Business and Personal.

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Johnson's Universal Lathe Chuck—Awarded the highest Premium by the Franklin Institute of Phila., for " Durability, Firmness, and adaptation to variety of work." Lambertville Iron Works, Lambertville, N. J.

Hill's Patent Direct-Acting Steam Drop Hammer will be illustrated shortly in the Scientific American. Address Hill & Williams, Quincy, Ill., for circular.

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Machine-cut brass gear wheels, for models, &c. List free. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Rubber Hydrant Hose, Hose Pipes and Couplings, best quality. Send for Prices to Bailey, Farrell & Co., Pittsburgh, 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 & Belden Co., Danbury,Ct.

Driving Belts made to order, to accomplish work required. Send full particulars for prices to C. W. Arny, 48 North Third St.. Philadelphia, Pa.

Power & Foot Presses & all Fruit-can Tools. Ferracute Wks., Bridgeton, N.J. & C. 27, Mchy. Hall,Cent'l.

Leather and Rubber Belting, Packing and Hose. Greene, Tweed & Co., 18 Park Place, New York.

Hand Fire Engines, Lift and Force Pumps for fire and all other purposes. Address Rumsey & Co., Seneca Falls, N. Y., U. S. A.

See Boult's Paneling, Moulding, and Dovetailing Machine at Centennial, B. 8-55. Send for pamphlet and sample of work. B. C. Mach'y Co., Battle Creek, Mich.

Walrus Leather and Walrus Leather Wheels for polishing. Greene, Tweed & Co., 18 Park Place, N. Y.

For Sale—24 in. x24 ft. Lathe, with Chuck; two 13 in. Lathes ; one 7 ft.x24 in. Planer; two 8 in. Shapers. E. P. Bullard, 48 Beekman St., New York.

The French Files of Limet & Co. have the endorsement of many of the leading machine makers of America. Notice samples in Machinery Hall, French Department, Centennial Exposition. Homer Foot & Co., Sole Agents, 22 Platt St., New York.

Trade Marks in England.—By a recent amendment of the English laws respecting Trade Marks, citizens of the United States may obtain protection in Great Britain as readily as in this country, and at about the same cost. All the necessary papers prepared at this Office. For further information address Munn & Co., 37 Park Row, New York city.

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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 hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon, 470 Grand Street, New York.

Spinning Rings of a Superior Quality.—Whitinsville Spinning Ring Co., Whitinsville, Mass.

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

Temples and Oilcans. Draper, Hopedale, Mass.

J. P. H. will find full particulars of the malleable glass on p. 402, vol. 32, and p. 20, vol. 33. —H. L. C. will find a good recipe for paste blacking on p. 139, vol. 31.—L. H. W. will find directions for bleaching beeswax chemically on p. 299, vol. 31.—D. M. K. can mend his rubber foot ball by the method described on p. 203, vol. 30.—R. A. B. can preserve natural flowers by the process described on p. 204, vol. 28.—T. J. should waterproof his horse covers by the process described on p. 347, vol. 31.—D. C. will find a recipe for a waterproof varnish for pictures on p. 11, vol. 31.—J. D. T. and many others, who ask how to obtain engineers' certificates in New York city, should apply at police headquarters.—M. will find a description of the glacier theory on p. 90, vol. 31.—I. S. can nickel plate his show case trimmings. See p. 235, vol. 33. —J. R. McN. can make purple and red ink by using the recipes given on p. 315, vol. 33.—F. O. X. will find directions for kalsomining outdoor work on p. 133, vol. 34. For crystallizing with alum, see p. 127,vol. 26.—R. A. I. will find directions for mounting chromos on p. 91, vol. 31.—L. will find recipes for colored fires on p. 165, vol. 24.—L. W. S. will find directions for case-hardening set screws on p. 202, vol. 31.—J. H. D. will find directions for skeletonizing leaves on p. 155, vol. 31.—C. W. should use aquarium cement in the joints of his tanks. See p. 80, vol. 31.—T. O'B. will find a recipe for hair dye on p. 138, vol. 27.—R. S. P. will find a recipe for a silver-plating fluid on p. 269, vol. 31.—C. H. P. should know that a circle contains a larger area than can be enclosed by a line, of similar length to its circumference, in any other form.—W. W. B. will find an account of the inventions of the past century on pp. 330, 336 352, vol. 34.—F. W. F. can remove grease spots from clothing by using rectified spirits of naphtha.—S. R. S. will find a description of the Solvay soda process on p. 404, vol. 34.—B. X. will find directions for making transfer paper for manifold writing on p. 363, vol. 31.—T. & B. will find directions for lining casks with a waterproof, tasteless compound on p. 11, vol. 34. This also answers H. C. B.—W. A. W. will find an answer to his query as to friction of water in pipes on p. 250, vol. 34.—R. V. L. D. will find directions for building a shell boat in the Scientific American Supplement, vol. 1.—J. B. O. C. and others will find a recipe for mucilage on p. 202, vol. 31.—W. B. will find a recipe for aquarium cement on p. 80, vol. 31.—C. E. W. will find a recipe for Babbitt metal on p. 122, vol. 28.—L. R. can clean his dirty oil by the method described on p. 409, vol. 34.—F. R. W. can mold rubber in his iron joint by the process described on p. 283, vol. 29.—R. G. B. will find full directions for making a telescope on p. 11, vol. 1,Scientific American Supplement.—F. & S. will find directions for bleaching hair on p. 380, vol. 24.—E. G. E., W. J. M., R. J. W., J. K. B., R. S., and others who ask us to recommend books on industrial and scientific subjects. should address the booksellers who advertise in our columns, all of whom are trustworthy firms, for catalogues.

(1) T. L. F. says : 1. Please give me a plain mode of calculating port openings, exhaust, etc., of small steam cylinders. A. The ports should be so proportioned that the velocity of the steam will not exceed 100 feet per second. Hence, if you multiply the area of the piston in square inches by the piston speed in feet per minute, and divide by 6,000, the quotient will be the minimum port area. 2. Is Mr. David Shive's way of calculating the horse power of an engine one which can be relied on? A. The rule is a close approximation. You have not, in your instance, applied it properly. 3. I am using a small engine for driving 8 or 10 lathes, and occasionally a small circular saw, for about 2 or 3 hours. I have to drive a large fan. My boiler is 8 feet high and of 30 inches grate surface; cylinder is 15 inches long and of 7 inches bore; engine runs at 130 revolutions per minute, which gives no power to spare under 75 or 80 lbs. steam. After throwing the fan off, we have far more power than is required, running full speed with 25 or 30 lbs. steam. Would it not pay to build a small cylinder, say 5 by 6 inches, running at 200 revolutions, to use when not using the fan? A. Your engine seems to be performing very well, and we scarcely think the proposed change is essential.

(2) A. B. C. asks : What are the proper proportionate sizes of condenser and air pump to obtain a vacuum of 24 inches under the following conditions? Small engine, say from 8 inches diameter by 10 inches stroke; slide valve cutting off at $\frac{7}{10}$ to $\frac{3}{4}$ of the stroke. Steam pressure in boiler 75 to 80 lbs., and piston speed 300 feet per minute. Heat of injection water 60°. Air pump to be double acting. Plunger with rubber valves, worked with crank on forward end of shaft. What should be the size of injection pipe? A. You should proportion the apparatus so that the amount of injection water will be from 22 to 26 times the volume of the condensed steam.

(3) C. U. E. says : From the following you will see that friction decreases with the diameter of shaft. See p. 283, vol. 34. R=pressure on journal, and c=coefficient of friction. Then friction =F=c R ; the space described is the circumference of shaft 2 π r; and the mechanical effect lost by friction is A= c R 2 π r; now if the shaft makes n revolutions per minute, the mechanical effect expended per second is equal to $L = 2 \pi c R r \frac{n}{60} = \frac{\pi n c R r}{30} = 0.105\, n\, c\, R\, r$. Therefore the friction increases with pressure, number of revolutions, and diameter. A. According to the query, the velocity was to remain constant, so that, as the diameter of the journal was increased, the number of revolutions was to be diminished in proper proportion; and the mechanical effect lost by friction would be unchanged.

(4) A. L. B. says : 1. I am building a small upright steam engine, the cylinder being 1¾ x ¾ inches. How large a fly wheel should I have? A. From 2½ to 3 inches in diameter. 2. Which is the simplest way of constructing a feed pump for the boiler? A. A plunger pump would probably be the simplest. 3. The boiler is 3 inches in diameter and 7 inches high, having 13 tubes in it. Is it large enough to keep the engine on a steady run? A. No. It is rather too small.

(5) W. F. W. asks : Why is it that saw filings obtained by sharpening a saw, thrown into a fire in small quantities, will flash like powder? A. Because they are suddenly heated and consumed.

Why is it that, if you multiply all of the numerals except 8 and 0 by a multiplier produced by multiplying the figure 9 by 2, all the figures in the answer will be 2s, and likewise, if you multiply by 9 x 3, the answer will be all 3s, and so on ? Thus:

12345679	12345679	12345679
18	27	81
98765432	86419753	12345679
12345679	24691358	98765432
222222222	333333333	999999909

A. It is determined by experiment. Thus, it having been found that 111,111,111÷9=12,345,679, the rest follows.

Please give me a good composition for imitation marble, that can be shaped into molds before getting hard? A, See p. 165, vol. 27.

(6) W. C. F. says : I am manufacturing a class of work that may be cast in a chill, and would thus be uniform in size, and save lathe work; but when thus cast the pieces cannot be drilled. By what process can I anneal the castings so they may be drilled? A. Make them red hot, and cover them with quicklime.

(7) A. A. A. says : I am about to construct a magneto-electrical machine like that represented on p. 100, vol. 34, of the Scientific American. I have a permanent magnet which measures from the two ends to the bend 13 inches, and between the two ends 1½ inches, and from the outside across the two ends 3½ inches, and it will lift more than its own weight. I want to know what length and thickness the ends of the soft iron magnet should have, so as to correspond with the permanent magnet, and also the kind, length, and number of wire. A. Make the iron cores for the electro-magnet about ½ inch long and ½ or ⅝ in diameter. Use 150 or 200 feet of No. 23 copper wire in each coil. Cover the iron with paper, and wind on that.

(8) L. K. Y. asks : Will you please tell me how I can make a Britannia dip? Silver platers use a dip by the above name. Before putting a piece of Britannia metal in the silver solution they dip the piece in the Britannia dip. A. Britannia metal should be rinsed in a fresh solution of caustic soda or potash, and then transferred at once to the silvering solution.

(9) M. R. says : I have so changed the solution in a five cup Callaud battery that the offspring seems to have some of the characteristics of frictional and induced electricity, direct from the battery. By placing a piece of graphite from a lead pencil in contact with a piece of carbon, and putting them in circuit(the pencil connected with the positive pole) heat is produced in the lead sufficient to inflame an ordinary friction match. Is this an unusual degree of heat to be produced direct from a battery of this number of cups or of the density form ? A. No.

(10) B. S. S. says : Please give me a recipe for coating wooden troughs for batteries, that will withstand the alkali. A. The following is much used in batteries: In 12 parts benzole dissolve 1 part India rubber, and to the solution add 20 parts powdered shellac, heating the mixture cautiously over fire. Apply with a brush.

(11) P. F. W. asks : 1. Can an engine with a 4 foot drive wheel make 60 miles an hour? A. It is possible. 2. Can an engine with a 5 foot wheel make 75 miles an hour? A. Yes, so far as the size of the wheel is concerned. 3. What is the ascertained or supposed maximum of speed attainable by 4, 5, and 6 foot drive wheel engines, respectively? A. The ascertained maximum is about 60 miles an hour. The supposed is an unknown quantity.

(12) G. S. N. asks : I have a 2 x 6 inches cylinder engine, with fly wheel 15 inches in diameter and 2½ inches face, making 150 to 200 revolutions per minute, with steam at 50 lbs. The cone on my lathe has four changes of speed, being 6, 5¾, 4¾, and 3¼ inches in diameter. What size of wheel should I use on a shaft to drive my lathe at the proper number of revolutions? A. Let the countershaft of the lathe make 180 revolutions per minute.

(13) G. W. F. asks : 1. What is the measure of a gage as applied to saws? A. A gage, according to Stubs' standard, is no particular part of an inch. Gages from No. 1 to No. 26 vary from $\frac{1}{10}$ to the $\frac{1}{100}$ part of an inch. No. 1 is about $\frac{1}{3}$, No. 3, ¼, No. 10, ⅛, No. 16, $\frac{1}{14}$. 2. What should be the gage of a 22 inch shingle saw? A. About No. 11 at center and 14 to 16 at the rim. 3. What should it cut per revolution, running at 1,700 revolutions per minute? A. About ¼ of an inch or more, according to the hardness of timber. 4. What width of belt will be required to run it? A. About 6 inches. 5. What size of saw pulley should be used? A. About 7 inches. 6. Could it be safely run at 2,000 revolutions per minute if thick at center? A. Yes.—J. E. E., of Pa.

(14) A. B. says : I have a pump on a tugboat worked with crank and fly wheel. Bore of steam cylinder is 4 inches, stroke 6 inches; bore of pump barrel is 2 inches. Pressure of steam is 85 lbs. to the square inch. What would be best for a plunger? I have been using rubber, but it will not last more than two weeks. A. Use a mixture of 3 parts copper, 1 part tin, and 1 part zinc.

(15) L. W. R. says : 1. I am trying to electroplate with silver and gold some small articles of Britannia metal. composed of tin and antimony, with two 2 quart Smee batteries; but the solution soon gets out of order and will not work. Deposition takes place very slowly, and sometimes will only go on a part of the work, and the metal will then scale off the work. A. Rinse the objects in a fresh solution of caustic soda or potassa,and transfer at once to the plating solution. The latter seems to contain too much cyanide. The free cyanide should be equal to about half the weight of silver in solution. When it is more, it is apt to dissolve silver off from both anode and objects. 2. What ought the strength of gold and silver solutions to be, according to the hydrometer, for plating Britannia metal as above described ? A. The proportion of about 2 or 3 ozs. of silver to the gallon is a good working strength. 3. Will gold and silver coin do to make the solutions, and also for anodes? A. Coin is sometimes used, but it is better to use pure metals.

(16) W. H. S. asks : How will brass packing rings do in an engine? A. Do not use them. Cast iron piston rings are the best.

(17) E. H. S. asks : 1. Is it possible to send four or more messages over the same wire without confounding the signals? A. Yes. 2. How are the receiving and transmitting instruments constructed? A. Several ways have been devised, but we believe the details of the system now used by theWestern Union company have not been published. A description of Gray's harmonic telegraph will be found on p. 92, No. 6, Scientific American Supplement, vol. 1.

1. Can you explain why the blood gives off only such of its constituents to the various organs or parts of the body as are needed by them, as for instance, lime to the bones, phosphorus to the brain, etc.? A. It is generally believed that each organic substance in the body has the power of assimilation of its own kind of matter only. 2. Would an excessive drain upon any organ of the body in a healthy person cause an appetite for food which would contain a large percentage of the material which is being destroyed? A. Most likely.

(18) I. A. asks : 1. How are the positive and negative wires fastened in a Leclanché battery? A. The wire leading from the zinc may be fastened by soldering ; the other is sometimes baked in with the carbon, or it may be secured to the carbon with a clamp. 2. Why does the bichromate of potassa solution in a battery turn dark green after a short time's use? A. Because the chemical reaction exhausts the solution. 3. I have a battery trough made of wood, with 8 cells in it. The cells are 5 inches high and 4 inches long, by 2 inches wide. I propose to make 16 porous plates of yellow ocher, powdered charcoal, and fine sand ; they are to be 5 inches high, 2 inches wide, and ½ inch thick. I shall place them two in each cell, so that there will be a space of 1 inch on each side to receive coke and manganese, and I shall have the zinc in between the plates, and have the plates cemented fast to the partitions. The zinc plates are to be 5 inches high, 2 inches wide, and ¼ inch thick. Will it work? A. The arrangement will probably not work satisfactorily. You had better get the regular porous cells from some dealer in electrical apparatus. You can have them made of any desired shape.

(19) F. A. asks : 1. Through how long a carbonic acid vacuum tube would a ¼ inch spark from an induction coil pass? A. Try the experiment if you have the opportunity. 2. How far from the tube could the time of night be seen by a watch? A. Try it for yourself. 3. What length of platinum wire, No. 36 or 40, would three bichromate of potassa cells heat red hot? A. Probably about a foot.

(20) J. D. O. says : Enclosed find specimen of wire of which I have some 1,600 feet. I intend using it in making an induction coil, for medical purposes. What size and what length of wire would be the best for making the primary or inner coil? A. About 100 feet of No. 20 will do. 2. What should be the length of the induction coil? A. Five or six inches. 3. Is the wire to be wound like thread upon a spool, and are both coils to be wound in the same manner? A. Yes, but it does not matter whether the direction of winding is the same in both coils. 4. What do you think of the way of coiling the wire shown in your paper, p. 344, vol. 33? Would it be practically advantageous in my case for such a comparatively small coil? A. No. 5. Is there any necessity for insulating material to separate the inner and outer coils? A. Yes. 6. What is the difference in quantity, intensity, etc., between an electro-magnet of given length (say 3 inches) composed of 4 layers of insulated wire, with another magnet twice as long composed of the same length of wire, the number of layers being of course nearly one half? The size of the wire and the battery power of course is the same in both instances. Would not No. 1 exceed in intensity, and No. 2 exceed in quantity? A. The terms are hardly applicable to magnets. No. 1 would be the strongest,provided the current were not sufficiently powerful to magnetize it to saturation.

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

J. H. P.—Nos. 1, 2, and 3 are different varieties of mica schist. No.4 is a chlorite schist. Not valuable.—G. P. H.—The black is hornblende rock. The red is granite containing a potassa felspar. Both contain a small percentage of iron, but not sufficient for extraction.—G. B. L.—It does not contain fertilizers, and is valuable for building purposes.—R. W. C.—It is sulphuret of iron.—I. H. M.'s and G. C. R.'s specimens have not been received.