long march 25 miles, so that at the halt the rear man comes to where the front man started from. At the start a courier rides from the rear to the front, and returns to the rear, reaching it (25 miles ahead from where he started) just as the column halted, all movement being at uniform rate. How far did the courier ride? A. Rule for contents of taper timber: To the sum of areas of the two ends add four times the area of the middle section. Multiply this sum by one sixth of the length. If in inches, divide by 144 for board measure. The pole contains 100 feet board measure. The courier rode 42·67 miles to reach the head of the column and 17·68 miles returning to the foot, in all 60·35 miles.

(6076) A. E. R. asks: What must the diameters of the cylinders of a compound engine be, that the sizes of the cylinders will be as 1 is to 4, and the two to have the same horse power as a simple engine with a cylinder 26 inches in diameter, the same pressure of steam in each case? A. The high pressure cylinder should be 18½ inches diameter, low pressure cylinder 36¾ inches diameter.

(6077) J. B. G. says: Can you tell me through the SCIENTIFIC AMERICAN the name of this insect and how to stop its work? A. Reply by Prof. C. V. Riley.—The specimens sent by your correspondent prove to be *Lyctus striatus*, which is the commonest and most widely distributed of our so-called powder post beetles. These beetles and their larvæ are known to live and tunnel in the branches or trunks of dead trees, in telegraph poles, household furniture, wooden handles of tools or agricultural implements, etc. In the case of their emergence from furniture, oviposition has taken place while the boards were still in the lumber yard or while the felled tree was still on the ground. It is also pretty certain that the insects pair and multiply within furniture for several generations, and that only a portion of the beetles issue through the holes bored by them. If a large and heavy piece of furniture, *e. g.*, a bureau, is infested, the destruction of the larvæ and beetles is next to impossible without materially injuring the bureau. The only thing that can be recommended is a liberal and frequent application of common kerosene by means of a rag or a brush. A portion of the oil will penetrate into the wood, through the holes made by the issuing beetles, and will at least kill many of the larvæ and beetles that are still working within the wood.

(6078) W. McC. asks: What flux should be used in soldering copper wires for electrical purposes with soft solder that will not cause the wires to corrode? A. Resin is the best flux for soft soldering for the purpose stated.

(6079) P. J. K. asks: Is there any way to harden steel? For example, plow shares, so that one side is hardened while the other remains soft. A. We call to mind no satisfactory way of hardening the face side of steel plow shares. In attempting to do so the plates are apt to warp and spring out of shape.

(6080) C. W. C.—A solid bar is stronger than a tube of the same outside diameter.

(6081) C. D. R. asks: 1. I would like to know the difference between a dynamo which gives a current of 52 volts and lights 2 sixteen candle power incandescent lamps and one of 110 volts that lights the same number of lamps? A. There is no such thing as a current of 52 volts. A dynamo of given winding may maintain this potential. To increase the potential to 110 volts the simplest plan is to use finer wire and more turns on the armature. 2. When a dynamo is charging a storage battery what prevents said battery from running dynamo as a motor when it has acquired a sufficient current? A. As long as the potential maintained by the dynamo exceeds that which the battery can produce, the battery will take current from the dynamo. If the dynamo is disconnected from the power shaft, the battery will run it as a motor. 3. How can you tell when a Leyden jar is fully charged? A. By connecting to a graduated electroscope and charging until the potential ceases to rise. 4. Would a battery of several rods of electric light carbons and a hollow cylinder of zinc for electrodes, with an exciting solution of sal-ammoniac, give satisfactory results on open circuit work? If not, how can it be improved? A. Yes; but the better plan is to use a very large carbon surface. A single rod of zinc is enough for eight or ten carbons.

(6082) A. H. M. writes: I have three American accumulators, 150 ampere hours capacity each, giving a pressure of 2 volts each. I wish to run a ⅛ horse power 6 volt motor with them with best results as to strength of motor. Is it proper to connect cells in series? How long will cells run motor continuously at full load? A. Connect in series. They will run the motor for ten hours. 2. I wish to charge cells with arc light circuit of 10 amperes. Should cells be thrown into arc circuit in series? How long will it take to charge them? What is the formula for above question? A. You cannot do this with safety. We advise you not to attempt it. Allow 5 amperes charging current for each square foot of positive plate. 3. Is it best to charge them to their full capacity each time they are thrown into the arc circuit, or could they be thrown in and out according to convenience? A. You can work either way. It is best to charge them up to full capacity frequently.

(6083) A. L. J. asks: 1. Please state the object of placing an induction coil in circuit of long telephone lines, since as the E. M. F. increases, the current strength must decrease. A. It gives high voltage for the circuit external to the induction coil. 2. Is the temperature of the electric arc higher than that obtained with largest burning glasses? A. Yes. 3. I ran a current from battery through a short coil galvanometer with astatic needle. After stopping current, the needle did not point north. What was the cause? A. The needle was so perfectly astatic that there was not enough polarity to move it. 4. In the electrolysis of water why do not carbon electrodes succeed instead of platinum? A. Their porousness might make them retain some gas. Iron or copper electrodes in caustic alkali solution are excellent. 5. In electroplating a spoon, for instance, which are the electrodes, the spoon and the piece of metal to be deposited, or the two rods, connected to battery, from which they are suspended? A. The spoon and piece of metal. 6. What are the differences in electromotive force, current strength, and resistance of a circuit in which a motor is included, when the motor is stopped and when running? A. The electromotive force is the same except for the armature, which generates counter electromotive force. If the armature is not allowed to rotate, the current strength increases.

(6084) G. H. S. writes: I have recently constructed a simple electric motor and large bichromate of soda battery described in your valuable book, "Experimental Science." At first 4 cells would run the motor, but after a short time the whole 8 would not work it. I used in solution a saturated solution of bichromate of soda and added sulphuric acid to one-fifth volume. If depolarization is the trouble, why should it depolarize so quick? I never used it half an hour. What is the best way to depolarize? Is it necessary to amalgamate the zincs? Mine are cast and have some blow holes which will not take the mercury. The zincs get covered with a scaly substance which prevents the action of the acid on the zinc. At first the action was so strong that it made the solution quite warm and made quite a strong smell. The solution was a little warm at first. Kindly put me on the right track. A. Your entire trouble is due to bad amalgamation of your zincs. The production of heat and of an odor shows a destructive and useless action and proves that the amalgamation is imperfect. You will have no satisfaction until you attend to this.

(6085) G. M. H. says: Will you please inform me through your Notes and Queries column how to make printing press rollers? A. To 8 pounds transparent glue add enough cold water to cover it; let it stand with occasional stirring seven or eight hours. After twenty-four hours, all the water should be absorbed. Heat it in a water bath, remove from fire, and add 7 pounds molasses that has been made quite hot. Heat, with frequent stirring, for half an hour. The moulds should be clean and greased. Pour into moulds after it has cooled a little, and allow to stand eight or ten hours in winter, longer in summer.

(6086) W. C. C. writes: Will you kindly decide the following dispute? A states that a bullet fired from a rifle straight into the air will reach on its return the point of departure with the same velocity with which it left the muzzle of the gun. B says that possibly this is true in theory, but not in practice, else why will a bullet on being fired from a gun pass through resisting bodies which it cannot penetrate if dropped from a height equal to that attained by the missile when discharged from the gun? A. The theory of the vertical projection of a bullet and its final velocity is derived from the unimpeded speed due to a vacuum and gravity. In practice the resistance of the air impedes the velocity of the bullet in both its upward and downward flight, the return impact being much less than the muzzle impact.

(6087) F. H. F. asks: 1. What is the rule for determining the number of watts necessary to produce an arc light of given candle power? I understand that experts at the World's Fair decided on 450 watts for a 2,000 candle power light, 300 watts for a 1,200 candle power light; now, how can I determine the watts for a 1,500 candle power or a 1,000 candle power light? A. The rule is partly conventional, and is based on experiment. There is no rule. You can approximate by intercalation. 2. What is the relation between candle power and watts in arc lights? A. There is no fixed relation that can be stated. You can deduce an approximation from the above. 3. What book will explain the matter in detail? A. See SUPPLEMENT, Nos. 694, 695, 696, for general articles on the subject; price 10 cents each by mail.

(6088) R. C. F. asks: 1. Will you give me a formula for preventing Ilotype prints from curling up when I do not desire to mount them? A. After washing, dry off the water with blotters, then place the prints in pairs face to face between sheets of strawboard or cardboard, six pairs between each board, and put a weight on top. Let them stand for three or four hours or until dry. Each unmounted print will then remain flat. 2. How can I keep film negatives from curling up after development? A. After the negatives are washed immerse the films for five minutes in a solution of water 1 oz., glycerine 2 minims. When dry, keep under pressure as advised for Ilo print.

(6089) J. McG. asks: 1. Can a copper vessel be used as a generator in the manufacture of hydrogen gas, or is a vessel made of sheet or boiler iron lined with lead preferable, and what should be the thickness of metal to be used in either case? A. By all means use a lead-lined vessel. Burn the joints together—do not solder. No particular thickness is required. 2. Which is the better and more economical method of generating hydrogen, that by sulphuric acid and iron filings in water or by blowing steam through heated coal? A. By the action of steam on coal you produce a quantity of carbon monoxide gas with the hydrogen. By using hot iron borings in place of coal, the steam process will give reasonably pure hydrogen. On the large scale this method is cheaper than the acid generation. 3. Give names of works on subject of generating hydrogen gas for aeronautical purposes, with prices of same. A. See SUPPLEMENT, Nos. 828, 849.

(6090) S. H. Co. write: Parties here wish to procure a magnet that metal buried underground will attract. One which will locate gold or silver. They claim there is such an instrument called "the hidden treasure seeker." Is there such an instrument manufactured, and if so, can you tell us where one can be procured? A. No such thing exists. [It is surprising that any one should expect to be able to buy apparatus of this description. If there are $10,000,000,000 worth of treasure hidden in the earth, what would be the value of an instrument that would indicate its whereabouts? And who, owning an instrument of this kind, would part with it for any consideration whatever? The fact of offering for sale an instrument purporting to be an operative instrument for this purpose is *prima facie* evidence of fraud or dense ignorance. The shovel and pick, the hammer and drill, are the only treasure-seeking instruments of any value. Ore finders, divining rods, and devices of that class are delusions.—EDS.]

(6091) J. M. W., Cal., writes: Would you kindly let me know if the following is correct? In the Encyclopedia Britannica (Americanized edition, Belford-Clarke, publishers, Chicago, 1890) it states under the heading of "weights and measures" that the United States inch=1·000049 British inches? I always thought they were identical, and that Whitworth's standard in measuring was the same in both countries. Again, in an English work I see the grain apothecaries' weight=1·0978 grains avoirdupois, in other words, 10 grains apoth.=nearly 11 grains avoir.; in the above encyclopedia there is no difference given. Is there any difference? In coming across such discrepancies as the above, it makes one ardently hope that something will soon be done toward bringing about a "universal standard system of weights and measures." Would you mind also stating the difference between the English and American pint, quart, peck, and bushel? A. The difference in length of standard measures as stated is correct. Brown & Sharp Manufacturing Co. use the American standard. The grain has but one value, 7,000 to one pound avoirdupois or troy, in England. In the United States 7,000 to one pound avoirdupois and 5,760 to one pound troy and apothecaries' weight. The American standard measure of the gallon is 231 cubic inches. The British standard gallon is 277·274 cubic inches. The United States standard bushel is 2150·42 cubic inches. The imperial or British bushel is 2218 192 cubic inches. Divisional measures in proportion. The metric system is intended to equalize international weights and measures.

(6092) G. E. K. says: Would you please give the formula and instructions for mixing same for making Portland cement walks, drives, floors, etc.? I notice some are of a fine gram and others of a coarse nature. Also of different colors. Please explain this feature. A. English Portland cement is generally preferred. Procure a sharp, light-colored sand, and wash it free from all particles of soft earth or soil; also some stone chips, gravel, and large stone. Excavate the sidewalk about 18 inches deep, and fill in the large stone to within 6 inches of the surface; prepare a concrete made of the cement 1 part, stone chips and gravel about 6 parts, and bed it in upon the stone bottom to within 2 inches of the surface; then prepare a concrete of the cement 1 part and fine sand 2 parts, and lay it in up to the surface, floating the surface with the cement at pleasure. Finish by lining off into very regular blocks. A more economical sidewalk can be made by omitting the stone bed, but it will require a good hard soil to lay it on, and then will not be so sure of being permanent. See also SUPPLEMENT, No. 539. Sometimes finely broken stone is used in place of sand. The color can be varied by the use oxide of iron, such as is used for metallic paint.

(6093) F. L. M. says: How should whitewash be prepared to secure best permanent results on cellar walls? Painters affect entire ignorance in the matter, and the information is difficult to obtain. A. The following coating for rough brick walls is used by the United States government for painting lighthouses, and it effectually prevents moisture from striking through: Take of fresh Rosendale cement, 3 parts, and of clean, fine sand, 1 part; mix with fresh water thoroughly. This gives a gray or granite color, dark or light, according to the color of the cement. If brick color is desired, add enough Venetian red to the mixture to produce the color. If a very light color is desired, lime may be used with the cement and sand. Care must be taken to have all the ingredients well mixed together. In applying the wash, the wall must be wet with clean fresh water, then follow immediately with the cement wash. This prevents the bricks from absorbing the water from the wash too rapidly, and gives time for the cement to set. The wash must be well stirred during the application. The mixture is to be made as thick as can be applied conveniently with a whitewash brush. It is admirably suited for brickwork, fences, etc., but it cannot be used to advantage over paint or whitewash.

(6094) E. E. D. asks: I have four 1·2 inch horse shoe magnets. How can I recharge them? A. By touching the poles to the poles of an active dynamo and removing it slowly in the line of the armature axis you can recharge a magnet. Be careful to touch the right poles, *i. e.*, north pole of magnet to south pole of field and *vice versa*. 2. How can I make a magneto exploder with these magnets? A. See our SUPPLEMENT, Nos. 161 and 315. 3. How can I make an atomizing petroleum burner? A. See SUPPLEMENT, No. 569.

(6095) F. R. H. says: Can you tell me through the Notes and Queries column of your paper how carbon paper is prepared? A. Melt 10 parts lard, 1 part of beeswax, and mix with a sufficient quantity of fine lampblack. Saturate unglazed paper with this, remove excess and press.

(6096) W. T. says: Would you please give me a formula for a cement that I can cement brass ornaments to glass so they will stick tight? A. A cement for such purposes as fixing metal letters to glass windows consists of copal varnish 15 parts, drying oil 5 parts, turpentine 3 parts, oil of turpentine 2 parts, liquefied marine glue 5 parts. Melt in a water bath, and add 10 parts dry slaked lime.

(6097) W. T. writes: I have built the 8 light dynamo contained in SUPPLEMENT, No. 600, and must say it is a dandy. Have not had the least trouble with it. I made all connections and started it without any batteries, and it lit three 52 volt 16 candle power lamps at once. I have also made the hand power dynamo, and had no trouble with it. Is there a SUPPLEMENT treating on volt or ampere meters? If so, what numbers? A. Ammeters, SUPPLEMENT, Nos. 440, 603, 618, 628, 734; voltmeters, SUPPLEMENT, Nos. 353, 552, 556, 668, 734, 933.

Communications Received.

"On a Display of Aurora Polaris." By A. W. F.
"On the White Heron." By T. H.
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"The Great Sugar Pine." By T. H.

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AND EACH BEARING THAT DATE.

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Truck, electric motor, J. C. Henry 520,780
Truck, stove, H. M. Putt 521,127
Tub, Gwynn, Jr., & Spencer 520,880
Turntable, J. B. Tinsley 521,060
Type, method of and machine for justifying, J. L. McMillan 521,039
Typewriter case and table, combined, F. C. Wood 521,067
Typewriting machines, ribbon reversingmechanism for, F. P. Stiles 521,091
Typewriting machines, type cleaning device for, C. A. Joerissen 520,850
Valve, F. W. Hess 521,027
Valve, G Oliver 521,040
Valve, automatic exhaust, relief, G. De Laval 521,030
Valve, sluice, W. A. Doble 521,106
Vapor burner, H. Ruppel 520,805
Vehicle, J. Johnston 520,961
Vehicle, Price & Daniels 520,830
Vehicle runner attachment, wheeled, S. C. Schofield 520,806
Vehicle, two-wheeled, J. A. Johnson 520,927
Velocipede wheel, E. E. Fay 520,845
Vending machine, coin-actuated, F. B. Cochran 520,769
Ventilating and furnace checking device, Watson & Douglas 520,974
Ventilation, house, J. McCreery 521,033
Voltmeter, E. R. Knowles 520,789, 520,964
Wagon brake, J. Jacobs 520,849
Wall finish compound, R. E. Haire 521,143
Washing machine, J. Beukema *et al* 520,841
Washing machine, D. P. Edgar 520,771
Watch bow fastener, D. H. Abney 521,070
Water closets, automatic pull for, E. D. Andruss 521,072
Water tube boiler, J. J. Horan 520,883
Water wheel governor, electrical, C. S. English 521,085
Wheelbarrow, M. V. Garver 520,919
Wheelbarrow tray, M. V. Garver 520,920
Whiffletree, J. C. H. Hobbs 521,028
Windlass, grain shovel, J. H. Finley 520,956
Wire stripper, J. J. Bettinger 520,818
Womb battery, J. C. Petit 520,895
Wrench. See Pipe or nut wrench.
Wrench, A. Bareis 521,076
Wrench, A. McCallum 521,123

DESIGNS.

Box, fancy, E. Jansen 23,330
Brushes, etc., back of, G. W. Shiebler 23,331
Clasp for garment supporters, E. D. Candee 23,332
Door, screen, E. M. Kemp 23,338
Fire screen, J. A. L. Gist 23,337
Lamp stand, W. S. Grey 23,329
Monument, W. H. Perry 23,340
Rack, C. C. Wientge 23,333
Radiator, J. F. McElroy 23,339
Scale beam, letter, J. E. Withrow 23,335
Screw, W. E. Quimby 23,336
Silversmith's stock, G. L. Crowell, Jr 23,327, 23,328
Slab support, J. Totham 23,334
Spoon, fork, or similar article, S. Smith 23,326
Trimming, C. E. Hertlein 23,325
Woven fabric, W. T. Smith 23,324

TRADE MARKS.

Antiseptic surgeons' dressing, Johnson & Johnson 24,831
Axles, vehicle, Cleveland Axle Manufacturing Company 24,836
Belt stud or fastener, Binz & Linderman 24,835
Boilers, compound to remove and prevent scale on, R. Publman 24,825
Cloth or canvas backed leather, F. H. Atwood 24,815
Cotton dress goods and shirtings, Cone Export and Commission Company 24,812, 24,813
Crackers and biscuits, American Biscuit and Manufacturing Company 24,818
Cure for the heaves in horses, P. Schuelk 24,834
Hats and caps, men's, J. Marshall 24,808, 24,809
Hosiery and underwear, Lowell Hosiery Company 24,806
Lard compound, Anglo-American Provision Company 24,820
Medicinal strengthening plaster, Johnson & Johnson 24,830
Medicine for corns and bunions, C. H. Van Wie 24,832
Medicine, stomachic and carminative, E. Dort 24,827
Milk, condensed and plain, evaporated cream, butter, and cheese, New York Condensed Milk Company 24,819
Paint or preparation for the cure of corns, warts, and similar growths, H. S. Moore 24,833
Paper, wrapping, writing, printing, and toilet, Stone & Forsyth 24,822
Paper, writing, Crane & Company 24,821
Pills, liver, Francis Medicine Company 24,829
Preparations for the skin, M. Meyberg 24,823
Preparations, including soap, certain named toilet, Vail Brothers 24,824
Remedies for diseases of the stomach, I. Schoultz 24,828
Remedy, certain named, C. T. Sing 24,826
Ribbons, piece goods, cloths, and stuffs made of silk, A. & S. Blumenthal 24,811
Sheetings, shirtings, muslins, drillings, and denims, Smith, Hogg & Gardner 24,814
Shirts, men's, March Brothers, Pierce & Company 24,810
Suspenders, Scientific Suspender Company 24,807
Tea, Beling & Tissera 24,816, 24,817

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