Notes and Queries.

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(10296) Y. M. C. asks: Please give recipe for solution to oxidize nickel. A. To oxidize nickel, place the article for a short time in a dilute solution of potassium sulphide, sodium sulphide, or ammonium sulphide.

(10297) L. T. says: We have a number of kerosene barrels filled with water on top of our buildings, to be used in case of fire, and during the winter are troubled considerably by the water freezing and bursting of barrels, although we put in one or two pails of salt as a preventive. We have been informed that people were in the habit of standing a piece of 2 x 4 pine on end in a barrel of rain water to prevent the bursting of the barrel. Would like to know the best preservative to use for preserving the barrels against the effect of exposure to the sun and elements. A. If the barrels are open in one end, there should be no bursting or freezing, as the expansion is not hindered. There would be no use in putting in a piece of pine wood. Salt is of use, but will not prevent freezing in extremely cold weather. Paint with asphalt to preserve the barrels against the effect of sun and rain; with good asphalt the life of such a barrel becomes almost indefinite.

(10298) F. A. S. asks for a strong glue that can be held over a flame and then be applied. A. Some of the so-called marine glues are used in this way: (A) Naphtha, 1 pint; pure rubber, cut into shreds, 1 ounce. Macerate for 10 to 12 days and then rub out smooth on a plate. Then mix 2 parts of shellac with 1 part of this solution. Melt at about 250 deg. F. for use. (B) Dissolve 10 parts of caoutchouc in 12 parts of refined petroleum, by digesting for 10 days to 2 weeks. Then carefully melt 20 parts asphalt and when melted, pour in the other solution. Keep warm (in hot water), and stir until uniform. Pour into greased molds and allow to harden. These marine glues are very strong.

(10299) G. H. M. asks: Can a battery be made where one of the electrodes used is gold? If so, what is the other electrode, and what is the exciting fluid used? A. We can see no reason why a battery may not be made with gold for a negative element, and any metal which will be acted upon by the liquid used for the positive element, if one wished to do so. Platinum was used in this way in some of the older forms of cell. It was replaced by carbon as a cheaper material. And the carbon of almost any cell may be replaced by gold.

(10300) J. M. C. asks: How many watts are required to 16 candle power incandescent lamp per hour? Also, about the average price per thousand watts of electricity. A. Incandescent lamps for best service are made for about 3½ watts per candle, or 55 watts for a 16 candle power lamp. The price for service is differently rated in different places. In large cities it is about 2 cents per ampere hour at 110 volts; in small places the rate is often so much a lamp-month, the time of lighting not being considered.

(10301) C. B. says: I want a magnetic coil capable of attracting an armature a distance of ¾ of an inch. The circuit will have a pressure of 110 volts at 10 amperes. What size coil will I need, and also size wire? A. We do not advise you to make a magnet as you propose to carry 10 amperes at 110 volts pressure for the purpose of attracting an armature ¾ of an inch. It would require a large wire and be very heavy. It is far better to use one ampere and have a pair of 100-volt lamps in parallel as a resistance. The coil will require to be wound to 10 ohms resistance and No. 24 wire may be used. Of this about 400 feet will be required.

(10302) C. S. N. writes: 1. Having noticed in your Notes and Queries column a short time ago that borax and good management are the best for welding steel, I wish to state that while both are indispensable. I find that an ounce of carbonate of iron to the pound of borax is a very good addition. Can you inform me whether aluminium can be soldered with lead-and-tin solder, and in what proportions? Also, what kind of acid to use? A. Lead-and-tin solder alone is not suitable for soldering aluminium. A solder made of 1 part aluminium, 1 part of 10 per cent phosphor tin, 8 parts zinc, 32 parts tin, by weight, makes a good-flowing solder. Canada balsam is used for flux. 2. What is the voltage of an Edison-Lalande battery cell, such as is used on gasoline engines, and will it be either temporarily or permanently exhausted by running a small motor for an hour or more? A. The voltage of an Edison-Lalande cell is about 7-10 volt. Their small internal resistance greatly increases their amperage and capacity to from 100 to 300 hours. They are not exhausted on short runs.

(10303) C. E. D. writes: In a recent issue G. M. T. asks concerning the falling of two spheres of same size but different weight, and you reply that they will fall in a vacuum with the same velocity, likewise the same in air. The latter part of the answer is manifestly incorrect, for it would indicate that falling bodies are not resisted by the air. The weight of the body is the power to overcome the resistance; and since the resistance is the same, the heavier body will fall faster. Any other conclusion will not produce added speed. A. We fear our answer to the query was not sufficiently explicit. Two bodies of the same size but of different weights will fall with different velocities in the air after they have fallen a sufficient time. Aluminium is more than 2,000 times heavier than the air at normal pressure. At or near the beginning of its fall the air would resist an aluminium ball in the same degree as one pound would resist the motion of a ton. How slight that would be any one can see. It would be imperceptible under moderate velocities. How little the air resists heavy dense bodies can be seen by considering how swiftly a stone or bullet cuts the air. Lead is more than 8,700 times heavier than the air, and is in a higher degree able to overcome the resistance of the air. There is no question that the lead ball will acquire the greater velocity. The height from which the balls are dropped must be greater than is usually available for such experiments in order to make this difference appreciable. Our correspondent is quite right in his argument, and the result will be as he says if there is a sufficient distance for the fall. It will probably be necessary to drop the balls from a height of about 200 feet to make a perceptible difference in the time of fall.

(10304) C. H. asks: Please publish in your Notes and Queries column directions for constructing a Wimshurst static electric machine capable of producing a half or three-quarter-inch spark. A. You will find full instructions with working drawings for making a Wimshurst machine in our SUPPLEMENT 548. Other valuable articles are contained in SUPPLEMENTS 584, 647, and 648, which we send for ten cents each. It is not our practice to print again what we have already published, but to refer inquirers to the proper numbers, in which they can find what they require.

(10305) A. C. B. says: Please settle the following argument: A says that a wheel coming in contact at its bottom surface meeting with resistance will speed faster at its upper surface than at point of contact. B states speed is identical at both points. A. A rotating wheel of any sort turns about its center, so that all the parts of the rim move with the same velocity, that is, while one point turns through five degrees of a circumference, every other part turns through five degrees. This must be evident, since the wheel does not break apart, as it would do if one point went faster than any other point. But if an eye were on the surface of the ground just by the side of the rim of the wheel as it turns to that eye, a point of the rim would seem to come down toward it and come to rest by the side of the eye, instantly that point of the rim would move again and rise up into the air to the top of the wheel. To such an eye the point of the wheel in contact with the earth is at rest. In your discussion A sees one feature of the motion of a wheel and B sees another feature, and both are right, for the wheel has both motions at the same time. We wish this question might come to rest *in the ground*. Some one asks it nearly every month. See answer to Queries Nos. 9622, 9636, 9679. Every possible feature of the motion of a wheel is considered in one or another of these answers.

(10306) E. E. L. asks: 1. Would like to make inquiry as to the probable number of the earth's magnetic lines of force per square inch passing over the earth's surface at the equator. A. We have not the figures at hand for intensity of the earth's magnetism at the equator. You can perhaps obtain them from the Director of the U. S. Coast and Geodetic Survey, Washington, D. C. 2. What is the boiling point of chemically pure water in vessels of the different common metals, and also in an earthenware vessel? A. Pure water boils at 100 deg. C. when the barometer stands at 760 millimeters, and the thermometer in the open air is at the freezing point. We are not aware that the containing vessel has any effect upon the boiling point of a liquid contained in it. 3. What is the temperature at which an electro-magnet ceases to be magnetic? A. Iron ceases to be magnetic at a red heat. 4. Is it possible to insulate a flowing stream of water, as from a hose, so that an electric current will not flow to the earth? A. Water, pure water, is an insulator of itself, and a current of electricity cannot flow along a stream of water from a hose discharging pure water. Atmospheric electricity or electricity of very high potential will discharge over an insulator, as does lightning, and Leyden jars, and waves from wireless telegraph transmitters; but hydrant water does not to any great extent carry the electricity of 110 volts such as is used on lighting circuits. We are aware that the popular impression is quite different from this. We do not know how to insulate a hose at its nozzle when the other end of the hose is attached to the earth.

(10307) W. L. J. asks for an acid-proof cement, preferably one which will stand a reasonably high temperature. A. Try a putty made of litharge and glycerin.

(10308) L. A. D. writes: I am a stereotyper. What will I put in paste to make the matrix hard after it is dry? Give me a recipe for backing powder. What is the cause of blow holes in plate and cure for it? A. Paper matrices for making stereotype plates from type forms, used in newspaper offices, are prepared as follows: Make a jelly paste of flour, starch, and whiting. Dampen a sheet of soft blotting paper, cover its surface with the paste, lay thereon a sheet of fine tissue paper, cover the surface with paste, and so on until four to six sheets of the tissue paper have been laid on. The combined sheet thus made is then placed, tissue face down, upon the form of types, which are previously dusted with whiting, and with a brush driven down upon the types and thereon allowed to dry. The operation of drying is facilitated by having the types warmed by placing them upon a steam-heated table. A blanket is placed over the paper during the drying operation. Probably thorough drying will avoid the difficulty you mention.

(10309) W. S. S. asks for a recipe for a soap to clean woodwork that will not injure the finish or varnish or paint, but at the same time remove the dirt. Also if such a soap will do the work, should like it for cleaning carpets or rugs, so that same will not be left sticky and stiff. Understand there are receipts for such soaps. A. To clean paint, provide a plate with some of the best whiting to be had; have ready some clean warm water and a piece of flannel, which dip into the water and squeeze nearly dry; then take as much whiting as will adhere to it, and apply it to the painted surface, when a little rubbing will instantly remove any dirt or grease. After which, wash the part well with clean water, rubbing it dry with a soft chamois. Paint thus cleaned looks as well as when first laid on, without any injury to the most delicate colors. It is far better than using soap, and does not require more than half the time and labor. To clean paint, take 1 ounce pulverized borax, 1 pound small pieces best brown soap, and 3 quarts water; let simmer till the soap is dissolved, stirring frequently. Do not let it boil. Use with a piece of old flannel, and rinse off as soon as the paint is clean. This mixture is also good for washing clothes. This would probably answer for cleaning rugs.

(10310) J. H. W. asks: Can you tell me in your query department what is the best size wire for the secondary winding of a spark coil for a gas engine? Could the secondary wire be too fine? Have you a good book on the subject? A. Very rarely is any number of wire less than No. 36, A. W. G. silk covered, used in the secondary of induction coils. The secondary cannot be too fine. We recommend upon this subject Norrie's Induction Coils, price $1 by mail.

(10311) A. M. L. asks: Kindly inform me through the SCIENTIFIC AMERICAN: 1. What substances best conduct sound? A. If by best conductors is meant those through which sound travels most rapidly, the answer as given in Zahm's "Sound and Music," price $2.50 by mail, is, steel, 15,470 feet per second; iron, 16,822 feet; fir wood, lengthwise the fiber, 15,218 feet; aspen wood, along the fiber, 16,677 feet; white pine, 17,260 feet. Chladni obtained a velocity for fir much greater than that given, 19,685 feet. 2. What substances are most opaque to heat? A. Kent's "Engineers' Pocket Book," price $5, gives as the result of tests with heat at 310 deg. F. a list of 32 articles, of which the best four are loose wool, live geese feathers, loose lampblack, and hair felt. Of course these are all combustible, to an extent. Of covering materials, for instance, to protect ice from melting, mineral wool and hair felt are the best. In protecting liquid air from external heat to prevent evaporation a vacuum as perfect as possible has proved to be the best insulator. 3. What substances are most incombustible? A. A brick is probably the most incombustible thing. It has been once burned in a kiln till everything combustible in it is destroyed. Volcanic lavas are also incombustible. Furnace slag is of the same character.

(10312) J. M. C. asks: How many watts a 16-candle-power incandescent light will use? A. Sixteen-candle-power lamps of different types use from three to four watts per candle.

(10313) H. W. C. asks: Please advise me as to what books you recommend on designing of motors of the two-pole Edison type, with points as to effect of change of area of poles, position of greatest pull, etc., price of same and where to be had. Will Parkhurst's $1 work cover it? A. For the principles of designing of motors on direct current we recommend Thompson's "Dynamo Electric Machinery," price $6, as the leading authority. Hawkins and Wallis's "Dynamo," price $3, discusses the principles of the machine. Wiener's "Designing of Dynamos and Motors," price $3 last edition, is considered a reliable work. Parkhurst's little book, price $1, contains the plans and details of two little motors which he designed. It has no instruction in reference to the mode of designing. The book "Electrical Designs," price $2, contains a large number of plans of machines, some of which would probably be useful to you. The only way to learn the art of designing thoroughly is to take a course of electrical engineering and then work in the shops of some one of the great electrical companies. You will then become a designer with originality in your designs.

(10314) K. G. B. asks: 1. Will you kindly inform me through your valued paper whether there is any way of finding the "constant" of a Thompson recording wattmeter from the type, class, etc., as stamped on the metal plate attached to it? To illustrate: What would be the constant of a Thompson wattmeter Type M, Form E 3, Class 50, 220 volts? The constant of these meters is always marked in ink, which makes it easy for electric light companies, if they are inclined that way, to change it to a higher figure, thus making the meter register more current than is consumed in reality. A. The constant of a Thompson recording wattmeter may be roughly verified by the following method: Turn on a number of lamps of a rated number of watts. Multiply the watts per lamp by the number of lamps. Observe the number of seconds required for a revolution of the disk, and multiply the watts used by the number of seconds per revolution of disk. Divide this product by 3,600, the number of seconds in an hour. The quotient is the constant required. If a stop-watch is used the seconds per revolution can be found with great accuracy. The reason this is only a rough method is that lamps as they grow old take more than their rated number of watts. The meter is not liable to over-record the service, since the disk is not likely to run too fast. A better way is to connect an accurate wattmeter in series with the recording meter to be tested, and compare the readings. 2. Is there any book or manufacturer's catalogue that will give accurate information on this subject? A. Foster's "Electrical Engineer's Pocket Book," price $5 by mail, and the circulars of the manufacturers.

(10315) H. H. asks: Kindly advise me of the method used for grinding glass for the mirrors of reflecting telescopes; I mean more particularly the means of describing the curve before beginning. Also, if there is not a more practical way of getting a parabolic curve than that given in most text-books, which simply say it is the focus of a point equi-distant from the focus and directrix? I understand the theory well enough, but often wonder if opticians have no more practical way of getting at it than constructing perpendiculars to the directrix and measuring to the focus; also, if in getting at a spherical curve of, say fifteen feet radius, it would be necessary to use a compass or stick of that length to construct it? If you know of any publication that would give me this information will you kindly let me know of it? A. A parabola is most correctly described by locating a sufficient number of points on the curve and passing a line through these points. Kent's "Engineer's Pocket Book," price $5, gives four methods of describing a parabola. In shops, the curves required are first described of full size and a template is made for use in work. Lofts or floors of sufficient size are necessary. For grinding lenses, forms are turned and used in the machine or by hand to shape the glass. Orford's "Lens Work for Amateurs" gives instructions in this work.

(10316) N. J. R. asks: What are the proper proportions of gas and air to use for the greatest explosive force of acetylene, gasoline, and crude oil gas? A. The strongest explosive power of acetylene gas is made by a mixture of 1 part acetylene to 9 parts air; of gasoline vapor, 1 part vapor to 8 parts air; crude oil illuminating gas, 1 part gas to 6 of air. See Hiscox's book on "Gas, Gasoline, and Oil Engines," $2.50 by mail.

(10317) D. P. asks: A says that the mechanical advantage of a movable pulley is due to the fact that it is a second-class lever. B says that the mechanical advantage is in the rope. A. The movable pulley is a second-class lever and the source of power. The rope is only the medium of its application. A is correct.

(10318) F. H. asks: 1. I have a yoke and cores for an electromagnet. Yoke, 8 by 1½ by 1¾ inches; cores, 6 by 1 inch. I have at my disposal six large bichromates. What number of B. W. G. should I use, and how many pounds of the same to obtain the best effects in connection with my battery? A. Use No. 14 magnet wire, and wind to a depth of one inch on the spools. You will find in the new edition of Hopkins' Experimental Science, price $5, full directions for such a magnet. 2. Also if such a magnet could be used for diamagnetic experiments? A. Yes; with pole pieces properly shaped to bring the flux to the point where the diamagnetic substance is suspended. These, too, are illustrated in Hopkins. 3. Please give me the best proportions of water, bichromate of potash and sulphuric acid for bichromate cells (water and acid in cubic centimeters and bichromate in grammes). I have several recipes, but they all differ with regard to proportions of bichromate and acid. A. There are many formulas for the bichromate solution. We cannot say which one is the *best*. Practice now is to use chromic acid directly in place of bichromate of potash. Indeed, bichromate of soda is to be preferred to the potash salt, since it is more easily dissolved and the solution does not throw down crystals, as bichromate of potash does. The idea is to have a saturated solution of the salt and add sulphuric acid to a proportion of about one in ten to one in twelve. If the acid is more than one in ten it will act too strongly on the zincs and the cell will overheat, the liquid "boiling" as it is called.

(10319) W. M. H. asks: 1. May the direction in which the armature of a dynamo or motor revolves be governed at the will of the operator by change of current or other means? A. A dynamo may be run in either direction by placing the brushes so that they lead in the proper direction. A motor is reversed by changing the direction of the current in either the field or the armature, but not in both. 2. What means is employed to change the direction in which a trolley car runs? A. By throwing the reversing switch to change the current as above.

(10320) W. D. S. says: In your "Scientific American Cyclopedia," under the head of "Soaps," is a formula for making "Yellow Soap," the last of the list of soaps. It gives: Tallow, ½ lb.; sal soda, 1½ lb.; resin, 5 to 6 lbs.; stone lime, 28 lbs.; palm oil, 8 oz.; soft water, 28 gal. Surely this is a misprint. Will you kindly give me the correct formula, as I wish to make a soap with sal soda and lime? Also, could you give me the formula for making bisulphide of carbon for killing gophers and weevil? A. For the manufacture of ordinary yellow soaps, the fats used are tallow, palm oil, and resin. These may be used in such varying proportions that a few general facts will be of more value than one specific formula. Fats require from 13½ to 15 per cent of caustic soda for complete saponification. Rosin also requires about 15 per cent. As caustic soda is more expensive than soda ash (carbonate of soda), it is common practice to take soda ash and causticize with lime. An excess of lime is usually used. One hundred parts of soda ash are dissolved and heated to boiling; 75 to 100 parts of lime are then added, and the boiling continued for about one-half hour. It is then allowed to settle, and the clear solution is used for making the soap. In estimating the amount of soda ash required, it may be assumed that 100 parts of soda ash are equivalent to 75 parts of caustic soda. The proportion of rosin used is extremely variable, in some cases equal amounts of fat and rosin are taken, but this is not considered excessive. For a good laundry soap the amount of rosin may vary from 25 per cent to 40 per cent of the fat taken. Carbon bisulphide is now largely being made in the electric furnace. It could not be manufactured on a small scale. It can be purchased in any quantities at reasonable price.

(10321) A. B. S. says: I am using large quantities of soft zinc from which I make small stampings, leaving about 30 per cent that I am obliged to put into scrap. This scrap is worth to me 4 cents a pound, whereas the new material costs me 12 cents. My idea would be to melt down this scrap that I have and reroll, but in trying this I find that the metal becomes so hard that it breaks in rolling. I presume that during the process of melting, one or more of the component parts passes off in the form of a gas, or perhaps my appliance for melting is not what it should be. I am familiar with the melting of copper and with the various alloys of brass, but this matter of remelting zinc and putting it in shape to stamp properly is something I am unfamiliar with. A. Melt the zinc at the least possible temperature, and pour into heated iron molds so that the cooling shall proceed very slowly. Avoid introducing any iron accidentally into the zinc during the melting, as iron causes brittleness. Adding 0.5 per cent lead makes the zinc more malleable. It should be rolled out at a temperature of 150 deg. C. to 200 deg. C., at which zinc is most malleable; at temperatures much above or below these limits, the zinc becomes too brittle to roll.

(10322) D. J. B. wishes to know what the back pressure per square inch would be in the cylinder of an engine operated by compressed air instead of steam, and where the air is allowed to expand fully in the cylinder before the exhaust valve opens. A. The back pressure at the exhaust of an air motor depends entirely upon the cut-off point and the initial pressure as with steam in principle, but does not follow the same ratio. See Hiscox's book on "Compressed Air."

(10323) F. M. wishes to know the best chemical used to purify acetylene gas. A. First wash with water to remove ammonia. To remove the other impurities, chiefly compounds of phosphorus and of sulphur, the following chemicals have been used: 1. Chloride of lime; unless all ammonia has been removed, nitrogen chloride may form. 2. Solution of cuprous chloride; one liter of this solution will purify 14 to 16 cubic meters of gas. 3. Solution of chromic acid in sulphuric acid: 5½ grammes of chromic acid will purify 1 cubic meter of gas. 4. Paraffin oil or other hydrocarbon oils. Solutions 2 and 3 give the best results. 4, used in conjunction with 2 or 3, increases the certainty of the purification.

(10324) C. F. H. asks: Can you give me any information as to the mixture used in binding coal screenings together that are made into briquettes? A. The best material for binding coal fines into briquettes, and the one most largely used, is pitch. Asphalt has had a limited use. Starch paste, residues from starch manufacture, dextrine, molasses, etc., have been used from time to time experimentally, but are not practicable. Various mineral substances, such as clays, lime, water-glass, etc., have also been proposed, but naturally have the drawback of adding just so much ash. Occasionally, oxidizing materials, such as niter, are added, when it is desired to produce a very quickly burning briquette for the rapid generation of high temperatures.

(10325) M. G. M. asks: 1. With a current of 20 volts and where bare copper wire is used, is there any waste of same current where nothing but dry pine is used for insulation? A. There is always some leakage of current when bare wire is in contact with wood, and even over insulators, especially in wet weather. But in the case above there would not be much leakage so long as the wood is dry. 2. How many feet of No. 36 tinned iron wire like the inclosed has a resistance of 10 ohms? A. Iron has very nearly six times the resistance of copper. No. 36 copper wire has 2.408 feet per ohm. Ten ohms of No. 36 iron wire would be 4.02 feet long.

(10326) S. R. asks for a good receipt for making a reliable fire extinguisher in powder form, one that is easy to prepare. A. For a cheap, dry powder fire extinguisher, bicarbonate of soda will serve; it may advantageously be mixed with 5 per cent to 10 per cent in some powdered mineral, as flint, tripoli, chalk, etc., to prevent caking in damp air. A mixture of *dry* bicarbonate of soda with *dry* sal-ammoniac, and kept in a *dry* place, will do better, as it would yield both carbonic acid and ammonia. In a confined space fire extinguishers of a type similar to gunpowder have proved effective; the object being to fill the room with carbon dioxide, sulphur dioxide, and nitrogen gases, and thus choke the fire. A good formula for this type of extinguisher is niter, 60 parts; sulphur, 36 parts; charcoal, 4 parts.

(10327) W. R. asks what the different gases are which, if introduced into an inclosed arc lamp will turn the color red, green, yellow, blue, etc. A. Colored electric lights are ordinarily produced by coating the globe with an aniline dye, made in alcoholic solution, and mixed with a little varnish. We do not know any gas which could withstand the heat of the arc for any time and which could color the arc. Some color can be imparted to the arc by soaking the carbons in solutions of sodium chloride, strontium chloride, or lithium chloride, and drying them thoroughly before using. The light of the arc itself is so intense that it is very difficult to overcome it with any other colored light.

(10328) H. M. asks: Can you give me information as to what a transformer is and what it is used for? I have been informed that it is much on the scale of an induction coil. If so, can you give me some scale by which to transform a 110-volt current into amperes? A. A transformer changes an alternating current from one voltage to another and from one current strength to another. It cannot change volts into amperes. In that respect they resemble induction coils. An induction coil is a particular sort of transformer, provided with a condenser, interrupter, etc. It is used almost entirely for raising the voltage. 2. Also, please tell me how many volts it will take to each ampere, and a scale of how it should be wound, what size wire to use, and if the fine wire should be used outside or in? A. It is impossible to change amperes into volts. And as to the winding, each one is wound for the work it is to do. There is no general winding.

(10329) G. W. L. asks: 1. What is the most economical method of generating carbonic acid gas—not necessarily pure—in large quantities? A. The commercial sources of carbonic acid, on a manufacturing scale, are as follows: 1. By the burning of limestone. 2. By the action of acids in limestone (calcium carbonate), magnesite (magnesium carbonate), or dolomite (calcium magnesium carbonate). The acid used is sulphuric. This method is used by the manufacturers of bottled effervescing waters. 3. By collecting the carbonic acid gas generated in the fermentation vats of large breweries. This source is largely used in Germany. In addition, the gas coming from many of the natural springs is collected. This practice is also largely used in Germany. 2. Are there any known chemicals, or other substances, that will decompose water, aside from the alkaline metals? A. Besides the alkaline metals, water is decomposed by many of the hydrides and carbides of the different metals. Thus calcium carbides decompose water with the formation of lime and acetylene. Also, vapor of water passed through red-hot tubes of different metals is decomposed into its constituents. Vapor of water passed through red-hot coal is decomposed, with formation of carbon monoxide and dioxide, hydrogen, marsh gas (CH_4) and other hydrocarbons: this is the basis of the industrial manufacture of water gas, which has displaced coal gas in most cities.

(10330) I. D. asks for a formula for bluing iron and steel without heating. A. 1. From our Cyclopedia of Receipts, Notes and Queries: Scour the steel with a small quantity of a strong aqueous solution of soda, rinse in ¼ of an ounce chloride of iron, dissolved in 5 ounces of water, and let it dry; then apply in the same manner a solution of 1-5 of an ounce pyrogallic acid in 1 ounce of water, dry, and brush. Does not wear well without lacquering. 2. The blue oxide is sometimes imitated by using a thin alcoholic shellac varnish, colored with aniline blue or Prussian blue. 3. To blue steel without heat, mix finely-powdered Prussian blue with rather thin shellac; gently heat the steel and apply the varnish. 4. Iron and Steel to Blue Without Heat—Solution of potassium ferricyanide and water, 1:200; solution of ferric chloride, 1:200. Mix the two solutions and dip. 5. Antimony trichloride, 25 parts; nitric acid, fuming, 25 parts; and hydrochloric acid, 50 parts. Apply with a rag and rub until the proper color is obtained with a piece of green oak.

NEW BOOKS, ETC.

Manual of Wireless Telegraphy. By A. Frederick Collins. New York: John Wiley & Sons, 1906. 10 chapters; pp. 232; 90 illustrations; 1 chart. Price, $1.50.

This book combines theory and practice, and while instructive to the general reader, is intended more especially for the use of telegraph operators and engineers interested in wireless telegraphy. It is written in plain and simple words, and is for the most part free from mathematics and technical terms. It gives explicit instructions for the wiring of stations both ashore and on shipboard, and for the maintenance and arrangement of apparatus used in the principal systems. The author defines the attitude of the army and navy with reference to the employment of wireless telegraph operators, and outlines the nature of the work expected and the compensation therefor. A glossary of terms used in wireless telegraphy is included. The book contains little or no historical matter, and deals strictly with the present stage of development.

Switchboards. By William Baxter, Jr. New York: The Derry-Collard Company, 1906. 8vo.; pp. 192. Price, $1.50.

This volume deals with switchboards for both direct and alternating current, and includes an excellent section on circuit-breakers. It is intended primarily for the use of engineers and others who have to do with switchboards in practice. The illustrations, both from photographs and diagram drawings, excellently supplement the text.

Animal Micrology. By Michael F. Guyer, Ph.D. Chicago: The University of Chicago Press, 1906. 12mo.; pp. 240. Price, $1.75 net.

Dr. Guyer's book will be found to be a valuable elementary treatise for the beginners in the study of microscopic science. It gives greater attention to the details of procedure than to the discriminations between reagents or the review of special processes. As the author explains, the book attempts to familiarize the student with the little "tricks" of technique which are commonly left out of books and methods, but which are of such great importance in securing good results. The Appendix includes a brief non-technical account of the principles of the microscope, as well as the formulæ for a number of the most widely-used reagents. A concise table of a large number of tissues and organs, with directions for preparing them properly for microscopic investigations, is also included. The Appendix concludes with valuable directions for collecting and preparing material for an elementary course in zoology.

Marine Engineers. By E. G. Constantine. 12mo.; pp. 332. Price, $2.

One purpose of the author of this book, as explained in the Preface, is an unusual one, namely, to furnish information to various classes of readers, including parents and guardians, who may have some intention of educating their sons to become engineers. Obscure technicalities have been carefully avoided and basic principles have been lightly dealt with, so as to indicate only the course best calculated to secure that acquisition of knowledge of the science of engineering and its branches which is the essential characteristic of the engineer.

Air Compressor and Blowing Engines. By Charles H. Innes, M.A. London: The Technical Publishing Company, Ltd., 1906. 12mo.; pp. 290. Price, $2.

Compressed air has become of such great importance in engineering activity that the literature discussing and treating of the subject has grown to considerable proportions. Notwithstanding this, the book in question here will be welcomed by engineers interested in this phase of the profession. The text is a reprint of a series of articles which originally appeared in The Practical Engineer. The discussion includes the properties of air, calculations of the work necessary for compression under various circumstances, experiments with compressors, calculations of efficiencies, theories of valves for the equalization of pressure, construction of blowing engines, and descriptions of air compressors. The book is very fully illustrated.

Der Nachweiss von Schriftfälschungen, Blut, Sperma, U.s.W. By Prof. Dr. M. Dennstedt and Dr. F. Voigtländer. Braunschweig: Druck und Verlag von Friedrich Vieweg und Sohn, 1906. 12mo.; pp. 248.

It is unfortunate that at the present time there is in existence no translation of this extremely interesting and well-written German volume. It deals with the science of a certain phase of crime detection, and as is so often the case in the investigations of German experts, it is carried out with the greatest possible degree of accuracy and attention to detail. The illustrations, comprising mainly photographs of actual examples from German criminal records, are splendid. The book deals with the detection of forgeries, the recognition of blood stains, etc., and is treated in accordance with the rules of pure science, bringing into play very largely the use of photography.

The Copper Handbook. A Manual of the Copper Industry of the World. Vol. VI. Houghton, Mich.: Compiled and published by Horace J. Stevens, 1906. 8vo.; pp. 1,116. Price, $5.

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