Business and Personal.

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Glass—Instructions given in etching and frosting; also stencil etching. T. J. Calnin, 31 Albany St., Boston, Mass.

Shaw's accurate and U. S. Standard Mercury Gauges, Steam, Vacuum, Hydraulic, and Test Gauges, &c., 915 Ridge Avenue, Philadelphia, Pa.

Wanted—A small Water Power Engine. Address George Austin, PostOffice Box 4,060, New York City.

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F. C. Beach & Co., makers of the Tom Thumb Telegraph and other electrical machines, have removed t 16 Water Street, New York:

Pat'd Graining Stencils—J. J. Callow,Clevel'd, O.

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For 2d Hand Portable and Stationary Boilers and Engines, address Junius Harris, Titusville, Pa.

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"Dead Stroke" Power Hammers—recently greatly improved, increasing cost over 10 per cent. Prices reduced over 20 per cent. Hull & BeldenCo., Danbury,Ct.

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Steel Castings, from one lb. to five thousand lbs. Invaluable for strength and durability. Circulars free. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

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

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

Hotchkiss & Ball, Meriden, Conn., Foundrymen and workers of sheet metal. Fine Gray Iron Castings to order. Job work solicited.

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

Hydraulic Presses and Jacks, new and second nand. Lathes and Machinery for Polishing and Buffing metals. E. Lyon, 470 Grand Street, New York.

Diamond Tools—J. Dickinson, 64 Nassau St., N. Y.

Temples and Oilcans. Draper, Hopedale, Mass.

Notes & Queries

O. J. H.'s letter has been placed in the hands of a prominent physician for reply.—C. W. J. should obtain the best medical advice.— W. R. will find a recipe for a black walnut stain on p. 90, vol. 32.—W. N. will find directions for making concrete gravel walks on p. 50, vol. 32.

(1) J. L. C. says: I have a surveying compass, the needle of which does not traverse well. What is the cause, and how can I remedy it? A. It has probably become demagnetized. You should have it charged again.

(2) G. W. D. says: Referring to your recent descriptions of reflectors and to the article in your paper of November 28, 1874, entitled "A Possible Improvement in House Heating," I beg to inquire if any considerable increase of heat could be obtained by massing, by means of reflectors or lenses, the radiations from furnaces, gas, and oil lamps, or other artificial sources, provided the beams are carried in parallel rays and arrested within, say, 6 feet of the focus. I apprehend no difficulty in so utilizing the sun's rays, but am doubtful as to the gain of heat, in massing heat radiations from other sources. I would not require over 200° Fah. Can this be accomplished, and how? A. All heat rays are susceptible of accumulation by concentrated radiation, whether of the sun or of artificial combustion. Blackened surfaces constitute the heat radiators. Place a wire basket filled with a small shovel full of glowing coals in the focus of a reflector, and the heat rays from it will ignite phosphorus in the focus of a supplementary reflector 12 feet distant. A number of reflectors, so placed behind as many fires as to concentrate the heat rays upon a given point, will cause a degree of heat at that point corresponding in intensity with the combined rays of the fires, less the loss by absorption into the medium through which they pass. Light rays from the moon may be concentrated as readily as those from the sun, but no degree of multiplication of such rays will reveal any appreciable accumulation of heat. From this it is to be inferred of this reflected heat that what little of heat from the sun there may be, that is not absorbed by the moon, is lost on its way to us in its passage through the atmosphere of the earth.

In using compressed air, would there be any gain of power (without reference to the question of economy) by devaporizing and heating before compressing the air? A. If you heat the air at constant volume, before compressing it, the pressure will be increased; and then if it is compressed, the pressure will of course be greater than if it had not been previously heated.

(3) R. K. asks: What is the best material for locomotive boiler tubes for conducting heat, copper, brass, or iron? A. Brass.

(4) W. H. H. W. says: My neighbor has a well 40 feet deep and 800 feet from his house. The house is 10 feet lower than the bottom of well. Will it be possible to draw the water from the well by a siphon? Is it necessary to lower or cut away the hill that the water will not be required to rise more than 30 feet. What size of pipe should be used? A. It will not be advisable to attempt to raise the water more than 25 or 26 feet, nor to use a pipe smaller than 1 inch in diameter.

(5) A. F. B. asks: Is it a saving of battery material for a Callaud gravity battery to stand open at night? A. Yes.

(6) J. T. B. asks: 1. Will electricity, passing through a magnet, change its poles? A. Yes. 2. Which is the cheapest. way to run a strong electric battery? A. A carbon battery excited by bichromate of potash is the cheapest where great power is required.

(7) G. W. McD. asks: Does the air in the air chamber of an hydraulic ram change in the operation of the ram, that is, does more enter and some escape, in the working of the ram? A. Yes.

(8) C. C. J. R. asks: 1. If the circumference of a steel wheel be placed near a large magnet, does the wheel become a magnet? A. Yes. 2. Where are its poles situated? A. One pole would be next to the permanent magnet, the other would probably be on the opposite end of the wheel. 3. Does the horseshoe magnet of a magneto-electric machine lose its power by use? If so, is the loss much? A. Yes, gradually; but the loss is sometimes almost insensible for a long while. 4. Does it continue to lose as long as it is used? A. Yes. 5. How many revolutions ought a magneto-electric machine to make in a minute to produce the strongest current of electricity? A. The current will increase with most machines until the velocity of the movable magnets exceeds 1,000 revolutions. 6. Does a magnet lose its power when placed near the circumference of an iron or steel wheel which is revolving? A. Yes.

(9) W. N. M. says: I have the two conductors of an electrical machine, and the plate,shaft, and crank. There are no rubbers, and I want to know of what material to make them, and whether to put them between the wheel standards or on the same standard as the brass globe. A. Make the rubbers of leather and stuff them with horsehair. They should be attached to the standard carrying the brass globe.

(10) C. H. R. says: I notice in your accounts of the working of some of the many cables that electricians have experienced much difficulty in attaining a speed in the transmission of signals that was sufficient to relieve the pressure of business, and, in order to hasten it, have formed a metallic circuit by joining two wires, thereby overcoming in a measure the effects of the secondary current produced in the cable by the primary. I have often noticed in some of my experiments the strong natural tendency of the electricities when separated to reunite, and would suggest to electricians, if they think it worthy, a trial (my facilities in regard to the necessary apparatus being too limited for any conclusive experiments). If a vessel could be so constructed as to hold negative electricity (which could be accomplished by charging it, and, drawing the positive to the ground), by attaching it to one end of the cable, and by working the opposite end with positive electricity, it might possibly not only hasten signaling, but overcome some of the other difficulties and make one cable free to work in opposite direction. A. The idea is impracticable for the reason that a signaler cannot operate opposite ends of the cable at the same instant.

(11) T. E. asks: What size of boiler should I use for a small engine, with 1 inch bore and 2 inches stroke? A. Make one 9 inches in diameter and 15 inches high.

(12) J. P. asks: How would you determine in horse power the best way steam heating should be charged? A. This must be a matter of argument, as there is no universal standard. A very common rating would be to charge the number of cubic feet of water evaporated per hour for heating purposes, as so much horse power. Others would multiply this by 2, to get the horse power.

(13) L. W. says: I am told that telegraph messages, in traveling from one station to another, go through the ground, and that the wire serves to complete the circuit. Our operator says that the current passes over the wires, and that the ground wire serves to complete the circuit. A. The signals pass over the wire only. The earth merely completes the circuit by acting as a reservoir for the electricity discharged at each end of the wire.

(14) J. W. S. asks: 1. Is the actual pulling power of a locomotive engine with 4 feet driving wheels greater than with 5½ or 6 feet wheels, weight of locomotive, size of cylinder, and all other things being equal? A. Yes. 2. Why are small driving wheels generally adopted for freight locomotives? A. Because they are required to haul heavy loads, and great speed is not wanted.

(15) J. A. W. says: How much more will a screw 3 inches in diameter lift, than one 1½ inches, of the same pitch or number of threads per inch? A. Disregarding friction, the rule is as follows:

$$\text{Weight raised:} \begin{Bmatrix} \text{force} \\ \text{applied} \end{Bmatrix} :: \begin{Bmatrix} \text{circumference} \\ \text{described by} \\ \text{force} \end{Bmatrix} : \begin{Bmatrix} \text{pitch} \\ \text{of} \\ \text{screw.} \end{Bmatrix}$$

Hence the relation will be the same for all screws having the same pitch.

(16) W. S. W. asks: Is there any difference between an open crank motion or an eccentric motion? An eccentric motion is a solid crank, but the positiveness in the motion seems not to be the same. Are there the same dead points in an eccentric as there are in a crank? A. Yes, the motion is the same.

(17) F. C. W. asks: How many times will a locomotive cylinder fill and exhaust in a second? A. Take the case of a locomotive with 6 feet driving wheels, moving at the rate of 40 miles an hour. The wheels would make a little more than 3 revolutions per second, so that the cylinder would be filled a little over 6 times.

(18) H. W. K. asks: What is the process of tempering solid steel dies in lead? A. By heating steel in melted lead the outside becomes sufficiently hot to harden before the inside does; hence the inside is left comparatively soft, and the steel is therefore not liable to crack in the hardening. Another advantage is that the heating, and hence the tempering, is very uniform.

(19) W.C. A. asks: Will it make any difference in the working of a main telegraph line if I should use it for a return wire for a short circuit, putting keys, sounders, and local battery on the short circuit wire? A. It would not interfere with the working of the main line. Vocal sounds have been sent through a few feet of wire.

(20) J. W. S. says: Does steam at pressures from 40 to 125 lbs. per square inch destroy the elasticity of steel springs working in the boilers? A. Good springs are quite durable in such situations if they are protected against corrosion.

(21) E. W. W. says: I am building a cistern in my cellar with the inlet pipes each 2 inches in diameter. running from the roof, about 20 feet. How large should the outlet pipe be to prevent overflow? A. Make it 3 inches in diameter.

(22) A. R. asks: What is the formula for the number of feet in a telegraph pole? A. The following is given for timber measuring: $G=\frac{1}{4}$ girth at middle in feet. $g=\frac{1}{4}$ girth at one end in feet. $g'=\frac{1}{4}$ girth a tother end in feet. L=length of log in feet. c=cube contents of same in feet.

$$c = L \left(\frac{G+g+g'}{3} \right)^2.$$

(23) M. G. says: I have been trying to gold plate a chamber of a revolver. It had been nickel plated, but it had partly peeled off, so I took it all off. I cleaned it thoroughly, and (to plate it with copper first) I plunged it into a solution of sulphate of copper, and it turned all black. I would like to know what is the reason for this. A. Clean the chamber again carefully, and use a cyanide instead of an acid solution of copper for the first thin deposit. The superior chemism of the acid for iron or steel over that of acid for copper is sufficient to produce the results obtained. Do not use too much battery.

(24) W. F. C. asks: What is heat lightning? A. Heat lightning is a name given to the reflection of lightning discharges that take place below the horizon or behind clouds.

(25) A. R. W. asks: Can you give me a recipe for a phosphorus paste for cockroaches? A. Take phosphorus 1 oz., warm water 1 pint; put in a bottle, cork up, and agitate till the phosphorus is in a minute state of division, adding towards the end moist sugar ¼ lb. Then add lard melted by gentle heat 1 lb., and repeat the agitation till the whole is nearly cold; when cold, form it into a stiff dough with oatmeal, and make into small cakes. Dry in the air.

(26) I. E. H. asks: How can I make rubber stamps? A. Vulcanized rubber is used, as prepared by the manufacturers, and can be procured in strips about 3 inches wide and ¼ inch thick, and of any length desired. The name and address should be set up in type and well oiled; a rim about ¼ inch in hight should be placed around the form, and dentist's plaster, mixed to the proper consistence, poured in and allowed to set; then the plaster cast is to be separated from the type. A piece of the vulcanized rubber is then cut out, of the size of the plaster mold, and laid upon it, and both together are placed in a screw press, and heat sufficient to thoroughly harden the rubber is applied. The screw is then turned down hard, and left for a time until the rubber is perfectly forced into the mold. After the whole is cold, the rubber is separated from the model, and any irregularities trimmed off with a sharp knife; the rubber stereotype is then fastened, with glue or other cement, to a block of wood, and the stamp is ready for use. 2. Of what is the well known oil bath for vulcanizing rubber composed? A. At the present day Parkes' method is generally adopted; the caoutchouc is simply immersed in a mixture of 40 parts sulphide of carbon and 1 part chloride of sulphur; it is next placed in a room heated to 70° Fah., and, when all the sulphide of carbon has been volatilized, the process is so far complete that it is only requisite to boil the material in a solution of about 1 lb. caustic potassa in 2 gallons water, the vulcanized caoutchouc being next washed to remove excess of alkali.

(27) H. D. M. F. asks: What is a bogie? A. "A four-wheeled truck supporting the fore part of a locomotive, and turning beneath it to some extent, if necessary."—*Knight's Mechanical Dictionary.*

(28) C. D. K. asks: 1. How can I stain light yellow brick so as to give them a dark color? A. You cannot stain brick a permanent color as you can some kinds of wood. The nearest approach to it probably is the cement wash which permeates the pores of the brick. Something of the nature of a glaze might be fixed into the face of the brick in the kiln. Light brick may be made darker by smoke, but the color will be neither even nor agreeable. Cement or oil paint is the most practicable.

(29) C. M. asks: Would a moist blast for forges, etc., be injurious to the iron? A. No, but there would be no advantage derived from the introduction of moisture.

(30) C. F. G. asks: For what are barytes used? A. The sulphate of baryta is the permanent white of water color artists; it is also employed to adulterate white lead. When mingled in excess with the latter pigment it forms Dutch white : in equal quantity Hamburg, and in lesser amount Venice, white. But it becomes, when ground with oil, translucent, and impairs the opacity of the lead paint.

(31) O. J. H.—Paris green (Schweinfurt green) is an aceto-arsenite of copper. In 100 parts: oxide of copper,31·29; arsenious acid, 58·65; acetic acid, 10·05. Dr. Ehrmann gives as its formula: $(C_2H_3O_2)_2$ Cu $\}$ O_2+3 (CuO,As_2O_3).

(32) A. M. S. says: You stated some time ago that glycerin was a low form of alcohol. Some students tell me it is an oil. A. The alcohols are classified after the number of the O H, or hydroxyl, groups contained in them. Thus: ordinary alcohol (ethylicalcohol)—C_2H_5 (O H)—is a monatomic alcohol; C_2H_4 (O H)$_2$, or ethyline alcohol, is diatomic; C_2H_5 (O H)$_3$, or glycerin, is triatomic, etc. We do not know what you mean by "low form" of alcohol; glycerin, the last named alcohol, is more highly constituted than the former.

How are photographs fastened to glass for the new style of oil painting? A. Cover the picture with a fine cloth, and remove all air bubbles by means of a soft rubber roller.

(33) W. B. W. asks: How can I make a petrifying solution to make vegetable tissues hard and durable? A. The time required for ordinary petrifaction renders its artificial application impracticable. There are various methods of metalizing leaves, etc.. usually by electro-deposition of the metal, which, when properly applied, copy perfectly. These may be afterwards enameled to suit.

(34) J. D. E. asks: 1. What are the sizes and distances apart of the lenses in the eyepiece illustrated in SCIENTIFIC AMERICAN SUPPLEMENT, vol. 1? A. For medium power, focus of 1st lens, 1·30 inch : focus of 2d lens, 1·30 inch; focus of 3d lens, 1·40 inch; focus of 4th lens, 1·00 inch. Distance between 1st and 2d lens, 1·73 inch; distance between 2d and 3d lens, 2·25 inch; distance between 3d and 4th lens, 1·47 inch. Diameter of 1st and 2d lens, 0·48 inch; diameter of 3d lens, 0·68 inch; diameter of 4th lens, 0·34 inch. Distance of diaphragm from 1st lens, 1·45 inch; aperture of diaphragm between 1st and 2d lens, 0·08 inch; aperture of diaphragm between 3d and 4th lens,0·46 inch; distance of cap from 4th lens, 0·30 inch; aperture of cap, 0·17 inch. 2. Should there be a diaphragm at the focus of the object glass? A. There should be diaphragms in the tube to cut off the reflections from the inside. 3. What is the ratio between achromatic lenses of different foci? A. In telescopic objectives the magnifying power varies directly as the focal length. If the focal length is double, the magnifying power is double. 4. Is it necessary to have the focus of the field lens of the Huyghenian eyepiece longer than that of the eye lens? A. Yes. 5. Is it necessary to have the rays of light parallel when they enter the eye? A. They should be nearly enough parallel to enable the eye to bring the object to a focus.

(35) E. P. M. asks: How can I soften some such substance as black hard rubber so as to mold it into small round tickets, with letters on them? A. The rubber is usually formed into the shape desired while still soft and warm, before vulcanization.

(36) H. N. R. asks: 1. Which is the most powerful, a reflecting or refracting telescope? A. A refracting one. 2. Can I get one which will distinguish objects 16 miles distant for $30? A. Yes. 3. Where can I get it? A. Address the opticians who advertise in our columns. 4. Would it be too long to carry? A. No. 5. Would it be a night as well as a day glass? A. Yes.

(37) A. L. F. asks: What is common pitch? A. It is the residue remaining after the removal of certain volatile bodies by distillation from the so-called Stockholm tar. The tar is originally obtained by a kind of rude distillation of the resinous wood of the pine, in turf-covered kilns.

(38) O. J. H. asks: What is Paris green? A. It is the aceto-arsenite of copper, and is the most poisonous of any of the combinations of arsenic.