(5305) T. K. writes: I observe very frequent reference in the SCIENTIFIC AMERICAN to the Fuller battery. I have tried, without success, to get information about this battery or to obtain the cells or parts of them here, as it seems to be quite unknown. I should therefore feel greatly obliged for a working description such as would enable an average amateur to construct the battery. I wish it for use with a bedroom glow lamp of about 6 volts. I use at present 3 cells plunge chromic acid battery, but the lowering and raising of the plates is troublesome, as the battery is only used occasionally for a minute or two at a time. How long does the zinc generally last? Is it free from local action when the circuit is open? Is chromic acid, bichromate] of potash, or chromate of soda best for such batteries? A. We advise you to use the plunge battery, as the Fuller will not stand an open circuit. It is described in our SUPPLEMENT, No. 159. The zinc would last a long time, except that the solutions would mix and local action would occur. Chromic acid or sodium chromate are preferred to the potassium salt.

(5306) W. W. P. writes: I have a double sulphate of nickel bath (about 20 gallons) which worked with perfection until lately. It now turns dark, and it seems to turn only in spots. I think the bath is strong enough, as it weighs 8½. The nickel scales where the black streaks occur. Please give me some receipt for taking foreign matter out of the solution. Could I overcome the difficulty by evaporating all the water and make a new bath with the nickel? A. By adding with constant stirring a saturated solution of ammonium sulphate to your bath, you can precipitate the double nickel-ammonium salt, leaving the supernatant liquid colorless. From the precipitate make up a new bath. (Unwin.)

(5307) F. P. writes: I would like to make some bottled soda water and I think I can do it by filling the bottle with water, putting in the proper amount of sodium bicarbonate, and lastly some citric acid in in crystals and corking it quickly before the acid can dissolve enough to act on the soda. What proportion of water, soda, and acid is best to use? Is there any way or material that would be better or cheaper that I could use without some special apparatus or tools? A. You require for three parts of citric acid, about four parts of sodium bicarbonate. For a pint bottle use two drachms citric acid and two and one-half drachms sodium bicarbonate. You may use the same quantity of tartaric acid instead of citric. There is no better way of doing without special apparatus.

(5308) "Beta" says: How many quart size Fuller cells would be required to operate an induction coil giving ½ inch sparks, and about how many hours would they give a stream of sparks continuously on one charge of cells? An average estimate only required. A. Four to six cells should answer. They would run it many days before exhaustion, but owing to the mixing of the solutions, it would gradually become polarized.

(5309) C. C. W. writes: Many remedies have been offered in your columns from time to time for the relief or cure of poisoning by oak or ivy, and all probably have merit. I have found however that a solution of boracic acid, applied frequently, as soon as the symptoms make their appearance, will do wonders, in every case completely breaking up the threatened inflammation. If the trouble has made much progress, the effect of the solution is still very much better than any other preparation that I have ever seen used, rapidly reducing the pain and inflammation. It seems to be fairly entitled to the name of specific. A saturated solution of the acid in hot water should be made, and that diluted with from one-third to one-half volume of water for use.

(5310) M. A. T. says: 1. Near our city is a gas (natural) pipe line thirteen miles in length. The first three miles are laid with six inch pipe, the remaining ten miles with eight inch pipe. The pressure at wells is 100 lb., at entrance to city it is about 25 lb. The line is laid over a hilly country. Do you think it possible to use an air compressor that will give a uniform pressure of 75 lb. at the city? If possible, how large a one and how much power will it take to drive it with? A. The laying of a new line of eight inch pipe, or even ten inch pipe, will be the most economical way of increasing the pressure at the end of the line. We cannot assign a definite size or cost of a compressor plant without knowing the present flow and proposed increase from pumping, which will require a compressor and boiler plant large enough to handle the total output of the gas well, and although the differential pressure head would not be very great, say 50 pounds per square inch, the volume would require the operation of a very large compressor—possibly from $6,000 to $8,000 would cover the cost of the plant, and require from 150 to 200 horse power.

(5311) X. Y. Z., Melbourne, asks: Is it practicable to drive a small boat—large enough to carry two persons—say ten or twelve feet long by about two feet beam, a speed of five or six miles per hour by hand power screw? According to my calculation, a ten inch screw, with pretty open pitch and 200 revolutions per minute, would do. Am I near it? Otherwise which would be the handiest and best power for a small boat like that? Could it be driven by an electric battery? If so, what about cost of such battery? Boat to be used on narrow and crowded river and occasionally on open bay —Hoboons Bay—in fine weather. A. Although two m n are power nough for a speed as stated in so small a boat, there are mechanical difficulties in its application that will modify its possibilities. A ten inch screw at 200 revolutions with a pitch of thirty inches, of which there can be realized not more than two feet of speed per revolution—a little less than five miles per hour, or with 250 revolutions per minute, will give a speed of nearly six miles. The necessary gear for transmitting the power from the hands to the screw will somewhat diminish the result in speed. The boat is too small for successful application of electric or other power.

(5312) J. T. D. asks: How can we make a pond hold water where the banks and bottom are almost clear sand where we wish to make the pond? The soil is about eighteen inches deep, then comes sand, and to get the depth we want will have to go nearly two feet in sand. A. If clay can be had in the neighborhood or within a reasonable distance, the pond can be made tight with a clay and sand puddle, which, if two parts clay to one part of the sand from the excavation is used, should be fairly tight if made six inches thick all over the bottom and sides, well compacted by ramming, then covering with six inches of the fine top loam. If required for gathering ice, it should have a top dressing of coarse sand or gravel to prevent the water from becoming muddy by wind agitation. If no clay can be had, hydraulic cement should be used in the place of the clay, and which may be mixed with the sand dry by raking into the bottom and sides and wetting by sprinkling, then a top dressing of loam and gravel as before.

(5313) T. H. writes: Can you give the point of lowest elevation on the dividing ridge between Lake Erie and Ohio valley—from Chautauqua Lake to Toledo? If you have not the data at hand, perhaps some of your readers have. Where shall I hunt to find the difference in the levels of Lake Ontario and Hudson Bay? There is water running out of Chautauqua Lake at all seasons, more, apparently, in a dry season than enters on the surface. Where is this water supposed to come from? A. The lowest point on the Ohio divide is probably along the line of the Wabash Canal. The Secretary of State, at Columbus, can refer you to authorities on the elevation. Lake Ontario is 234 feet above the level of the sea. Hudson Bay is supposed to be at sea level. There is no reliable survey across the highlands of Canada between Lake Ontario and Hudson Bay. Chautauqua Lake lies in a watershed of gravelly soil, through which the water percolates to the lake in springs beneath its surface.

(5314) P. R. L. writes: It is stated in "Experimental Science" that an induction coil may be used in charging a Leyden jar. I do not understand how a condenser may be charged by an alternating current. Please explain the process and principle. A. To charge a Leyden jar or battery, by means of an induction coil, connect the outer coating of the jar with one pole of the coil and the inner coating with the other pole, making the connection through a pair of pointed discharge rods having their points separated to such a distance as will permit only the direct current—that of opening—to pass. This current, which is of higher potential, is alone used for charging.

(5315) O. S. asks: 1. Will you give me directions how to mend rubber, so that it will hold warm water? A. The only way to mend rubber so that it will withstand hot water is to apply a patch consisting of a layer of vulcanized rubber, then vulcanizing the whole. 2. Which is the best for field magnets of motor 767, cast iron or malleable iron, the armature being soft annealed malleable iron? A. Use soft gray cast iron. 3. How many layers wire would you wind on the fields, and how close should the armature run to the fields? A. Wind magnet wire on the field magnet until the depth of the winding is equal to the depth of the winding on the magnet core. The armature should always remain as near the field magnets as possible, without touching.

(5316) J. S. F. asks: Has the United States passed a law and fixed a penalty for mutilating foreign coins? A. There is no law against the use or abuse of foreign coins in the United States.

(5317) J. B. R. asks: Is there always a draught up a tall chimney, and does this draught vary at times very much? If there are times when no draught at all is felt, please give conditions. If there is always a draught up a chimney, as some authorities say (even though fire is not present), why is this not perpetual motion, and, if the chimney is large enough and sufficient chimneys were built together, could not power be produced? A. The draught of cold chimneys up or down depends entirely upon a small difference of temperature between the outside and inside, or the effect of the wind blowing across the top, which generally produces an updraught. Its power is very feeble, and cannot be considered perpetual motion, because it is due to natural causes.

(5318) J. W. S. writes: Do you think there is anything in the very common notion among practical mechanics that pumps raising water to a considerable height must be down close to the water to do their best work? I have changed a deep well pump from near the water to 26 feet up from the water without any apparent loss, and it seems to me that if the piston is sufficiently tight to raise the water up to the reservoir from the piston, that the water must follow up to the limit of atmospheric pressure for elevation, at which the pump is placed; however, the contrary opinion is widespread, and I would be much obliged for your judgment in the matter. A. The general opinion in regard to the position of pumps above the water surface for best work is founded upon long experience with all kinds of pumps, good, bad and indifferent. A perfect pump will work well up to 30 feet, with the only drawback of liberating air constantly from the water. With the least air leak below the pump valves, the efficiency is lessened, although not perceptible to the eye. The best principle is the best practice in setting a pump chamber, viz., close to the water.

(5319) T. D. D. writes: I have been a steady subscriber for your valuable paper for over 45 years, and wish you would make careful answer to the following questions: What would, in your best judgment, be the per cent. of saving to the track and roadbed and rolling stock of any through line of railroad if an endless rail could be used? If 90 foot rails were used, allowing the weight of three cars at once, or an engine and two cars, would not the rails be less liable to creep when there was no open space or joint, thus avoiding the pounding of the wheels at the ends of the rails? A. Continuous rails would be a most valuable consideration in railway economy and the comfort of the traveling public, but there is a physical bar to a continuous rail; the expansion and contraction of such a rail by changes of temperature would destroy the track. To make any computation of the saving of such rail in the face of its impossibility, would be futile. A 90 foot rail is a more reasonable condition, but will not avoid variation in length by changes in temperature, and consequent creeping. It will, no doubt, save two-thirds of the damage due to pounding and batterment of the rail ends. On the other hand, the difficulties of transportation of 90 foot rails is a serious bar to their use.

NEW BOOKS AND PUBLICATIONS.

SHORTHAND INSTRUCTION AND PRACTICE. By Julius Ensign Rockwell. Bureau of Education, Circular of Information, No. 1. 1893. 8vo. Pp. 205, tables.

The shorthand alphabets which date from the year 1602 on, are very interesting. The bulk of the work is taken up with statistics of instruction in shorthand in various institutions for the scholastic year ending June 30, 1890.

A CHAPTER ON CHOLERA FOR LAY READERS: HISTORY, SYMPTOMS, PREVENTION, AND TREATMENT OF THE DISEASE. By Walter Vought, Ph.B., M.D., Medical Director and Physician in Charge of the Fire Island Quarantine Station, Port of New York. Illustrated with colored plates and wood engravings. Philadelphia: The F. A. Davis Co. 1893. 12mo. 110 pages. Price 75 cents.

This timely little work is offered to the public in the hope that it will enable the reader to obtain a clear and comprehensive idea of a disease which at present, there is every reason to believe, will appear this summer in our own country. The diagnosis of the disease, its treatment and its prev ntion are all described with a view to being read by laymen. The preventive doctrines are based on common sense, and, if followed, would without doubt tend to keep the person free from the dreaded diseas during an epidemic.

THE SHAKERS. By C. E. Robinson. East Canterbury, N. H. 1893. 8vo. Pp. 134. Illustrated. No index.

The full title of the work is "A Concise History of the United Society of Believers called Shakers." There is always more or less interest exhibited in communistic societies, and the aim of the present work has been to collect facts in relation to the Shakers, and state them so clearly that the world may know the true life and habits of this most singular people.

THE COMPASS. Edited by William Cox. Vol. II. 1892–93. New York: Keuffel & Esser Co. 1893. 8vo, cloth. Pp. 192. Illustrated. Price $1.75.

The subscription price of the journal is $1.00 a year. The *Compass* is devoted to surveying, mechanical drawing and mathematics. New instruments, formulas, etc., are described. The journal is handsomely printed in blue ink and is well illustrated. The *Compass* is very carefully edited, much more so, in fact, than many journals of larger size.

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