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THE INDEPENDENT is now publishing REV. JOSEPH COOK's famous Boston Monday Lectures, which are creating so much discussion everywhere.

See advertisement of THE INDEPENDENT in this paper.

Notes & Queries

(1) C. C. P. asks: In boiling linseed oil by means of a coil of steam pipe placed in the oil vat and connected with an ordinary flue, would it be necessary to superheat the steam? A. It will be advisable to superheat the steam, as the pressure of saturated steam due to the required temperature is very high.

(2) A. J. H. asks for a recipe for making marking ink that does not contain anything having a tendency to dissolve rubber? A. Lampblack or bone-black thoroughly ground with good soap and a very little dilute glycerin gives satisfaction. Shellac dissolved in strong aqueous solution of borax may also be used as a vehicle. For fine work, soluble aniline black dissolved in hot dilute glycerin is preferred.

(3) O. A. asks: Is there some cheap way that I can regulate my baking oven automatically when it gets heated to about 300°? A. We do not recall any means to do this better than by a thermometer, having its column of mercury in an electric circuit; so that the circuit will be closed by the mercury when the column reaches the height of 300°, and whereby an electro-magnet will be caused to attract an armature secured to the lever of a damper.

(4) A. F. W. says that he has been told that those who subsist almost wholly on a vegetable diet are liable to lose their mental power and vigor in old age. A. We do not think that there is any very good foundation for this statement.

How great an atmospheric pressure can a man of average power accustom himself to exercise in moderately? A. The precise limit at which men can work has probably never been definitely ascertained, while at the same time it is doubtful whether work can be carried on under any increase of pressure without danger of injury to the physical system.

(5) H. A. Z. asks (1) how to combine an oil with powdered black lead so as to make a black lead lubricator? A. The best way is to grind the clean substance with the oil. 2. What kind of oil could be most effectively used and with combined cheapness? A. A good quality of rosin oil would perhaps answer best.

(6) R. J. F. asks: 1. Where can I find the best description of an electrical engine? A. See p. 184 of our issue of September 22, 1877. 2. Is Bell's telephone patented? A. Yes. 3. What is the electrical candle? A. See p. 1366 of our issue of the SUPPLEMENT, August 25, 1877. 4. In making an electric light, would not 2 or 3 large gravity cells, attached to a Ruhmkorff coil of medium size, answer the purpose and give as good results as a battery of from 60 to 100 cells of Grove's set up in the intensity way? A. Not by any means known at present, although the use of the Ruhmkorff coil, as a means to furnish light, is being closely studied.

(7) M. I. wishes to know the proper speed for a 55 inch circular saw cutting white pine, and the proper time to gauge the speed, whether when cutting or when running light? A. You can run the saw, when in the cut, 650 revolutions a minute.

Also, having previously used a 10 foot pipe for conducting steam from boiler to steam engine, what loss of power will be experienced by using a pipe 20 feet in length? A. If the steam pipe is unprotected there will be more loss from radiation when the length is increased. But if the pipe is large enough (which we cannot determine from the data sent) and is well fitted, the change will make no material difference.

Also a recipe for a liquid in which to place pens after using, to prevent their clogging with ink, said liquid to take the place of a pen stand and penwiper? A. Probably water will do as well as any other liquid.

(8) H. A. S. asks for a rule to find the required diameter of a shaft where the length of shaft, number of revolutions per minute, and number of horse power to be transmitted is known? A. Let P = pressure in lbs. per square inch acting with an arm of a inches, then the diameter in inches = $0.0984 \times \sqrt[3]{P \times a}$

(9) W. M. asks: 1. What can I polish zinc stove boards with, to remove the dullness? A. Fine sand moistened with very dilute sulphuric acid (1 part acid to 20 of water). 2. Is there anything better than oxalic acid for cleaning copper boilers? A. Try dilute hydrochloric acid. Grease must be first removed with a sal soda solution.

(10) J. P. P. writes: 1. You say in your "Answers to Correspondents," in the issue of December 22, 1877, p. 396, answer 49, that 4 ozs. of copper wire is the amount to use for a pair of telephones. I judge by that you mean the wire wound on the spools at one end of the magnet. I bought 1 oz. of No. 36 insulated copper wire of an electrician, who said that it was sufficient for a pair. Is it impossible to obtain successful results with that amount? Must it be wound in the same direction on both magnets? A. The answer you mention refers to the small instrument in common use described on p. 207 of our issue of October 6, 1877, in which there is but one round bar magnet to each instrument, and one spool on each magnet; and the answer refers to the amount of wire to be used on the two separate instruments shown in Fig. 1, which would be 2 ozs. of insulated wire (of between No. 36 and 40 gauge) for the spool of one machine made on that plan; and this amount will give a good result, although the instrument may with care be made to work with less. Wind each spool in the same direction. 2. Must the ends of the magnets on which the wire is wound be north and south poles, or both similar? A. In the description referred to, the spool end of the magnet of each instrument is of north polarity. 3. I have been told that successful results depend greatly on the nicety with which the distance between the iron plate and magnet is adjusted. Is this so? If not, at what distance should the magnet be set to obtain good results? A. When the bar magnet in this style of instrument is once set at a proper distance (about 1/4 inch) from the iron membrane, it need not be altered unless the membrane is accidentally bruised. 4. How thin must the

iron diaphragm be, and what diameter? A. About 1/16 of an inch thick, and of about the diameter shown in Fig. 1. 5. I am using a tin-type plate and it is coated with some preparation. Would that make any difference in the vibrations? A. If not too heavy it may be left on (without causing any material interference with the vibration), as it serves to preserve the membrane from rust.

(11) W. V. asks: What is the horse power of the largest locomotive ever constructed? The steamship City of Washington has two engines, which are rated over 2,000 horse power. A. We do not think that experiments have ever been made to determine the power actually exerted by the largest locomotive, but the "Janus," with four cylinders, each 15 x 22, is probably capable of higher power than that quoted by you.

(12) E. H. B. writes: 1. I wish to get a battery for experimental purposes; will you inform me whether the Grove or Bunsen battery is considered the best? A. The Grove battery is generally preferred on account of the durability of the platinum strip, which forms its positive pole. 2. Which is the best for an electro-magnet, a long coil of fine wire or the reverse? I shall use about three cells of battery and want to make as powerful a magnet as possible. A. The wire should be of such size and length that its resistance will equal the resistance of the battery. Three lbs. of No. 30 copper wire (cotton or silk insulation) is sufficient, if properly wound, to make a good electro-magnet using the battery power you mention.

(13) C. S. writes: 1. Will you please inform me what the difference is between a high and low pressure steam engine? A. The first exhausts its steam into and against the pressure of the atmosphere; the second exhausts into a partial vacuum produced by the condensation of its own steam. 2. For what purpose are the high and low pressure steam cylinders in a compound engine? A. For the purpose of obtaining more work from steam of a high pressure.

(14) H. R. T. & Co. write: We pass our exhaust steam through a copper pipe to heat our liquors. Is it safe to use the water again in the boiler of the steam so condensed, or has it received properties from its contact with the copper pipe and also with the grease (tallow) used in oiling the cylinder, that would make it injurious to the boiler? If not this would give us clear water free from lime deposit, as our exhaust is wholly condensed. A. It is safe, provided you can be sure that your copper pipes will not leak, so as to contaminate your condensed water with the liquors through which they pass. Allow your condensed water to run into a tank, so that there will always be a surplus of water, on the surface of which, whatever tallow there may be carried over, will float; and if the water in the tank is three feet deep, draw your feed water from a point one foot from the bottom of the tank. You will notice that the tallow is deposited in the exhaust pipes in which the steam condenses, and it would be well to place an ordinary sink trap (which any plumber can furnish) at that point in the exhaust pipes where the tallow accumulates.

(15) L. N. B. writes that he has a stream running through his land, the water being 2 feet deep and 20 feet wide; the current runs 200 feet a minute. What kind of wheel, he asks, can he use without a dam to work a threshing machine? A. What is called a current wheel will answer. It is very similar to the paddle wheel of a steamboat.

(16) C. R. A. asks: 1. If there exists a law in Pennsylvania requiring steam boilers to be inspected? Or a law prohibiting the hanging of extra weights on safety valves, such as shovels, pokers, tongs, etc.? A. We think not, but we are not very familiar with Pennsylvania laws. Some of our readers will please correct us if in error. 2. How often should a boiler be cleaned out that fills up from 1 1/2 to 2 feet with loose scale in the course of six months? A. Every week.

Should the stopcock be opened at a gas well, allowing the gas to escape without closing valve at furnace, and is there a possibility of the fire coming through gasoline and setting fire to gas at the well? A. Ordinarily, no.

How can I prevent polished brass from coloring where it is heated by steam? A. Give it a coat of transparent varnish.

(17) I. H. C. writes: A steam engineer, friend of mine, is making a test gauge, and claims that a square inch when thrown into a circle the diameter would be 1.25 inches, and undertook to prove it to me by taking a strip of tin 4 inches in length and showing that it just meets around a mandrel of that size. A. The area of a circle is found by multiplying its diameter by the decimal .7854; and conversely, the diameter will equal the area divided by .7854. In the case you mention the area of the circle is 1 square inch, and its diameter is therefore 1.273 of an inch.

(18) C. G. asks: Is there any machine by which the nose can be straightened? A. There is a mechanical appliance in the market, but we cannot say whether or not it is generally efficacious. You can probably obtain the apparatus at a store where surgical instruments are used.

What is the cause of the following? When I place a finger over either ear so as to close it, I am able to sing several notes higher and louder than usual. A. If this is a fact, we must ask some of our readers to aid us in giving an explanation. When one ear is closed, as indicated, a given sound is greatly changed, according to the sensation of the one-eared listener.

(19) D. F. H. asks: How large a battery and what kind is used in transmitting messages by the Atlantic cable? A. The Atlantic cable may be operated by a battery that could be placed in a thimble.

(20) W. R. B. says that the sponges used at the Aquarium become clogged with dirt and slime and are difficult to clean. Is there any method of cleaning them readily and thoroughly? A. The Barbary sponges are often difficult to clean perfectly by any direct means applicable. Hot water and plenty of good soap are among the best things. Adhering lichen is softened considerably by digestion in dilute H₂SO₄ (1 to 20). Neutral ammon. chloride used hot also works

pretty well. Alkalies, even quite dilute, quickly clean such fibers, but are too apt to deprive them of native stiffness.

(21) A. M. W. says: 1. I have an engine with a 3-1/4 inch stroke and 3 1/4 inch bore. What size boiler, number of flues, and amount of heating surface, also diameter of flues, will it require to run it 400 revolutions, working at its full capacity? A. Make a boiler 30 inches in diameter, 4 feet high, with about 80 square feet of heating surface. Tubes 2 1/4 inches diameter. 2. Also what size boat would it run 8 miles an hour, drawing not over 10 inches when loaded? What diameter and what pitch would the propeller have to be? A. We doubt the practicability of realizing this speed, if, as we understand you, the propeller is to conform to the draught.

(22) G. T. L. writes: In the use of the metric system of weights and measures in French machine shops, how are the threads of screws reckoned, at so many threads per meter, per decimeter, per centimeter, or how? A. The number of threads are referred to the diameter, that is, so many threads per diameter. For example, 5 threads per diameter of 6.3 millimeters is about the same as the American proportions for a 1/4 inch thread, 20 threads per inch.

(23) J. H. F. asks: Which will work with the least power, a 2 inch crank or an eccentric, to drive a pump in a well 100 feet deep? A. The crank, as its use involves less friction than there is apt to be in the use of the eccentric. On account of its large bearing the eccentric motion is valuable in those cases (as in presses for cutting metal) where a powerful motion is required through a short distance. 2. What is the number of lbs. pressure per square inch at 50 feet and 100 feet? A. A column of water 32 feet high and 1 inch square weighs about 15 lbs.; that is, it will about balance the pressure of the atmosphere on a square inch of surface, at the level of the sea.

(24) N. A. S. writes: 1. Can I light gas by a plate machine (frictional electricity)? A. Yes. 2. If so, about how large a plate would be required to light about 24 burners? A. The glass plate of the machine should be about 18 inches in diameter, and its electricity should be accumulated in a Leyden jar battery of about 28 square feet of surface. 3. Are the wires over the jets left in the gas flame during the time it is burning? A. Yes. 4. How far apart should the points be? A. About 1/4 of an inch.

(25) E. U. N. asks: How can I make a really good razor strop paste? A. Equal parts of jeweler's rouge, plumbago, and suet melted together and stirred until cold.

At what depth in the ocean does the water become calm in all weathers, or is the whole mass of the ocean affected in rough weather in a similar manner to the surface? A. Water is agitated in the ocean only to a depth equal to the height of the waves.

What is the greatest extent to which air (atmospheric) has been compressed, and was any effect observable beyond diminution in bulk? A. It has been compressed to several hundred atmospheres without apparent change.

(26) I. H. B. asks (1) how the telephone is made, and what paper has a cut of it? A. The telephone is described in our issue of the SCIENTIFIC AMERICAN of October 6, 1877. 2. How do you prepare insulated wire? A. The wire is covered with silk or cotton, by means of a machine shown on p. 130, Fig. 4, of our issue of September 1, 1877.

(27) H. G. E. asks: 1. What is the difference between No. 1 and No. 2 pig iron? A. No. 2 is the hardest. 2. How can you tell the difference? A. No. 2 is closer grained than No. 1. 3. What is meant by the term hot iron? A. We presume it refers to iron made by the hot blast. 4. What is "gray forge iron" and how told? A. It is a grade of gray iron suitable for conversion into malleable iron, and is distinguished by the color of the fracture.

(28) I. G. writes: 1. I am making a telegraph sander; the cores are 2 inches long and 1/4 inch in diameter. On one end of each core there is 1/4 inch with a thread on to fasten to back armature; said armature is 3/8 inch thick. I intend to put a piece of gutta percha 1/2 inch thick against armature and one of same size at top of core, which will leave 1 1/2 inch for wire to be wrapped on. I want an instrument so that I can use it on lines of 1 to 15 miles, also to give strong clicks. Please inform me what sized wire I shall use, how much on each spool, and kind of insulation? A. Wrap the core with one layer of paper, and on this wind covered copper wire of about No. 27 Brown and Sharp's gauge, until the spool is about 1 1/2 inch in diameter. 2. Shall I wind both magnets to the right, or both to the left, or one to the right and the other to the left? A. Wind both spools the same way. 3. Shall I strip the end of wire for a couple of wraps on core? A. No. 4. If four such as the above instruments were on a line of 100 yards, how many cells of gravity battery would it take to work them? A. About 4 cells.

(29) P. R. asks: Would it be of value to invent a mode of making curves and coils of pipes out of tin, or sheet metal generally? A. A cheap method of making such curves (especially for lead traps) has long been sought.

(30) H. L. asks: On what principle does the injector work? A. It is supposed to act somewhat on the same principle as the hydraulic ram, whereby the momentum of a large column of water is imparted to a smaller one. A column of steam moving at a high rate of speed is condensed by cold, so as to have a much smaller diameter, and, having the full momentum of the original (continuous) column of steam, has more penetrative power, so to speak, and carries the water into the boiler by the friction of its column against the water with which it is surrounded.

(31) I. G. writes: I have made a tap two inches in diameter from what I supposed to be tool steel, but after finishing discovered that it was machinery steel. By what process can I harden it so that it will stand? A. Heat it well hot in a mixture of equal quantities of cyanide of potash and salt, and dip in water containing 1 lb. of salt per gallon.