the lower alkaline liquid is neutralized with muriatic acid. Impure carbolic acid now rises to the surface as an oil. This can be purified by washing with a little water, digesting over chloride of calcium to dry it, rectifying several times, and finally cooling to 14° Fahr., when pure crystals of carbolic acid separate, from which the remaining fluid portion is poured off. We know of no treatise on the subject.

H. C. L. asks: Will a register placed in a wall six feet from the floor heat a room as quickly and as cheaply as one placed fifteen inches or less from the floor, and why? Answer: Yes: for whether the register is placed near the ceiling or the floor, the warm air will ascend to the former at once, unless some obstruction intervenes. Where a lower hall way connects with an upper one by stairs, and the register is in the lower hall, the warm air will not ascend to the upper one, because of the obstruction of the ceiling and the attraction of aggregation which subsists between the particles of the warm air; but in an ordinary rectangular room such obstruction does not exist. The proper place for a register for warm air, however, is at or near the floor, for convenience in warming the feet, etc., in very cold weather. All rooms intended to be warmed by the ingress of warm air should have a ventilation flue, having a register at the bottom and at the top of the room, to insure a proper inflowing of the warm air, and this flue should be on the opposite side of the room from the warm air flue.

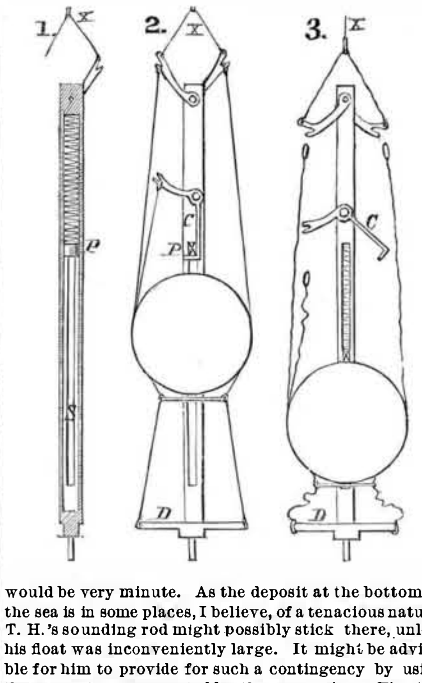
C. A. H. asks: By connecting a 2 inch hose to a 2½ inch, is there anything gained? Is it better than all 2 inch? Answer: The friction of the water will be decreased by this arrangement, and the pressure in the large hose will be the least.

K. asks: Is a mining lamp as safe if enclosed in finely perforated brass as in wire cloth? Answer: Yes.

E. C. G. asks: 1. Is there any way of replacing the gilt on a frame, and what is it? 2. How can I galvanize wrought iron? Answers: 1. You could scarcely do this work, if you have had no practical experience in the matter. We would advise you to entrust it to some one who makes a specialty of this kind of business. 2. Dip the iron into muriate of zinc, and afterwards into molten tin.

R. A. P. asks: What is the formula for ascertaining the proper hight and diameter of a marine engine smoke pipe, as used by successful engine builders? Answer: The practice of different builders varies greatly, and the best rule would probably be an empirical one based on data obtained from successful examples. For an approximate rule, the following is a very good one: Allow 200 cubic feet of air for the combustion of one pound of coal per minute; and having assumed a diameter for the chimney, and the number of pounds of coal to be burnt per hour, it will be easy to ascertain the amount of air required per hour, and the consequent velocity in feet per second. Then for a temperature of gas in the chimney, from 450° to 500° Fahrenheit, the hight of the chimney in feet necessary to produce this velocity is equal to one eighteenth of the square of the velocity in feet per second. More accurate methods are given in Professor Rankine's "Treatise on the Steam Engine and Other Prime Movers."

J. S. says, in reply to T. H., who asked if a spar of white pine could be used as a float for deep sea soundings: At the depth he mentions, namely, 5,000 fathoms, I am almost certain his spar, once down, would never rise again, for the following reasons: Dry wood is principally composed of cellulose, the specific gravity of which varies from 1·25 to 1·5; and were it not for the cellular structure of wood, it would not float at all, as is practically shown when it becomes water-logged. At a depth of 5,000 fathoms the pressure would be about 15,000 lbs. to the square inch, or 1,080 tuns to the square foot. I do not think white pine could resist such an enormous pressure. The use of a mixture to generate gas at the bottom of the sea is not impossible, but should say it is highly impracticable. Sea water is about 850 times heavier than atmospheric air; but at a depth of 5,000 fathoms, air would be compressed 1,000 times, and therefore would become heavier than water. Any gas of a greater density than air, such as carbonic acid, is of course out of the question. Hydrogen is the only gas that could be used. 1,000 cubic inches of hydrogen, at 60° Fahr. and barometer 30 inches, weigh 21·379 grains; at the above depth 1000 cubic inches would be compressed to 1 cubic inch. The weight of 1 cubic inch of sea water is 258·264 grains. Consequently 1,000 cubic inches of hydrogen would have a lifting power (at the above depth) of about 237 grains; or to lift 10 lbs., as T. H. wants to do, it would require 170 cubic feet of hydrogen. This scarcely requires comment. T. H. could easily accomplish his object by using as a float a flexible waterproof bag containing some liquid lighter than water, say a hydrocarbon oil of specific gravity 0·7. A cylindrical bag, 6 inches diameter and 2 feet long, thus filled, would have a lifting power in sea water of about 3 lbs. All liquids being nearly alike compressible, the difference of buoyancy between the bottom and the surface



would be very minute. As the deposit at the bottom of the sea is in some places, I believe, of a tenacious nature, T. H.'s sounding rod might possibly stick there, unless his float was inconveniently large. It might be advisable for him to provide for such a contingency by using the apparatus represented by the engraving. Fig. 1 is a tube with a slot, S, on either side, containing a loosely fitting piston, P, with two lugs projecting through the slots, also a strong spiral spring. Fig. 2 shows the spring held compressed by a catch, C. Fig. 3 shows weight and catch disengaged; the lugs of the piston, striking the weight, jerk the tube clear of everything. The disk, D, prevents the possibility of end of tube sinking in the bottom, without disengaging the weight. The float is attached at X.

A. T. A. says, in reply to G., who is troubled with red ants in his sugar: My sugar bucket contains about twenty-five pounds of sugar, and I am frequently troubled with these same red ants; but when so troubled I get three or four large black ants and put them in the bucket; and in less than three hours, not a red ant is to be seen, the black ones eating them up. As a means of preventing ants from getting on to a table, I put a piece of tobacco under each of the feet, and keep the table from contact with anything else.

R. S. H. says, in reply to C. F. B., who says that filing hand saws towards the point leaves more bevel on the front or cutting side of the tooth than on the back side: This is correct. He further says that the difference in the bevel is caused by the taper of the file. In this, I think, he is not correct. The difference of bevel on the two opposite sides of the tooth is caused by the position in which the file is held. If he runs his file level, while the saw is held plumb, he will find the bevel so nearly alike on the two sides that it will be difficult to decide which side has the most, showing that the taper of the file has little or nothing to do with it. Dropping the handle end of the file and elevating the point will and does produce the effect which he lays to the shape of the file. Moreover it produces a deeper cut, and a longer and more pointed tooth, which gives a sharper cutting point, and furnishes more space in which to carry the sawdust.

S. S. says, in reply to F. A. S., who asked for directions for constructing a stove to dry fruit, etc., without changing the color: He should have the dryer made of brick, or, if it is made of iron, have it fitted with a porous lining, and never allow the heat to get below 100° as the color changes in proportion to the time it takes to dry the fruit. If he intends to dry large quantities, it should be made with several chambers, that the green fruit may not be put in with that which is partially dry.

A. H. says, in reply to J. C. S., who asked about the dimensions of a belt per horse power: A 1 inch belt at a velocity of 750 feet per minute is a perfectly safe rule to calculate for one horse power. [There seems to be a considerable difference in the figures used for belting, and we shall be glad to hear from any of our readers who have made experiments. A rule by Mr. Rider, lately published, states that a belt one inch wide, and bearing on at least one third of the circumference of the smaller pulley, will transmit a force of 19·25 pounds, at any velocity. Applying this rule to the present case, we find that, with a velocity of 750 feet per minute, the belt would transmit $(19{\cdot}25 \times 750) \div 33{,}000 = 0{\cdot}431$ horse power.—EDS.]

T. M. G. says, in answer to a querist who asked if broken files can be mended: I have to say that my father once imported a lot of files, many of which arrived broken. He tinned them on the clean broken ends and "sweated" them together. In order to test the strength of the joint so made, one was struck across something, and the file broke within an inch of the joint.

D. R. says, in reply to a correspondent who asked how to harden jewellers' rollers: Put them in a cast iron box with carbon made from ivory chips, and keep the box at a dull red heat for 4 or 6 hours; then dip the rolls in water, or salt and water. They must be handled quickly from the box to the water, as the air spoils the surface.

A. S. G. replies to R. B.'s query as to passing trains as follows: Engine A can run on to the siding with eight cars, leaving the other eight on main track. Engine B then runs past, pushing the eight cars before it, after which A regains its place on the main track, getting out of the way while B puts the eight cars on to the siding, runs by them, and pulls them again on to the main track. The trains have now passed, and nothing remains but for A to pick up its cars, and go on its way. No problem of this kind is insoluble, as long as the siding can hold at least one car with its engine. [Answers similarly correct have been received from F. D. C., E. L. W., T. M. W., G. E. K., H. R. R., H. C. B., S. B. E., F. V. F., J. J. M., J. T., L. B. E. L., F. A. W., O. B. A. S., E. R. and J. N. P.—EDS.]

B. B. says, in reply to R. B.'s query as to trains passing each other: Two trains cannot pass each other under the circumstances described.

J. S. B. & Co. say, in answer to H. H. who asked for a cement for a leaky cast iron furnace: Clean borings or turnings of cast iron 1 lb., sal ammoniac, 2 ozs., flowers of sulphur, 1 oz. Mix them well together and keep dry. When required for use, take of the mixture 1 part, clean borings 20 parts: mix thoroughly and add a sufficient quantity of water. A little grindstone dust added improves the cement.

A. D. N. replies to A. P., who is troubled with water in his boiler: I guess you have no drain cocks to your cylinder or steam pipes, and that the water which troubles you is condensed steam collected in your engine while cooling off. Any engine is harder to start after cooling, partly because of the water of condensation and partly because the engine is cold. [A. P. says that when he uses a small quantity of water in his boiler, he does not have the trouble; hence it does not probably occur from condensation in the cylinders only.—EDS.]

D. B. says (in answer to A. B. F. who asks: 1. Does sulphur when burned for bleaching purposes do equally well whether the flame is blue or red with a sparkling blaze? 2. Does the burning in the two different ways produce same kind of gas? 3. What will prevent cotton or linen fabrics from becoming mildewed?) 1. The flame of sulphur is blue; the red blaze must be produced by some impurity. 2. The blue, of course, gives rise to the bleaching property. 3. Mildew can be prevented by the use of powdered sulphur.

G. W. W. says, in reply to E., who asked how to utilize several hundred horse power running to waste at a distance of 3 miles: Put a water wheel at the fall, and attach air pumps, lay a pipe from the pumps to the factory, of suitable size, then connect to your engine the same as with steam. Start your pumps and compress the air in your pipes, and with it run your engine, without steam, fuel or boiler. You will have no danger from fire or explosion. A safety valve can be placed on your main pipe to carry off surplus pressure. Power can be let all along the line of pipe, and it can be conveyed any distance.

J. H. W. says, in reply to A. K., who asked for a recipe for invisible ink: The following recipe is a good one: No. 1. 1 dram sulphate of copper or of iron, 1 oz. water; put into a bottle. No. 2. 1 dram prussiate of potash, 1 oz. water; put into another bottle. Write with No. 1, using a gold or quill pen. When dry, apply No. 2 with a feather, or lay a wet cloth saturated with the fluid on the writing, when it will be perfectly visible. The writing will be of a dark blue color. This is called invisible ink.

J. H. W. says, in answer to W. B., who asked how to remove ink spots: Use cyanuret of potash or oxalic acid. After the removal of the spots, wash well with water; and if the color of the cloth is taken out, apply ammonia, when it will be instantly restored.

C. H. A. says, in answer to G., who asked how to get ants out of sugar: Every ant in it will, sooner or later, go home with a load, and then return for more. Hence, if the vessel containing sugar or other substance infested by ants be removed from the place where it stood to another, the ants in it will take their loads and depart. Those returning will be like an Irish friend of mine, who, seeking a foot bridge which had once been laid across a stream, exclaimed: "Here it is, an' 'tis gone, sure!" The very last ant will leave in the course of a few hours, but it may be necessary to move the package several times, to prevent those which have found their way home from returning with their friends. I have tried this repeatedly and it has never failed.

G. W. F. says: E., in a recent question, says: "I have several hundred horse power running to waste," etc. It seems to me to be a problem, well worthy of the most serious consideration, how to make the most of water power, particularly where it exists, as your querist states, to the extent of several hundred horse power. The most perfect key to this matter, conceivable, seems to be that mentioned in your last issue as practiced in Belgium, namely, the transmission of power by means of compressed air. The letting of excess power to run anybody's factory readily suggests itself, or even its application for the manufacture of ice.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined with the results stated:

R. J. says: 1. I send a specimen which completely puzzles me. Recently I had given to me several very rich specimens of gold ore. I extracted the gold by pouring on it 1½ parts of hydrochloric acid to one part of nitric. My object in putting in a larger quantity of hydrochloric than nitric was to precipitate the silver which was in the ore. I left them together until all effervescence ceased; I then had an orange colored liquid, which I evaporated until it got gummy; this I put into a crucible and heated to a white heat, and the specimen herewith was the result. 2. What is the best work on chemistry? Answers: 1. We are afraid that you have been deceived in the appearance of the ore which you imagined contained so much gold. The residue sent us consists largely of the red oxide of iron; and from your account, there is little doubt that you have been trying to extract gold from the bright yellow sulphide of iron, or iron pyrites. The effervescence was caused by the decomposition of the nitric acid, nitrous fumes being evolved. The sulphur was oxidized by the nitric acid into sulphuric acid, which combined with the iron oxide to form sulphate of iron, some sulphur being separated. It was this sulphur which caused the liquid to become gummy when evaporated and heated. The hydrochloric acid, in the presence of the oxidizing nitric, played a minor part. The solution finally contained sulphate of iron, free sulphur, free hydrochloric acid, and perhaps some chloride of iron. The white heat, to which the solution (evaporated to dryness) was finally submitted, decomposed the sulphate of iron, driving off the acids or decomposing them, and there was finally left the red oxide of iron. There may have been some grains of metallic gold, however, as there generally is in iron pyrites, though seldom enough to pay for extraction. The gold can be extracted by the following method: The pyrites is roasted as thoroughly as possible to drive off the sulphur. It is then reduced to powder and agitated with mercury. The mercury combines with the gold present, forming an amalgam of mercury and gold. This amalgam is then submitted to the action of heat, by which the mercury is driven off and the gold recovered in the metallic state. The mercurial vapor is of course condensed, and the metal used for another operation. 2. Bloxam's is highly recommended.

E. B. G.—The stone you send is a hard fine grained limestone, and looks as if it might be available for lithographic purposes, but the specimen is too small for us to judge accurately of its value. A good lithographic stone is of a yellowish gray color, and uniform throughout; free from veins, fibers and spots; a steel point makes an impression on it with difficulty, and the splinters broken off by the hammer have a conchoidal fracture.

E. L. W.—Your specimen is rich in lead, and is probably a lead ocher; but it is too small for complete analysis.

COMMUNICATIONS RECEIVED.

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

On Crank Pins. By W. A. S.
On a Balloon Experiment. By D.
On Pressure and Space. By J. A.
On Air and Steam Engines. By F. A. W.
On Perpetual Motion. By J. W. S.
On Traction Engines. By H. M. S.
On the Art of Inventing. By J. E. E.
On Street Pavements. By W. H. B.

Also enquiries from the following:
E. G. de W. & Co.—J. S. B.—D. M.—C. W.—J. J. H.—C. & N.—G. C. F. S,

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had, also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal," which is specially devoted to such enquiries.

Correspondents in different parts of the country ask: Where can I obtain pipe clay for making lead pencils? Who owns the patent rights for the various artificial stones? Who makes the best candle machine? Does the vapor stove, using crude petroleum, work well practically? Who recently invented a process for tempering and preserving the elasticity of steel and brass springs? Makers of the above articles will probably promote their interests by advertising, in reply, in the SCIENTIFIC AMERICAN.

[OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

WERE GRANTED FOR THE WEEK ENDING

September 9, 1873,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Alarm, burglar, H. P. Hood	142,630
Alarm, till, C. & W. H. Tucker (r)	5,566
Axle box, W. A. Clark	142,556
Bed bottom, P. Anderson	142,549
Bee hive, A. J. Sternberg	142,748
Blindslat fastener, G. W. Brooks	142,674
Blind stiles, etc., boring, L. Worcester (r)	5,568
Boiler and condenser, B. T. Babbitt	142,663
Boiler and condenser, B. T. Babbitt	142,664
Boiler feed heater, etc., J. Armstrong (r)	5,569
Boot and shoe stretcher, J. Lyons	142,710
Boots, machinery for lasting, Trask & Wheeler	142,657
Bottle casing, J. Dugan	142,685
Bracelet, J. S. Palmer (r)	5,571
Buckle, W. Parsons	142,721
Button, J. Durand	142,686
Can for holding paint, etc., G. H. Chinnock	142,612
Can for oils, etc., G. H. Chinnock	142,613
Car axle box, W. W. Whitaker	142,752
Car brake, W. Warinner	142,658
Car brake, railway, W. D. Pope	142,649
Car brake, railway, G. Westinghouse, Jr.	142,680
Car brake, self-acting coal, J. D. Leonard	142,572
Car coupling, R. H. Dowling	142,682
Car coupling, P. Kendrick	142,634
Car coupling, T. & J. W. Meikle	142,713
Car coupling, C. L. Miller	142,715
Car coupling, J. Waite	142,750
Car heater, railroad, Scripture & Stackman	142,737
Car, pneumatic railway, H. G. Yates	142,605
Car truck, changeable gage, W. W. Whitaker	142,751
Car wheel, Sax & Kear	142,587
Carpet, J. Dornan	142,681
Carriage spring, G. W. Harlan	142,627
Caster, salt and pepper, J. Bird	142,670
Casting, core apple for, J. B. Aston	142,662
Casting, core barrel for, W. Smith	142,746
Chair frame, G. Gardner	142,625
Chair seat or back, G. Gardner	142,624
Chair, connecting cradle, J. Reeves	142,583
Chuck, centering, G. H. Miller	142,642
Cigar mold, N. DuBrul	142,683
Cisterns, cut off for, G. W. Howell	142,569
Clamp, F. M. Holmes	142,697
Clothes dryer, A. S. Miller	142,714
Clothes reel, D. L. Huff	142,631
Clutch, friction, J. J. Grant	142,564
Coal delivering sack, W. S. Shackleton	142,741
Coal hod, H. B. Safford	142,734
Coal mining machine, F. M. W. Price	142,582
Composition mastic, A. Thiele	142,595
Condenser, marine, B. T. Babbitt	142,665