Now, could I take half the battery required to run it at its fullest capacity, and run it as a one-sixteenth horse power machine? A. The motor would require more than one half the battery to run at one-half its full capacity. 2. Where the instructions are to use wood, would it be any better were I to use type or babbitt metal? A. Type metal or babbitt would not do for the core for the hub of the armature, unless you provide a commutator cylinder separate from the hub. 3. Please let me know what is meant by the word shunt as applied to electrical machines. A. Shunt is a term applied to one part of a divided circuit.

(4187) E. D. H. asks: 1. Please give the solution of the Leclanche batteries. A. Saturated solution of sal ammoniac and water. 2. What size storage battery would be required to run a small motor for operating a wood turning lathe? A. Your query is too indefinite to admit of direct reply. It requires 8 cells of storage battery per horse power. 3. About what it costs and how much would the cost be in renewing it? A. The cost of a storage battery is $15 per cell. The cost of charging, of course, varies with the cost of the motive power used in driving the charging dynamo. Probably a fair average will be ten cents per cell.

(4188) M. W. writes: Suppose two electrical storage batteries each having capacity enough to run a dynamo for several hours of several horse power, the one being charged and the other not. How long a time will it require after they are connected till there is an equilibrium between the two, that is, will the charges in the two become equal in an instant or will it require some time? A. The charging of storage batteries by means of other storage batteries is practically the same as charging them by the current from a dynamo, and they should be charged at the same rate. For elaborate tables on charging and discharging dynamos consult SUPPLEMENT, No. 838.

(4189) H. R. writes: I am making some blue enamel for enameling iron ware made of sand, borax, potash, and cobalt oxide. When ground into a pulp, there is a white scum on the top of the enamel. Can you let me know the cause of it? Can you give me a receipt for blue enamel? Is there any book published on the manufacturing of glass and enameling? A. Fuse the mixture, pour while fused into water and regrind it. This will give it greater uniformity and avoid the scum. The "Scientific American Cyclopedia of Receipts," $5 by mail, gives a great deal of information on this subject.

(4190) W. P. D. writes: During last fall's drought we dug a cistern, at a depth of ten feet found moisture. It was walled up with brick and cement and bottom laid with same. (Star brand cement being used.) Later on, when the ground became thoroughly wet, a leak showed in bottom, and water rose two feet deep. It was pumped out and another layer of brick and cement was put down, making the bottom double, but it filled with water just the same. What had we best do to secure good results and make it hold full up? Would the water go out during drought as it came in? It is now half to three-fourths full. All comes through the bottom. A. The water will doubtless disappear in the dry season. The remedy will be to pump out the cistern, plaster walls and bottom with best Portland cement, neat, then put in another bottom and walls of brick laid up in the cement.

(4191) R. M. asks: 1. Please give chemical action in a single fluid battery using iron for the positive plate, and a saturated solution of common salt. A. The iron would oxidize very slightly and the battery would become polarized. The salt would merely act to accelerate oxidation. 2. Also E. M. F. of the same. A. It would be very slight; practically only a fraction of a volt.

(4192) E. L. writes: I have a silver wash made by dissolving silver chloride in a solution of hyposulphite of soda. When first made the solution worked very well and deposited silver nicely. Now, after a lapse of several months, it will not work at all, and there is a considerable amount of black sediment in it. Can you tell me how it can be made to work, or how the silver can be reclaimed, if that is impossible? A. Possibly your solution is exhausted. To get rid of black sediment, filter. To recover silver add a few pieces of zinc, acidify in open air with sulphuric acid, and eventually dissolve all the zinc. The silver will be left in the metallic state.

(4193) G. H. C. asks: If the rings used in the armature of motor No. 641 were so made that a segment of iron came between each pair of coils so that the circumference were unbroken, would it decrease or increase the power of the motor, and are such rings made? A. It would increase the power of the motor to some extent.

(4194) W. T. B. asks: 1. If the carbon sticks used for arc lamps be used for carbon element in bichromate plunge battery, should enough sticks be used to make the carbon surface equal the zinc surface? A. You should use enough of the carbon rods to make the carbon surface nearly or quite double that of the zinc surface. 2. How many half gallon gravity battery cells are required to run motor described in No. 761, SUPPLEMENT? A. The gravity battery is not suitable for running motors of this kind. You will probably require 20 or 30 cells to run the motor up to its full capacity. Better use a plunging battery or a Bunsen. 3. Would not said motor be just as efficient, if a circular iron band, say ¾ inch wide, ⅛ or three-sixteenths inch thick, fastened to a wooden disk, were substituted for the iron disk to which the armature spools are attached, the spool cores to pass through the wood disk and be screwed to the iron band? A. There is no objection to the construction you describe.

(4195) E. H. asks: What is meant by a silicated carbon filter? What is its composition, how made, and what is its action, or, in other words, how does it purify water, etc.? A. Silicated carbon filters may be any mixture containing silica and carbon. This may be sand and charcoal mixed or a porous sandstone slab covered with pulverized charcoal. Solid filter slabs may also be made from pulverized retort carbon, sand, and clay, by baking the same as bricks are made. The action is principally as a filter or strainer, with a slight tendency to deodorize the water by the absorptive action of the carbon.

(4196) W. E. K. says: Will you please tell me what is meant by latent heat, and also something to take away warts? A. Latent heat is the heat that has been absorbed and which becomes hidden in the change of fluids to vapor, or in the fusion of solids. It is also the heat that is derived from the condensation of vapors and from fluids when passing into the solid state. As its name indicates, it is hidden or conccaled heat, not shown by change of temperature. Try a drop of kerosene oil on the warts twice a day.

(4197) J. H. K. asks: 1. How are school blackboards made? A. The best mixtures contain a vehicle, often shellac varnish, with emery or ground pumice to give "tooth," and lampblack or other pigments, often with a little Prussian blue. See the "Scientific American Cyclopedia," $5 by mail. 2. How can gas be lit by electricity and what is a simple way? A. By a spark coil, three or four Leclanche batteries in circuit therewith, and a circuit-breaking attachment to each burner. The latter are sold by electrical dealers. 3. How can small bombs be made, which, when thrown to the ground, do not make much of a report? A. Fulminate of mercury is the explosive of ordinary torpedoes. All this class of manipulation is very dangerous.

(4198) F. W. P. asks: Can a fish of any kind or eel shoot or swim up a ten-foot dam or falls? Does the bottom of a wagon wheel go slower than the top? Is it better to write a letter for information to the publishers of any paper, or send an article before doing so? A. Salmon are known to jump a considerable fall with deep water below. They jump all the falls of the Columbia below Spokane. We have no figures. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 275, for an interesting account. Eels crawl around falls or dams. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 706, for a discussion of the wagon wheel question. Send letters and article together.

(4199) C. C. B. writes: Will you allow me to add a little to your directions for reinking type writer ribbons. I find that one part each of alcohol and glycerine, with aniline dye, makes the ribbon too sobby, and causes it to blur in use. After using one of my ribbons for a day or two inked as above, I ventured to run a hot iron over it, having first put it between two blotters. This remedied the trouble at once.

(4200) W. D. R. says: I wish to convey water through a pipe 260 feet from a ditch. I have 24 feet fall. I would like to know what is the smallest size pipe I can use and have a supply of 3 gallons per minute. A. A ¾ inch pipe will give you about 5 gallons per minute. We do not recommend smaller pipe, on account of its liability to close after being in use some time.

(4201) H. G. G. asks: What occupies the space in the top of the barometer tube? Is it a a vacuum? If it is not a complete vacuum, what fills the space? A. It is as near a perfect vacuum as possible. In a barometer that has no spot at the top when it is tipped down so that the mercury touches the top of the tube, there is good proof that it contains no air or gases. There is only a possibility that an infinitely small amount of vapor of mercury rises in the open space that condenses as the mercury rises to the top in tipping the barometer.

(4202) W. S. T. says: Please give me the proper weight for a flywheel for an engine 3¼ inch bore, 6 inches stroke, running 90 revolutions, cutting off ⅛ stroke, or give rule in next issue for finding weight of flywheels. A. For weight of flywheel rim

$$\frac{\text{mean piston pressure} \times \text{stroke in feet}}{\text{Rev. per m.}^2 \times \cdot 0003}$$

or for your engine, assuming 40 pounds mean piston pressure per square inch,

$$\frac{40 \times 8{\cdot}29 \times \frac{1}{16}}{90 \times 90 \times \cdot 0003} = 34{\cdot}6 \text{ pounds.}$$

(4203) H. M. asks: What is the red transparent composition used on the outside surface of corrugated lenses for semaphore signal lamps and how is it made to adhere to the glass? From close observance I notice that green and blue lenses are not made in this way, but apparently the coloring matter, whatever it may be, seems to have been mixed through the glass. From this the question arises, can green or blue lenses be made in the same manner as the red? A. Colored glaze is used and baked on as with glazed earthenware. Otherwise the coloring is made at the glass house by using colored glass in blowing. Colored varnishes may be used for cheap work. The principal colors in sheet glass are sold by the trade, consisting of ordinary glass glazed on one side with colored glass. This is a special business for ornamental windows and decorated work.

(4204) W. B. says: Suppose there is a hole through the center of the earth from one side to the other. The air being exhausted in the hole, a lead ball is dropped in; will it fall past the center? Will its velocity increase or diminish in the first 2,000 miles? A. The lead ball would not drop through the hole freely unless the hole was from pole to pole. The motion of the earth decreases from the surface toward the center or axis. The ball partaking of the surface velocity would hug the east side of the hole, because it would always be approaching a part having a slower motion as it moved toward the center. With a polar hole the ball would drop with an increasing velocity to the center, and pass to an equal distance to the other side with a decreasing velocity, from the effect of gravity, and would vibrate from surface to surface, no friction being considered.

(4205) C. P. M. asks: If a cannon be fired at a horizontal and another ball be dropped from the same height at the same instant, which will reach the ground first? I say there will be no difference. A says that is an old theory, and that modern science has proved that the ball that is dropped will reach the ground first, and if the SCIENTIFIC AMERICAN does not agree with him he will not accept it as authority. Will the best modern rifle fired at 100 yards throw a ball in a straight line that or any part of that distance? If not, how far above the target will the rifle actually be sighted, and at what point along the line will the ball be farthest above a direct line, and how far? A says he has sighted rifles as a business, and that a rifle will throw a ball in a straight line for a given distance varying according to the velocity. What is your opinion of A? A. You are right as to the time of direct fall and the fall of the horizontal shot. A ball fired horizontally does not move in a straight line after it leaves the gun. It is a downward curve. The sighting is depressed from the line of the bore to meet the curve of the ball at given distances. Hence the ball rises on the line of sight, but not on the line of the bore. Do not think well of A's opinion. The depression in sighting depends upon strength of powder and weight of ball, as well as length of barrel or distance between the sights. We have not the figures used in practice.

(4206) W. E. MacK. writes: 1. I made an induction coil as described in your paper, but can only get about a one-half inch spark. There are two pounds of secondary wire wound perfectly, each layer shellacked, with two layers of thin paper between each layer. I feel positive that the insulation is perfect throughout. The condenser is made from leaves of an old ledger, every leaf examined for imperfections and then dipped in paraffine. How can I test to find out where the trouble is? A. Test the secondary wire of your induction coil by means of a galvanometer and rheostat, and see if it has the resistance due to its length. If the resistance of the coil is less than that of the wire, your insulation is deficient at some points. If the resistance is extremely high, or if the current will not pass at all, it indicates a break. Possibly you are not using sufficient battery to develop the full power of the coil. If you are using small cells, try connecting them up by twos in parallel. 2. Why is it that if the wire from the zinc of a bichromate of potash cell be connected directly with the carbon it becomes red hot, while if connected at the binding post or to another piece of wire from the carbon it is not made even sensibly warm? A. By connecting the wire directly with the binding posts, you have the greatest possible current you can obtain from the battery. Any additional resistance introduced into the circuit reduces the current. 3. I have three cells of carbon and zinc battery which I charge with a saturated solution of bichromate of soda and one part sulphuric acid to five of solution. Why is it that when this battery is set up fresh it becomes so hot that the paraffine is melted from ends of the carbons, although everything is quite cold before the zinc is put in? A. The fact of the zincs becoming warm in your battery indicates poor amalgamation. You should amalgamate your zincs thoroughly in every part. 4. On page 321 of Mr. Hopkins' book he speaks of sulphurous acid water. What does he mean? A. Sulphurous acid water is water in which sulphurous acid (which is a gas at ordinary temperatures) has been absorbed. 5. How shall I go to work to harden a steel roller (tool steel) 4 inches by 2 inches diameter with journals 3 inches by 1⅛ projecting from each end? I wish the journals soft and the center as hard as possible to get it. I have made three, but all crack in the hardening? A. For your roller take steel that has been worked as little as possible, and never heated above a low cherry red. Heat the roll to a temperature required for hardening and dip it straight down into cool water, holding it there until it becomes cool; afterward draw the temper of the journals. A roll of this kind is almost sure to spring in hardening. It should be finished, after hardening, in a grinding lathe.

Marlboro asks: For a variety of whitewash receipts.—J. G. S. says: What is a good formula for a floor stain? How made and applied?—F. H. E. says: Is there any way in which short hair may be curled without the use of curling iron, and without doing any injury to either hair or scalp?—E. W. says: Please give me a cement to fasten glass and brass or glass and tin, so that it can stand hot water?—H. W. F. says: Will you give receipt for Worcestershire sauce, same as made by Lea & Perrins?—R. C. C. says: Please give formula for rubber mixture to repair rubber coat.—A. H. R. says: Can you inform us of some lacquer to use on brass signs to keep them from tarnishing?—R. F. M. says: Could you kindly give us a recipe for hard transparent cement for sticking glass, insoluble in water?—H. B. A. says: How can I remove mud stains from a sole leather dress suit case without leaving any mark? Is there any way to remove initials badly put on with the black paint generally used for that purpose?—C. J. McG. says: Oblige me with a receipt for making colored crayons.—B. P. H. says: Be so kind as to inform me how a solution for removing ink is made?—T. F. McD. says: Please give a receipt to make an easy-running bismuth solder?—T. J. says: Can you furnish me with the receipts by which billiard balls are colored? Also how are the stripes on pool balls done?—P. H. H. says: Is there any kind of a cement that will stick brass to glass so that when a heavy charge of electricity comes over the wires it will not melt the cement? 2. Can you temper a drill so that you could drill a hole in glass, and how?—A Reader asks how to clean wall paper.—C. H. C. asks for tin and zinc plating baths.—E. C. W. asks for a durable whitewash.

Answers to all of the above queries will be found in the "Scientific American Cyclopedia of Receipts, Notes and Queries," to which our correspondents are referred. The advertisement of this book is printed in another column. A new circular is now ready.

Replies to Enquiries.

The following replies relate to enquiries recently published in SCIENTIFIC AMERICAN, and to the number therein given:

Removal of White Incrustation from Bricks.—Large quantities of the pressed bricks referred to in query No. 4054, February 27, are made near here. Hydrochloric acid, dilute 1 in 3 water, and put on with a whitewash brush, will take off the white referred to.—*W. D. B., Milton, Ontario.*

NEW BOOKS AND PUBLICATIONS.

THE MECHANICAL ENGINEER'S POCKET BOOK OF TABLES, FORMULA, RULES, AND DATA. By D. Kinnear Clark, M. Inst. C.E. New York: D. Van Nostrand Co. 1892. Pp. xxxii, 656. Price $3.

A book of this character, provided with an extended table of contents and also with a full index is always welcome. The work covers the ground designated by its title, with one noteworthy feature. This is the introduction of a considerable part devoted to electrical engineering, including, among other topics, dynamos, lamps, conductors, telephones, and lighting conductors. The preface states that the work is especially designed for the use of the mechanical engineer, and its numerous tables and practical rules and examples will prove of the greatest use to members of the profession in question.

NOTES ON BUILDING CONSTRUCTION. Part IV. Illustrated with cuts and folding plates. London and New York: Longmans, Green & Co. 1891. Pp. xix, 364. Price $4.50.

This large and beautifully made volume is written to meet the requirements of the syllabus of the Science and Art Department of the committee of council on education, South Kensington, England, for what is termed the course for honors. Whether the English examination system is productive of good or harm to the cause of education is an open question. Its influence on the world of books is in some ways bad as tending to restrict the scope of books to the limited "requirements" of the examinations. This volume, however, while avowedly written for such end, treats so fully of its subject, building structures and calculations incident thereto, that it will be found valuable to many besides the mere crammer for the "honors" of a South Kensington examination.

HOW TO RUN ENGINES AND BOILERS. By Egbert P. Watson. New York, 1892. Pp. 125.

This is a little hand book of useful information and direction by the editor of the *Engineer*, designed to be particularly serviceable to young engineers and steam users. It treats of cleaning the boiler and removing scales, boiler fittings, grate bars and tubes, bridge walls, etc., and several short chapters are given to the slide valve throttling engine. Many valuable practical hints relative to engine running and management are given, and the information contained in the book is set out so plainly and clearly that the most ordinary mechanic cannot fail to understand and appreciate its contents.

TO INVENTORS.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

March 15, 1892.

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Acid in oils and fats, dissolving lactic, A. Sommer 470,715
Acids in oils and fats, solution of, A. Sommer 470,714
Acids, making oxymethoxybenzoic, B. R. Seifert 470,920
Advertising match box, Harrison & Hooker 471,052
Air and gas meter, G. E. Abrahams 470,814
Air compressor and reservoir, J. G. Haines 470,934
Air moistening apparatus, E. Mertz 470,933
Air or gas meter, H. Lane 470,926
Ammunition car, rotating, H. A. Spiller 470,955
Annunciator, A. H. Brintnell 470,831
Arc light hanger, C. A. Pfluger 470,766
Auger, earth, G. P. Vicken 470,725
Awning, F. A. Leavitt 470,894
Axle, car, A. Alford 470,951
Axle lubricator, T. H. Fox 470,998
Axle skelp, L. D. Hill 470,787
Badge, C. A. Tripp 471,039
Bag. See Bicycle bag.
Baling press, A. Mattijetz 471,012
Banjo, J. W. Clement 470,986
Barrel stand, T. F. Marshall 471,010
Barrels, etc., machinery for shaping, finishing, and flanging metal, T. C. Barraclough 470,737
Basket, F. & H. Jepsen 470,680
Basket for marketing fruit, M. B. Williams 470,732
Battery. See Galvanic battery. Secondary battery.
Bed bottom, folding, S. Raymond 470,706
Beehive, U. G. Matthew 470,789
Belt, straightening, C. R. P. Klem 470,839
Bicycle bag, E. W. Mease 470,878
Bicycle lock, A. W. Hall 470,936
Binder for filing and binding papers, G. A. Huewe 471,055
Blacksmith's vise, G. R. Moore 470,764
Boiler furnace, J. F. Wangler 470,726
Bolt. See Joint bolt.
Bolts for doors, manufacture of cases and staples of sockets, G. Clarke 470,985
Book, W. Chichester 470,981
Bookbinding A. C. Hafely 470,866
Boring machine, J. Richards 470,879
Bottle for mucilage, etc., C. M. Higgins 471,003
Bottle stopper fastener, J. Menke 471,013
Box. See Fare box. Journal box. Letter box. Sheet metal box. Show box. Stuffing box. Work box.
Box fastener, S. S. Barrett 470,968
Bracelet gauge, W. Jones 470,694
Bracket. See Scaffold bracket.
Brake. See Car brake. Wagon brake.
Brick mould sander, C. A. Adams 470,963
Brooms, etc., holder for, Smith & Harding 470,880
Bucket, iron, W. & A. McLauchlan 470,947
Buckle, J. F. Ballard 470,652
Buildings, construction of, W. T. Sears 470,901
Bung, C. R. Martin 471,011
Burial apparatus, C. C. Shults 470,767
Burner. See Hydrocarbon burner.
Butter tub closure, O. Duesler 470,835
Button, link, F. E. Williams 470,731