Business and Personal.

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P. E. McK. will find a recipe for cement for china on p. 346, vol. 24.—H. H. R. can dissolve rubber by the process described on p. 363, vol. 3C.—H. E. M. and C. W. will find a recipe for blacking on p. 73, vol. 26.—W. B. M., C. D. A., and others who ask as to books on technical subjects should address the booksellers who advertise in our columns, for catalogues.—M. D. will find directions for tinning brass on p. 60, vol. 29.—W. J. can lacquer brass by following the directions on p. 409, vol. 30.—W. G. B. will find that the calcination of plaster is described on p. 399, vol. 29.—E. H. will find excellent directions for making sidewalks on p. 353, vol. 24.—J. L. B. and others are informed that the tunnage of the Great Eastern is 27,000 tuns.—G. W. C.'s question as to firing a moving gun has often been discussed in our columns.—J. W. should consult a manufacturer of turbines.—E. H. S. can polish stones by following the directions on p. 138, vol. 30.—B. F. G. does not state what the trouble is with his engine, and should consult an engineer.—J. W. H. will find on reference that we have frequently given rules for the areas of steam ports, which have been determined by extensive practice.—W. R. will find a description of the process of enameling iron vessels on p. 149, vol. 28.—W. T. H. will find a recipe for ink on p. 106, vol. 27.—L. N. E. will find directions for making a cheap telescope on p. 7, vol. 30.—F. B., who asks as to backing a train up an incline, does not give his name and address.—A. D. will find a recipe for making root beer on p. 138, vol. 31.

(1) W. H. S. asks: Is there any material other than plaster of Paris that will receive the fine lines of shading in electrotypes and retain them, to cast metal in, or is there any way of preparing plaster of Paris so that it will be hard and smooth enough for that purpose? A. We do not think of anything that will answer your purpose as well as plaster of Paris, which is commonly used. Try solution of alum in place of water.

(2) F. W. asks: 1. How can I measure the pitch of a propeller wheel? A. See p. 240, of this issue. 2. What size of wheel is suitable for an engine 12x12, for a tug boat, and what size of boat would be best for such an engine? A. Wheel 4 or 4½ feet in diameter, with a 6 to 7 foot pitch. The boat should be about 70 feet long.

(3) H. C. W. says: I recently saw a luminous fountain, light being reflected through the water. How was it constructed, and does it need the electric light to produce the effect? A. The apparatus is what is known as a vertical lantern, and may be constructed as follows: Into a small metallic box, open at one side, is placed a mirror at an angle of exactly 45°. The mirror should exactly fit the case, slanting from the upper left hand side to the lower right hand side, and facing the open side of the box. Into the top of the box is fitted a plano-convex condensing lens. The lantern is placed in the fountain, and the light from outside is thrown upon the mirror, which reflects it up through the condenser and so illumines the fountain. It is not necessary to use the electric light, as the lime light will fully answer the purpose; though the illumination will not be quite so brilliant, still it will be much more steady.

(4) J. B. G. asks: How can I make music by rubbing the fingers on the top edges of goblets? Will common glass do it? A. To produce the sounds you describe, select a large goblet, uniform in thickness and as thin as possible. Fill it, say, one third full of pure water. The glass and finger must be perfectly clean and free from grease. Dip the second finger in the water and immediately apply the under surface of the last joint to the upper edge of the glass, moving slowly around or to and fro with a somewhat firm pressure; to keep the finger and glass wet is essential to the success of the experiment. The vibrations produce a continuous monotonous sound, which may be varied by increasing or diminishing the quantity of water in the goblet.

(5) L. B. says: The entrance door of my dwelling is flanked by two cast iron columns 13 feet high and of 1 foot diameter; and finding that my two compasses and my galvanometer were inaccurate, I approached these columns with the compass and immediately the compass turned in such a way that it verified Oersted's law, showing the columns to be north at the base and south at the top. Then I found that the three hinges inside of the door were permanent magnets, and also that the large iron stove in the middle of the room (with the vertical pipes) was a magnet. Would it be possible to use the large magnets for experiments, and would they be strengthened by connecting them with a battery? A. The pillars, standing perpendicular to the earth, become polarized by its inductive influence. Their magnetism, however, is extremely feeble, in comparison with their dimensions. The cases cited are not an exception. We would not recommend the use of a battery in connection with the pillars, for the reason that such pillars (cast iron) when once magnetized could not be readily demagnetized, retaining for a time sufficient residual magnetism to endanger delicate pieces of mechanism (such as watches, etc.) by inductive influence.

I have made a magnet of nine plates of sheet iron 6 inches long and ½ inch broad, bent in the form of a horse shoe. The plates are covered with a thick wire. This magnet has only half the power of a solid magnet. How could I make it more powerful? A. By the passage of the current through the wires, every plate is converted into an individual magnet; and, as in this case, like poles are opposed to each other, the effect, if the plates were exact duplicates, would be *nil*, or nearly so.

(6) S. J. C. asks: What is your opinion in regard to bone dust and superphosphates for raising fruit, particularly berries, on sandy soil? I have muck and land plaster. Would it be advisable to compost the bone dust with either or both of these articles, or would superphosphate be better? A. If you use muck and land plaster, it would be better to use with them superphozphate instead of bone dust. The muck should be drawn out in the fall and allowed to stand in a heap one winter before using. The proportion of superphosphate used is optional, depending upon the soil, the time of year, etc. A good work to consult is "Agricultural Chemistry," by Johnson.

(7) J. B. T. says: A friend received an eagle that had been winged. The bird at time of reception answered fully the naturalist's description of the gray eagle. The next year, one white feather appeared where beak and feathers unite. The white has continued to increase each year, and for several years the bird was an unmistakable American or bald eagle. The time of transformation occupied perhaps eight or nine years, during which I frequently called attention to the subject. Are naturalists not a little at sea in this matter? A. The grey eagle (*haliætus albicilla*) is an inhabitant of Greenland, and (according to Baird) has never been found in any more southern locality on this continent. Your specimen is undoubtedly the bald eagle (*haliætus leucocephalus*) which, when young, has its entire plumage (including head and tail) dark brown; which changes to white as to head, tail, and upper and under coverts.

(8) A. S. D. says. In theory a hundred horse power engine would raise 3,300,000 lbs. of water one foot in a minute of time. Will you be kind enough to inform me what is the best result accomplished in practice with piston engines and pumps, and whether a greater percentage is obtained by rotary engines or not? A. The best results obtained with direct acting steam pumps, at a test made at the American Institute Fair in 1867, was an efficiency of a little more than 52 per cent of the power applied. A test of centrifugal pumps at the same place, in 1872, gave, as the best result, an efficiency of 68½ per cent. The tests of the two kinds of pumps, however, were conducted in such a manner that they are not strictly comparable.

(9) J. H. B. asks: Is there any known preparation that will effectually remove freckles without injury to the skin? A. There are several varieties of freckles. Your best plan would be to consult a physician, who can determine what is the best method and the best lotions to use.

(10) W. J. D. says: On p. 138, vol. 31, I find it asserted by V. A. that a supposititious ball dropped down through a conjectural hole to the earth's center would "oscillate for ever from end to end of a diameter of the earth, provided that frictional or retarding media, such as air, etc., be excluded." A friend, with whom V. A. interchanged speculation, contended that "the ball, on arriving at the earth's center and losing its weight, also loses its momentum, and will come to rest without passing the earth's center." You "incline to V. A.'s opinion." If we suppose the earth to be a hollow sphere, and admit V. A.'s conjecture that the ball's momentum will carry it beyond the earth's center, the ball would be acted on by two forces, namely, its weight, or disposition to return to the earth's center, and its inertia, or tendency to keep on moving from it. Having passed the earth's center, a point might be reached where the two forces are equal, and the result then would be the rotation of the ball about its axis and its revolution around the earth's center; in other words, the law of the centrifugal and centripetal forces, which keeps the planets in their appointed orbits, would operate on the ball. We know that the tendency of the earth to fall toward the sun is counteracted by its rotation, which is the tendency to fly from the sun. Is it not analogical to suppose that the disposition of the ball to fly from the earth's center, checked by the inclination to return to it, would practically operate to produce rotation and revolution? A. The velocity acquired by the body in falling to the center of the earth, under the supposed conditions, would be just sufficient to carry it through to the other side, overcoming the attraction towards the center. When it reached the other side, it would come to rest, and then the attraction would cause it to return to the center. This is not an analogous case to that of the motions of the planets in their orbits.

(11) F. D. X. asks: In a cellar under a house there is a well about 16 feet deep, situated about 4 feet from the corner of the house. I want to conduct the water from the well to back part of house, to a pump. Pump is about 40 feet from well. How can it be done? A. Use a good house pump, with pipe suitable for its connections, and be careful to make all the joints of the suction pipe tight, and lay it with as few bends as possible.

(12) W. C. asks: Is the forward eccentric of a locomotive placed in an opposite position to that in which the back eccentric is placed? A. No.

Is the cylinder of a Baxter engine placed within the smoke box or within the boiler? A. In the boiler.

Can I enter a machine shop as a machinist after two or three years' study at Cornell University? A. Probably you would have to accept a subordinate position at first.

(13) C. H. M. asks: What composition is used in metallic cartridges, to make them take fire when struck? A. A mixture of equal parts by weight black sulphuret of antimony and chlorate potassa is used for the purpose of discharging ordnance by means of a percussion tube placed in the touch hole of the gun. For this purpose also a mixture of amorphous phosphorus and chlorate of potassa is used. The needle gun cartridge contains a mixture of chlorate of potassa and black sulphuret of antimony, or a compound containing fulminate of mercury. The following is a good preparation: 16 parts of chlorate potassa, 8 black sulphuret of antimony, 4 flowers of sulphur, 1 charcoal powder, are moistened with either gum or sugar water and about 3 drops nitric acid are added. In this country either the above or a mixture of chlorate of potassa and amorphous phosphorus are used.

(14) C. M. says: 1. In looking over the sizes of the Birmingham wire gage, I find that there is no common difference between the various numbers of that gage. How were these different sizes obtained originally? Were they just fixed on by haphazard, or is there a formula given, by which, if any one size be known, any or all the other sizes may be obtained? A. The gages appear to have been fixed at random, as you suggest, and the extensive use of the English gage in this country is no doubt due to its earlier introduction 2. Would it not be better to have a wire gage with a common difference between the numbers, say the 100th part of an inch, or some such number that any ordinary mechanic could comprehend? With the gages now in use, there are few men who know exactly what any number on the gage corresponds to on the foot rule. A. There would be many advantages from the use of a regular system, such as you mention. One such plan is already adopted by many of the manufacturers in this country, who use vernier callipers, and measure their work by inches and decimals, frequently working to thousandths of an inch.

(15) N. L. asks: Which runs with the least power, a large or a small journal of equal length? Does the friction double if the size of the bearing is increased to twice the diameter? Two of us have a little dispute; one claims that if the size of the journal is increased, the friction is also increased; the other says this is not so, and quotes your article (extracted from the *National Car Builder*) on p. 258, vol. 30, being a test of car axles, one having 3¼ inches bearing, the other bearing being 3⅛. The one with the largest bearing took the least power to propel. A. If the pressure on the two bearings is the same, and is not excessive in either case, and both are equally well lubricated and run at the same speed, the work of friction of the larger journal will be twice that of the other. In the experiment referred to, it is not improbable that, with the larger journal, the lubrication was so much more complete that the coefficient of friction was much less than in the case of the 3¼ journal.

(16) A. B. W. asks: How can asthma be relieved or cured? A. Consult the best regular physician in your vicinity. There is nothing in the treatment of asthma that is not known to the entire profession.

(17) E. C. B. says: It was lately stated, in a daily paper, that a goblet, perfectly sound in appearance, full of water, was placed on a table about two feet under a gas burner, by a girl who came in to light the gas. With one hand still resting on the goblet, she turned the stopcock with the other, allowing the gas to escape for an instant. Then, touching the match, the gas flashed, and the goblet instantly flew to pieces. Can such an accident be possible? A. The tale bears evidence of being more wondrous than true.

(18) F. W. M. asks: In bringing water from a spring where the descent will be gradual for the entire distance, would anything be gained by starting from the spring and running a few rods with a larger pipe than would be used in the remainder of the distance? Would any more water come through a half inch pipe if the first few rods were ¾ inch pipe, than would come through if the entire course were only ½ inch? A. There would be a slightly increased delivery by the adoption of the larger pipe; but it would probably be very slight.

(19) F. S. C. asks: Is water compressible at 35° Fah.? A. Slightly.

Are there any jig saws which move the board being sawn, automatically, to cut out the patterns? A. No.

Are there any engines with more than two cylinders? A. Yes.

Of what is tobacco composed? A. Some of its constituents are: Nicotine, nicotianine, resin, albumen, gluten, gum, nitrates, salts of potassium, woody fiber, water, and ashes.

What is the size of the largest engine in the world? A. Cylinder about 108 inches by 14 feet stroke.

(20) S. H. R. says: I have some old gold, taken off a cane head; and inside, the gold is covered with soft solder. What will take it off? A. Hold it over a hot gas or alcohol flame, sufficient to melt the soft solder but not to affect the gold. When the solder is about melted, give the head of the cane a quick jerk, when the solder will all drop out.

(21) T. O. Z. asks: Is the gas from a gasoline machine more unhealthy to burn than city or coal gas? A. It would be necessary to have the gases analyzed, and see which contained the greatest amount of incombustible matter, before this question could be answered.

(22) F. E. says: In your patent law book it is stated: "When the air is exhausted from a pump tub (usually done by means of a piston), the pressure the atmosphere will cause the water to rise in the tube to a hight of 30 feet." 1. Would another arrangement, something like a blacksmith's bellows, fixed on the top of the tube, withdraw the air out of the tube and consequently raise the water? If so, what should be the size of the bellows in proportion to the tube? A. Yes. Proportion of bellows to pipe should be about the same as that of a common pump. 2. What force (given in pounds) would be required to withdraw the air out of the tube in this way, in proportion to the weight of water thus raised? A. The work would be the same as that required to lift the weight of water in the pipe to the required hight. 3. Does the water rise as quickly as the air is exhausted? A. Yes. 4. Would there be any difference in regard to the size of the pump tubes? A. It would take longer, with the same apparatus, to exhaust the larger of two tubes.

(23) B. says: I have a cloth awning which has been in use two years. This summer, small black spots began to appear on it and holes appeared in the center of each one, making the awning look as if a lot of scattering shot had been put through it. The spots seem to be caused by a rotting of the cloth, which breaks away easily. How can I stop it? A. If not too late to save it, try the plan of soaking it in strong brine.