

H. H. Heinrich, No. 41 Maiden Lane, New York, Inventor. Patentee, and Sole Manufacturer of the Self-Adjusting Chronometer Balance, which is not affected by "extremes" of high and low temperatures, as fully demonstrated by a six months' test at the Naval Observatory at Washington, D. C., showing results in temperatures from 134° down to 18°, of 5-10 of a second only, unparalleled in the history of horology and certified to by Theo. F. Kone, Esq., Commander U. S. N. in charge of the Observatory. Mr. Heinrich is a practical working mechanic and adjuster of marine and pocket chronometers to positions and temperatures, and is now prepared to apply his new balance wheel to any fine time-keeping instrument, either for public or private use. He also repairs marine and pocket chronometers, as well as all kinds of complicated watches, broken or lost parts made new and adjusted. Mr. Heinrich was connected for many years with the principal manufacturers of England, Geneva and Locle, Switzerland, and for the last fifteen years in the United States, and very recently with Messrs. Tiffany & Co. of Union Square, New York. Shipowners, captains naval and army officers, railroad and telegraph officials, physicians and horsemen, and all others wanting true time, should send to him. Fine watches of the principal manufacturers, for whom he is their agent, constantly on hand. His office is connected by electric wires with the Naval Observatory's astronomical clock, through the Western Union Telegraph, thus giving him daily New York's mean time. Many years ago the British Government made an offer of £6,000 for a chronometer for her navy, keeping better time than the ones in use, but no European horologist ever discovered the sequel, which Mr. Heinrich has now worked out to perfection, overcoming the extremes, as stated above. With him is connected Mr. John F. Krugler. For thirty years connected with the trade as salesman.—*Adv.*

Toope's Felt and Asbestos Covering for Steam Pipes and other surfaces, illustrated on page 357, present volume, received a Medal of Excellence at the late American Institute Fair. See advertisement on another page.

### Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue. The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.

Chard's Extra Heavy Machinery Oil.  
Chard's Anti-Corrosive Cylinder Oil.  
Chard's Patent Lubricene and Gear Grease.  
R. J. Chard, Sole Proprietor, 6 Burling Slip, New York.  
Wanted—Superintendent for six thousand spindle cotton yarn mill. States salary and references. Rosalie Yarn Mills, Natchez, Miss.  
Use Vacuum Oil Co.'s Lubricating Oil, Rochester, N. Y.  
50,000 Sawyers wanted. Your full address for Emerson's Hand Book of Saws (free). Over 100 illustrations and pages of valuable information. How to straighten saws, etc. Emerson, Smith & Co., Beaver Falls, Pa.

Interesting to Manufacturers and Others.—The world-wide reputation of Asbestos Liquid Paints, Roofing, Roof Paints, Steam Pipe, Boiler Coverings, etc., has induced unscrupulous persons to sell and apply worthless articles, representing them as being made of Asbestos. The use of Asbestos in these and other materials for structural and mechanical purposes is patented, and the genuine are manufactured only by the H. W. Johns M'fg Co., 87 Maiden Lane, New York.

Three requisites—pens, pins, and needles. The two latter you can get of any make, but when you want a good pen get one of Esterbrook's.

For Heavy Punches, etc., see illustrated advertisement of Hiles & Jones, on page 380.

Frank's Wood Working Mach'y. See illus. adv., p. 382.

Painters' list of 65 good recipes. J. J. Callow, Cleveland, O.

Improved Speed Indicator. Accurate, reliable, and of a convenient size. Sent by mail on receipt of \$1.50. E. H. Gilman, 21 Doane St., Boston, Mass.

Astronomical Telescopes, first quality & low prices, Eye Pieces, Micrometers, etc. W. T. Gregg, 75 Fulton St., N. Y. Engines. Geo. F. Shedd, Waltham, Mass.

The Mackinnon Pen or Fluid Pencil. The commercial pen of the age. The only successful reservoir pen in the market. The only pen in the world with a diamond circle around the point. The only reservoir pen supplied with a gravitating valve; others substitute a spring, which soon gets out of order. The only pen accompanied by a written guarantee from the manufacturers. The only pen that will stand the test of time. A history of the Mackinnon Pen: its uses, prices, etc., free. Mackinnon Pen Co. 200 Broadway, New York.

Among the numerous Mowing Machines now in use, none ranks so high as the Eureka. It does perfect work and gives universal satisfaction. Farmers in want of a mowing machine will consult their best interests by sending for illustrated circular, to Eureka Mower Company, Towanda, Pa.

Peck's Patent Drop Press. See adv., page 333.

The Inventors Institute, Cooper Union Building, New York. Sales of patent rights negotiated and inventions exhibited for subscribers. Send for circular.

Fragrant Vanity Fair Tobacco and Cigarettes. 7 First Prize Medals—Vienna, 1873; Philadelphia, 1876; Paris, 1878; Sydney, 1879—awarded Wm. S. Kimball & Co., Rochester, N. Y.

Superior Malleable Castings at moderate rates of Richard P. Pim, Wilmington, Del.

Wood Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

The E. Stebbins Manuf'g Co. (Brightwood, P. O.), Springfield, Mass., are prepared to furnish all kinds of Brass and Composition Castings at short notice; also Babbitt Metal. The quality of the work is what has given this foundry its high reputation. All work guaranteed.

The "1880" Lace Cutter by mail for 50 cts.; discount to the trade. Sterling Elliott, 262 Dover St., Boston, Mass.

The Tools, Fixtures, and Patterns of the Taunton Foundry and Machine Company for sale, by the George Place Machinery Agency, 121 Chambers St., New York.

Improved Rock Drills and Air Compressors. Illustrated catalogues and information gladly furnished. Address Ingersoll Rock Drill Co., 1½ Park Place, N. Y.

Mineral Lands Prospected, Artesian Wells Bored, by Pa Diamond Drill Co. Box 423, Pottsville, Pa. See p. 349.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro., 50 Astor House, New York.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs. H. Lloyd, Son & Co., Pittsbg, Pa.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

Power, Foot, and Hand Presses for Metal Workers. Lowest prices. Peerless Punch & Shear Co., 52 Dey St., N. Y.

Recipes and Information on all Industrial Processes. Park Benjamin's Expert Office, 50 Astor House, N. Y.

For the best Stave, Barrel, Keg, and Hoghead Machinery, address H. A. Crossley, Cleveland, Ohio.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 40 John St., N. Y. For Mill Mach'y & Mill Furnishing, see illus. adv. p. 349.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

Gun Powder Pile Drivers. Thos. Shaw, 915 Ridge Avenue, Philadelphia, Pa.

For Separators, Farm & Vertical Engines, see adv. p. 349.

For Patent Shapers and Planers, see illus. adv. p. 349.

Best Oak Tanned Leather Belting, Wm. F. Forepaugh, Jr. & Bros., 531 Jefferson St., Philadelphia, Pa.

Stave, Barrel, Keg, and Hoghead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

C. B. Rogers & Co., Norwich, Conn. Wood Working Machinery of every kind. See adv., page 348.

National Institute of Steam and Mechanical Engineering, Bridgeport, Conn. Blast Furnace Construction and Management. The metallurgy of iron and steel. Practical Instruction in Steam Engineering, and a good situation when competent. Send for pamphlet.

Reed's Sectional Covering for steam surfaces; any one can apply it; can be removed and replaced without injury. J. A. Locke, Agt., 32 Cortlandt St., N. Y.

Downer's Cleaning and Polishing Oil for bright metals, is the oldest and best in the market. Highly recommended by the New York, Boston, and other Fire Departments throughout the country. For quickness of cleaning and luster produced it has no equal. Sample five gallon can sent C. O. D. for \$8. A. H. Downer, 17 Peck Slip, New York.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit and other can tools. Bliss & Williams, B'klyn, N. Y.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 349.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J. Wright's Patent Steam Engine, with automatic cut off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

Machin' Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Solomon's Parallel Vise, Taylor, Stiles & Co., Riegelsville, N. J. Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 366.

Silent Injector, Blower, and Exhauster. See adv. p. 380.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Clark Rubber Wheels adv. See page 381.

Diamond Saws. J. Dickinson, 64 Nassau St., N. Y. Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Eclipse Portable Engine. See illustrated adv., p. 382.

Peerless Colors—For coloring mortar. French, Richards & Co., 410 Calowhill St., Philadelphia, Pa.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 380.

Elevators, Freight and Passenger, Shafting, Pulleys and Hangers. I. S. Graves & Son, Rochester, N. Y.

Steam Engines; Eclipse Safety Sectional Boiler. Lambertville Iron Works, Lambertville, N. J. See ad. p. 349.

Magic Lanterns, Stereopticons, and Views of all kinds and prices for public exhibitions. A profitable business for a person with small capital. Also lanterns for home amusement, etc. Send stamp for 116 page catalogue to McAllister, M'fg Optician, 49 Nassau St., New York.

Lenses for Constructing Telescopes, as in Sci. Am. SUPPLEMENT, No. 252, \$6.50 per set; postage, 9 cts. The same, with eye piece handsomely mounted in brass, 8.00. McAllister, M'fg Optician, 49 Nassau St., N. Y.

For best low price Planer and Matchery, and latest improved Sash, Door, and Blin' Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher, Schumm & Co., Philadelphia, Pa. Send for circular.

Penfil (Pulley) Blocks, Lockport N. Y. See ad. p. 381.

4 to 40 H. P. Steam Engines. See adv. p. 381.

Tyson Vase Engine, small motor, 1-33 H. P.; efficient and non-explosive; price \$50. See illus. adv., page 380.

For Yale Mills and Engines, see page 381.

Lightning Screw Plates and Labor-saving Tools, p. 333.

### English Patents Issued to Americans.

From November 9 to November 12, 1880, inclusive.  
Book binding, L. Finger, Boston, Mass.  
Draining and sewerage, G. E. Waring Newport, R. I.  
Electric gas lighter, G. D. Bancroft, Boston, Mass.  
Electric signal, E. M. Johnson et al., Menlo Park, N. J.  
Horse nail manufacture, S. S. Putnam, Boston, Mass.  
Hygienic confection, T. S. Lambert et al., New York city.  
Looms, F. O. Tucker, Hartford, Conn.  
Reflectors for lamps, J. S. Goldsmith, New York city.  
Railroad vehicles, E. R. Esmond et al., New York city.  
Sewing machine, G. F. Newell, Greenfield, Mass.  
Steam boilers, D. Sutton, Cincinnati, Ohio.  
Steam boilers, W. D. Dickey, New York city.  
Toy money box, J. E. Walter, New York city.  
Trucks, hand, E. J. Lyburn, Fredericksburg, U. S. A.



### HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from \$1 to \$5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) L. L. asks: 1. How can I grind and polish quartz and agate rock, and what kind of grinding and polishing material should I use? A. Quartz and agate are slit with a thin iron disk supplied with diamond dust moistened with brick oil. The rough grinding is done on a lead wheel supplied with coarse emery and water. The smoothing is done with a lead lap and fine emery, and the polishing may be accomplished by means of a lead lap, whose surface is hacked and supplied with rottenstone and water. 2. What is the best method of polishing steel? A. The usual method is to grind first on a coarse wet stone, then on a fine wet stone, then on a lead lap supplied with fine emery and oil, and finally polish on a buff wheel supplied with dry crocus and revolving rather slowly.

(2) R. L. asks how to make copying black and red inks. A. 1. Bruised Aleppo nutgalls, 2 lb.; water, 1 gallon; boil in a copper vessel for an hour, adding water to make up for that lost by evaporation; strain and again boil the galls with a gallon of water and strain; mix the liquors, and add immediately 10 oz. of copperas in coarse powder and 8 oz. of gum arabic; agitate until solution of these latter is effected, add a few drops of solution of potassium permanganate, strain through a piece of hair cloth, and after permitting to settle, bottle. The addition of a little extract of logwood will render the ink blacker when first written with. Half an ounce of sugar to the gallon will render it a good copying ink. 2. Shellac, 4 oz.; borax, 2 oz.; water, 1 quart; boil till dissolved, and add 2 oz. of gum arabic dissolved in a little hot water; boil and add enough of a well triturated mixture of equal parts indigo and lampblack to produce the proper color; after standing several hours draw off and bottle. 3. Half a drachm of powdered drop lake and 18 grains of powdered gum arabic dissolved in 3 oz. of ammonia water constitute one of the finest red or carmine inks.

(3) X. inquires: What is the rule for making a counterbalanced face wheel for engines? A. It is a common practice to place the counter weight directly opposite the crank, with its center of gravity at the same distance from the center of the shaft as the center of the crank pin, making its weight equal to weight of piston, piston rod, crosshead, and crank pin, plus half the weight of the connecting rod.

(4) A. R. asks: What is the best way to remove cinders from the eye? A. A small camel's hair brush dipped in water and passed over the ball of the eye on raising the lid. The operation requires no skill, takes but a moment, and instantly removes any cinder or particle of dust or dirt without inflaming the eye.

(5) D. F. H. asks: Can I move a piston in a half inch glass tube by the expansion of mercury? A. Yes, but you will require a long tube to get any appreciable motion of the piston.

(6) J. W. asks: What size of a bore and what length of a stroke I would want for a rocking valve engine of half a horse power? A. About 2 inches cylinder and 3 inch stroke, depending upon pressure and velocity.

(7) R. W. H. writes: In a recent discussion on hot air and steam portable engines it was decided to ask your opinion, which should be final. Water is scarce, though enough to use steam is easily procured. The country is hilly, so that lightness is desirable. The power wanted is 6 horse, and movable, that is, on wheels. Which will be best, hot air engine or steam engine? Which consumes most coal for a given power? Which will be cheapest in above case? A. For small powers the hot air engine is most economical, but we do not think it adapted to your purpose. We would recommend the steam engine for a portable power.

(8) J. C. T. writes: 1. I have a water tank for supplying my boiler, which is made of No. 22 galvanized iron; size 30 inches by 9 feet 4 inches. How many gallons will it hold? A. 342 gallons. 2. Will it be better to have it painted inside? A. Yes. 3. How many years will the tank wear under favorable circumstances, using well water? A. Depends upon the care taken of it.

(9) W. H. C. asks: Is there any way of deadening the noise of machinery overhead from the engine room below? The noise comes from machinery in the weave room of an alpaca mill. A. This is generally accomplished by setting the legs of the machines on thick pieces of India-rubber or other non-conductor of sound.

(10) G. H. asks: How can I mount photos on glass and color them? A. Take a strongly printed photograph on paper, and saturate it from the back with a rag dipped in castor oil. Carefully rub off all excess from the surface after obtaining thorough transparency. Take a piece of glass an inch larger all round than the print, pour upon it dilute gelatin, and then

"squeegee" the print and glass together. Allow it to dry, and then work in artists' oil colors from the back until you get the proper effect from the front. Both landscapes and portraits can be effectively colored by the above method without any great skill being required.

(11) C. W. S. asks: 1. Is there any practical and effective method known 'or cutting screws by connecting the slide rest with the mandrel of the lathe by gears or otherwise? A. This can be done in this way: attach a spur wheel to the back of the face plate. Mount a similar wheel on a short hollow shaft, and support the shaft by an arm bolted to the lathe bed so that the two spur wheels will mesh together. Fit right and left hand leading screws to the hollow shaft of the second spur wheel, and drill a hole through them as well as through the hollow shaft to receive the fastening pin. Now remove the longitudinal feed screw of the slide rest and attach to one side of the carriage an adjustable socket for receiving nuts filled to the leading screws. The number of leading screws required will depend of course on the variety of threads it is desired to cut, unless a change of gear is provided. 2. A writer in a foreign journal claims to make slides, r V-shaped pieces for slide rests, eccentric chucks, etc., on his lathe. Is any such process known here, or any process within the capabilities of an amateur mechanic by which the planing machine can be dispensed with? A. For small work held between the lathe centers a milling device fitted to the slide rest in place of the tool post will answer an excellent purpose. This device consists of a mandrel carrying at one end the cutter and at the other end a large pulley. This mandrel is journaled in a hinged frame supported by a block replacing the tool post, and is adjusted as to height by a screw passing through an arm projecting from the supporting block. The direction of the belt is adapted to this device by means of pulleys.

(12) J. E. B. asks: 1. What is the best turbine water wheel now in use? A. There are several wheels in market that seem equally good. You should examine all of them and decide from your own observation which is best. 2. What is the rule for finding the horse power of water acting through a turbine wheel which utilizes 80 per cent of the water? A. Finding the weight of water falling over the dam and its velocity in feet per minute, multiply the weight in pounds by the velocity, and the result is foot pounds, divided by 33,000, the quotient is theoretical horse power; if your wheel gives out 80 per cent, then 80 per cent of that result is the horse power of the wheel. 3. How can I calculate the capacity of a belt? A. You will find an exhaustive article on the subject of belts on pp. 101, 102, Vol. 42, SCIENTIFIC AMERICAN, which contains the information you desire. 4. What machine now in use is the best, all things considered, for the manufacture of ground wood pulp? Where are they manufactured? A. This information can probably be obtained by inserting an advertisement in the Business and Personal column of this paper.

(13) C. A. R. writes: Wishing to renew my Leclanche batteries, which were giving out, I bought some new empty porous cells. Please give the following information: 1. Can I use the carbon plates of the old elements over again? If so, do they need to undergo any washing or soaking; or are they as good as ever? A. Yes. Soak them for a few hours in warm water. 2. Is there anything I must add to the granular manganese with which I fill the cells, in order to obtain maximum power and endurance? Some makers add pulverized or even coarsely broken carbon. Is it an advantage? A. It is an advantage to add granulated carbon to the manganese. Use equal parts of each. 3. What is the exact composition of the curdy mass which forms around and especially underneath the zincs of newly mounted and old gravity batteries. Is this substance formed naturally, or is it the result of using poor zinc or sulphate of copper? A. It is copper, and should be removed, for it weakens the battery. It is the result of placing the zinc in the sulphate of copper solution. 4. Is there any real advantage in amalgamating the zincs of the above batteries? A. No. 5. Is there a speedy way of cleaning them when coated with this substance? A. They can be cleaned by scraping. 6. At certain occasions my electric bells began ringing without anybody apparently closing the circuit. I often notice that if I unjoin the batteries and let them remain thus for a few hours, on reconnecting them the bells would work all right for a week, sometimes a fortnight, when the same trouble would again occur. Can you in any way explain this phenomenon? The batteries are not placed in a very dry part of the house, but the wires, which run pretty closely together, are nearly all exposed, so that I can control the slightest corrosion or uncovering of the conductors. A. There must be some accidental closing of the circuit. We could not explain the action of your line without seeing it.

(14) J. E. E. asks: What is the number of layers of wire, and the size used for the primary of the induction coil in the Blake transmitter, and as near as you can the amount used for secondary? A. For primary, use three layers of No. 20 magnet wire, and for the secondary use twelve or fourteen layers of No. 36 silk covered copper wire. The resistance of the secondary wire should be from 100 to 150 ohms.

(15) J. M. I. asks how to make a barometer by coloring ribbon, so that they will change color, indicating weather changes. A. Use a moderately strong solution of chloride of cobalt in water.

(16) O. C. H. writes: In reply to R. A. R., question 22, in SCIENTIFIC AMERICAN, December 4, I will say that some months ago I was engaged in running a saw mill, lathe, and shingle factory; was troubled with two hot boxes, and frequently had to stop and apply ice. Seeing in the SCIENTIFIC AMERICAN a reference to the use of plumbago, I sent for some, and after three or four applications was troubled no more with hot boxes.

(17) F. W. asks: What is the best way for return pipe to go into the boiler from radiators—steam at 60 lb. per square inch, fall 15 feet? A. If your job is properly piped you can bring your return pipe in at any convenient place in your boiler below the water line. If you go into the feed pipe, have your connection inside all other valves.

(18) L. T. G. writes: I have four cells of carbon battery, the solutions are bichromate of potash and sulphuric acid. Also three cells of the Smee: sulphuric acid one part, to ten of water; and the four cells of the carbon battery are not sufficient to run my small electro-magnetic engine for more than two or three minutes. I wish to know if it would be injurious to either one of the batteries if I should unite them both in one circuit, to run the engine for about one or two hours at a time. A. The batteries will not be injured, but they will not work well together. Better increase the number of carbon elements. 2. Will either of the above batteries freeze in winter, or will cold weather affect their working? A. They will not freeze, but it is better to keep them at a temperature above freezing. 3. Is it always best to use the largest wire in connecting batteries with any instrument, say, above No. 11 or No. 12 wire, as the larger the wire the less the resistance, thereby getting nearly the full power of the battery? A. Yes. 4. What purposes are quantity and intensity electricity best suited for respectively? A. Batteries are arranged for quantity or intensity according to the work to be done. The maximum effect is obtained when the battery elements are combined, so that the total resistance in the elements is equal to the resistance of the rest of the circuit.

(19) J. H. asks: Which would be the strongest, two 2-inch by 4-inch joists nailed together, or one 4-inch by 4-inch joist? A. One 4-inch by 4-inch.

(20) J. K. B. writes: I suppose every experimenter who uses a carbon battery has been troubled by the uncertainty of the carbon connection. The makers of the Grenet battery seem to have solved the problem. Can you tell us through your correspondence column what solder they use, and how they make it stick? A. The carbon is coated with copper by electro-deposition; this coating is readily soldered to the carbon support with common soft solder.

(21) M. D. M. asks: 1. Is there a difference in a steam engine between the boiler pressure and the pressure on the piston when the piston is moving 400 feet per minute? A. Yes. 2. About what difference? A. From 2 to 8 lb., depending upon size and length of steam pipe. 3. Does the difference between them vary with a difference in the motion of the piston in the same engine? A. Not appreciably within usual limits of speed.

(22) F. writes: We have just closed up our steam stone works for this season, and we wish to know what is best to coat the inside of our steam boilers to keep them from rusting. Some say black oil, and others common tallow; which do you recommend as the best? A. We think the black oil quite as good and cheaper than tallow. Have the surfaces thoroughly cleaned before applying the oil.

(23) C. H. asks for a cheap and easy way of amalgamating battery zincs. A. It depends on the kind of battery. In the Fuller the mercury is placed in the porous cell with the zinc. In bichromate batteries all that is necessary is to dip the zinc in the bichromate solution and then pour on a drop or two of mercury. It soon spreads over the entire surface of the zinc. Another method is to dip the zincs in dilute sulphuric acid and then pour on a little mercury, but these methods, except in the case of the Fuller battery, are wasteful of mercury. It is better to apply an amalgamating solution with a brush. This solution is made by dissolving one part (by weight) of mercury in five parts of nitromuriatic acid (nitric acid one part, muriatic acid three parts), heating the solution moderately to quicken the action; and, after complete solution, add five parts more of nitro-muriatic acid.

(24) G. W. asks: 1. Would a perfectly round ball of the same specific gravity throughout lie still on a level surface? A. Yes. 2. Can a mechanic's square be made so true that a four-inch block may be made exactly square by such an instrument? A. Yes.

(25) W. H. asks: 1. What is the weight of a boiler 24 feet long, 44 inches diameter, 1/2 inch thick? A. With two flues, 16 inches diameter, 6,900 lb. 2. What is the contents (in gallons) of a tank 15 feet deep, 10 feet in diameter, top and bottom diameters being equal? Please give me a formula. A. Area of 10 feet diameter = 78.54 x 15 feet deep = 1,178 cubic feet, and, allowing 7 1/2 gallons per cubic foot = 1,178 x 7.5 = 8,835 gallons.

(26) C. L. W. writes: I have constructed a small induction coil to be used for giving shocks. It is 3 inches long. The primary coil is wound with 3 layers of No. 18 cotton covered wire, and the secondary consists of about 12 layers of No. 38 silk covered. 1. How many cells and what kind of battery shall I use to get the best results? A. For temporary use one cell of Grenet battery would answer, but for continued use some form of sulphate of copper battery is to be preferred. 2. Is it necessary that the spring and screw in the interrupter should be coated with platinum? A. Yes; otherwise they would soon burn out.

(27) H. C. P. writes: In the SCIENTIFIC AMERICAN of September 18, Mr. E. Y. D., query 26, asks whether a sun dial, made for latitude 48° 15', can be utilized in latitude 38° 50' for showing correct time. To make his dial available in the lower latitudes, he has only to lift the south side, so as to give the face a slope to the north equal to the difference of the latitude, in this case 9° 25'. For then the plane of the gnomon being in the plane of the meridian, the edge of the gnomon casting the shadow will be parallel with the earth's axis; and the face of the dial will be parallel with the horizon of the latitude for which the dial was made, and the graduation will show the time required; that is, on the supposition that it was correctly made, and for a horizontal dial.

(28) C. M. M. asks for a cheap process of plating steel case knives with tin. A. Clean the metal thoroughly by boiling in strong potash water, rinsing, pickling in dilute sulphuric acid, and scouring with a stiff brush and fine sand. Pass through strong aqueous salammoniac solution, then plunge in hot oil (palm or tallow). When thoroughly heated remove and dip in a pot of fused tin (grain tin) covered with tallow. When tinned, drain in oil pot and rub with a bunch of hemp. Clean and polish in hot sawdust.

(29) V. R. P. writes: I have an aquarium which contains 4 1/2 gallons of water. How many fish must I have in it—average length of fish 1 1/2 to 2 inches, to insure the health of the fish? At present, I refill the aquarium semi-weekly. Please tell me a process by which I can lengthen the time. A. Put in three fish, 1 1/2 inches in length, to one gallon of water, one small bunch of fresh water plants to one gallon of water. Tadpoles (after they have cast their branchia or gills), newts, and rock fish can be used to the extent of six to the gallon. The aquatic plants will supply the fish with sufficient oxygen, so that the water will seldom require changing.

(30) A. S. writes: I am about to construct an aqueduct 1,200 feet in length, the water level differing 40 feet. By placing a forcing pump in the valley I could then raise the water to a height of 40 feet, and having erected a tank at that height and connected it by means of pipes with another tank 1,200 feet distant, but on the same level, the water according to a law of nature would travel over the distance of 1,200 feet. But finding it very difficult to erect tank 40 feet high, I would prefer to construct the whole on the incline. Will the forcing pump having just power enough to raise the water 40 feet perpendicularly into the tank have sufficient power to force it into a tank of the same elevation through 1,200 feet of pipe running on the incline, or must I have more power, and how much more? A. The forcing pump must have enough more power to overcome its own additional friction and the friction of water in the long inclined pipe. Allow 20 per cent more power at least.

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

Box marked C. H. (no letter).—1. Garnetiferous quartz rock. 3 and 4. Micaceous quartz rock. 5. Granite. 6. Basalt with traces of calcopyrite.—L. C. G.—They are fossil sharks' teeth, common in marl beds.—J. E. C.—1. Iron sulphide and lead sulphide. 2. Quartzite, with traces of galena and molybdenic sulphide. 3 and 4. Dolomite. 5. Fossiliferous argillaceous limestone, containing traces of lead sulphide. 6. Lead sulphide in argillite.—C. T. M.—1. A silicious kaolin. 2. Similar to No. 1. Useful if mixed with finer clay for white ware. 3. Silicious carbonate of lime—some of this would probably make fair cement. 4. Brick—the clay from which this was made would probably be useful to potters. 5 and 6 are very silicious clays.

COMMUNICATIONS RECEIVED.

Liniment. By J. L. T. Seen and Tangible and the Unseen and Intangible. By J. L. T. On Cheap Railroads. By R. P. N. On a Meteor. By W. E. C.

[OFFICIAL.]

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AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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