NEW BOOKS AND PUBLICATIONS.

BOILERS AND THEIR USE.

The practical treatise of the late Prof. C. A. Smith on the above subject is to be published in book form by the *American Engineer* of Chicago, under a contract of the publishers with the author.

A BIBLIOGRAPHY OF ELECTRICITY AND MAGNETISM, 1860 TO 1883. Compiled by G. May, with Index. Trubner & Co., London.

This little volume gives a full list of works on electricity and magnetism issued within the period during which these subjects have become of such general interest. The titles are given in the languages in which the different works are written. By far the greater number of the works noted are in German, after which come French, English, Italian, etc.

THE CINCHONA BARKS PHARMACOGNOSTICALLY CONSIDERED. By Friedrich A. Fluckiger, Ph.D. Translated by Frederick B. Power, Ph.D. F. Blakiston, Son & Co., Philadelphia. Price, $1.50.

This monograph is based upon the treatment of the same subject in the "Pharmakognosie" of the author, who is a professor in the University of Strassburg, although the details have been amplified, and the latest information is given touching the natural and chemical history of this most important remedy.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

Were new our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) G. W. B. asks: What is the ratio between powder and ball in a rifle, or in other words what weight of powder will give the best results with a given weight of ball? A. The relative weight of powder to ball varies very much in practice; from one-seventh to one-half the weight of the ball in powder has given good results. The quality of powder, form of ball or bullet, kind of arm, proportional length of barrel, rifled or smooth bore—all are elements in the proportion. With the Harper's Ferry rifles (U. S.), 70 grains U. S. rifle powder to a 500 grain bullet at 200 yards gave the greatest penetration, while in some of the later rifles at target practice the charge reaches to nearly one-half the weight of the bullet. There is a U. S. regulation charge of 75 grains powder for a 218 grain bullet. The cartridges for sporting rifles as practiced here are charged from one-third to one-half the weight of the ball; for pistols, one-sixth to one-quarter weight of ball.

(2) A. McD. G. asks: 1. I want to light a room 18 x 20 three hours a day by electric light; can I obtain sufficient electricity to do it by means of a battery? A. Yes. 2. How many and what size cells would be necessary, and please describe the form of them? I want the details so that I can make them, as also directions for making and using the points. A. Use 25 cells of Bunsen battery. You will find full particulars, which will enable you to make this and other batteries, in SUPPLEMENTS 157, 158, and 159. Better purchase your carbon pencils. They are inexpensive, but would give you a great deal of trouble were you to try to make them. The same advice would apply in regard to an electric lamp. 3. Could I use this battery during the day to operate a telegraph line of one-quarter of a mile? A. You could use it in that way, but a gravity battery would answer better. It would require not more than two cells to work your telegraph.

(3) H. C. T. writes: I have some small iron articles that I wish to japan. Should be glad to have you give directions in the SCIENTIFIC AMERICAN. A. For japanning small iron goods, the japan may be put on with a brush, generally two coats. If the goods are of a kind that will bear dipping, you may thin the japan with a little turpentine. You will have to make a few experiments to find just how much to thin the particular kind of japan that you are using. The goods should be heated upon a plate of iron over the oven stove to a little above the temperature of boiling water, then dipped into the japan quickly and out, either with a hook or on small wires, then drained for a moment and hung in the oven. The oven should be raised to a temperature of 250° Fahr. Great caution should be used with an oven heated by a stove. Nothing but the pipe or such part of the stove as will not communicate fire to the vapor of the japan should be exposed in the chamber. The air that feeds the fire should not under any circumstances be taken from the drying chamber. A steam coil is the best if you can use steam at 60 pounds pressure, as that pressure is necessary to produce the desired temperature.

(4) C. L. asks at how early a date cast iron stoves came into use. A. Have no information in regard to iron stoves earlier than the middle of the eighteenth century. The Hollanders made stoves at a very early date of tile. A search among early illustrations of household goods might be of advantage to you.

(5) F. R. R. S. asks: 1. How can I remove coal oil from a carpet without destroying the colors, the spot not a very large one? A. Coal oil is soluble in ether, naphtha, chloroform, etc., so that by proper manipulation with these reagents the spots can be removed. No light, however, must be brought near them, as they easily catch fire.

(6) F. H. P. asks: 1. Is or was clover seed of any kind ever used for coloring purposes? A. No. At least not in our day. 2. Are or were dried apples ever used for coloring? A. No. Not that we know of.

(7) R. S. B. says: I am a constant reader of your valuable paper. Would consider it a favor if you would give me a receipt in detail for making Babbitt metal. Also what is necessary to harden it when too soft? A. Melt in a crucible 8 parts copper by weight; add 90 parts tin and 2 parts antimony. Proportions are varied for different purposes. Harden with antimony.

(8) M. D. asks: 1. Will not Swedish iron boiler tubes one-sixteenth of an inch thick, two inches in diameter, stand 120 pounds to the square inch pressure applied inside of tube? A. Yes, if the tube is one inch long; no, if it is six feet long. 2. Will not copper tubes be better made same size and thickness? A. No. 3. What is the mineral sent? A. The mineral is massive quartz not commercially valuble.

(9) W. H. says: I would be glad if you would inform me in your Notes and Queries what the composition is that is used to whiten the belts of the militia? A. Pipe clay.

(10) J. H. L. asks: Can you inform me how to obtain a hard, smooth, glossy black surface on wooden panels for art decorating purposes? A. Dissolve gum shellac in alcohol and add enough powdered ivory black or drop ivory to give it the consistency to apply with a brush. Put on three or more coats, rub down with rottenstone and a woolen cloth when dry, and varnish with thin coach varnish.

(11) A. V. asks: 1. If a dynamo would give 100 candle power, what candle power would double the size give? A. It should give at least 400. 2. What is the candle power of a Bunsen cell? A. The amount of light a Bunsen cell can produce depends upon its size and upon the kind of lamp used. In any case a single cell would produce very little light—not equal to one candle.

(12) W. M. B. asks: 1. What can I mix with varnish to cause it to dry immediately after being applied to smooth wood surface, that will retain a bright, lively appearance and will not crack or peel off? A. There is nothing you can use that will accomplish your purpose. Driers are added during the process of making the varnish, so that it is best for you to purchase a quick drying varnish. 2. I have some cheap silver looking ornaments that turn dark when exposed to the air. What can I cover or coat them with to exclude the air, and retain their bright silver appearance? A. Cover them with a "silver lacquer," which can be purchased of the ordinary paint supply houses.

(13) H. S. asks how to dye and fix the aniline colors so that they will not rub off? A. Albumen will be found a satisfactory fixing agent.

(14) R. H. H. writes: In one of your SUPPLEMENTS you mention using mercury flasks in making small steam boilers. 1. What are the dimensions of the flasks? A. Five in. diameter by twelve in. length. 2. Where can they be obtained, and what is the cost of them? A. From druggists and instrument makers. 3. How many would be required for an engine 4¼ inch cylinder, 4 inch stroke, running 250 to 300 revolutions per minute? A. From 65 to 70. 4. How many pounds steam pressure will they stand, or what pressure will it be safe to carry? A. Safe to carry 130 to 150 pounds. We suppose they will stand 600 to 800 pounds; we cannot, however, say that they are tested to that pressure.

(15) F. C. S. asks: What the so-called diamond ink used for writing or etching upon glass is composed of? A. The preparation is said to be made from ammonium fluoride dissolved in water and mixed with three times its weight of barium sulphate.

(16) W. H. McA. asks: 1. How is citric acid extracted from lemons? A. The juice of lemons is allowed to ferment, and chalk added to form calcium citrate. This salt when treated with sulphuric acid decomposes, giving rise to calcium sulphate, a white insoluble powder, and citric acid, which is in solution. The latter is then evaporated and the citric acid purified by crystallization. 2. Is there much of a demand for it? A. It is in good demand, and regularly sold by wholesale drug houses. 3. How much is it quoted at per pound? A. Forty-eight to forty-nine cents.

(17) P. P. H. asks: 1. How to polish, smooth, and brighten wooden (pitch pine) floors? A. This information is given on page 312 of the SCIENTIFIC AMERICAN for November 17, 1883. 2. How to stain rattan chairs to imitate mahogany and ebony? A. Wash the rattan with a concentrated aqueous solution of iron acetate, having a strength of 14° B. Repeat this until a desirable shade is produced. Then give a coat of quick drying varnish, such as can be made by dissolving black wax in spirits of wine. 3. How to regild much used gilt frames (without using the varnish and gold powder)? A. We fail to understand how it is possible to regild frames unless the size or varnish be employed with gold leaf or powder. 4. How to fix looking glasses where the quicksilver is partly gone, and with black spots? A. See SCIENTIFIC AMERICAN for Nov. 10, 1883, answer to query No. 23, for this information.

(18) L. D. B. asks for some simple chemical or other means for analyzing common drinking water to ascertain the different ingredients, and also for iron and lead? A. A simple test for water is to place it in a clear bottle, and first examine if it be colorless, and thus free from organic matter. Then taste it, and if no peculiar flavor is discernible let it stand a day or two; then heat or boil, and if no odor is present, the water is in all probability pure.—*Heisch's Test for Sewage Contamination:* Fill a clean pint bottle three-fourths full of water, dissolve a teaspoonful of loaf or granulated sugar, cork the bottle, and place it in a warm place for two days. If the water becomes cloudy or muddy, it is unfit for domestic use. If it remains perfectly clear, it is probably safe to use. If the water is sufficiently concentrated, it will give a blue precipitate with potassium ferrocyanide when iron is present, and a black precipitate with hydrogen sulphide if lead is present. It would be unwise to attempt these tests without some previous knowledge of chemistry.

(19) O. B. W. writes: 1. I wish to build a marine engine suitable for a small launch. Will you please tell me what is the most economical rate to drive propeller? Would 250 revolutions per minute be too high speed? A. Two hundred and fifty revolutions not too fast. 2. I do not understand how to get the size of ports: The steam pressure in boiler will be about sixty pounds per square inch. What should be the size of steam ports, and what pressure should there be in cylinder? The diameter of cylinder and stroke of piston is four inches, and the number of revolutions of engine per minute, say two hundred and fifty. A. Steam ports 3 x ⅜ in.; exhaust, 3 x ⅞ in. 3. What size boat would the above engine drive at about seven or eight miles an hour, the boiler pressure being sixty pounds? A. Boat about 26 ft. long and 4¾ ft. beam by 2 ft. 9 in. deep. Your boiler should have not less than 110 ft. heating surface.

(20) J. C. D. asks in what respect is a coal burning locomotive constructed differently from an ordinary wood burner, and also what change would be necessary to make in changing from wood to coal, as a fire under a common horizontal flue or tubular boiler? A. There is a difference in fitting the furnace for bituminous or for anthracite coal. For coal the furnace has much less depth and larger grate area than for wood. Anthracite coal furnaces have generally more grate area than for bituminous. Generally all that is required is to reduce the depth of the furnace and fit suitable grate bars. Furnace for anthracite coal, about 24 in. or 26 in. deep.

(21) R. R. asks: What is the minimum power required to operate an air pump cylinder 5½ in. diameter and 8 in. stroke, forcing air into a reservoir until it contains 100 lb. to the sq. in? The engine or power used to have same number of revolutions as air pump, with 75 lb. steam to the sq. in. A. We cannot estimate the power, as you do not give the number of strokes per minute. The pressure upon the steam piston must be at least equal to the *maximum* pressure of the air pump piston, if both have the same stroke; the total pressure on the air pump piston at 100 lb. per sq. in. will be 2,376 lb.; and as the pressure per sq. in. is but 75 lb., the diameter of its piston must be say, 6⅛ in.; add to this 33 per cent for friction of engine and pump, will give a cylinder 7¼ in. diameter.

(22) J. M. B. asks: Why the notches on a scale beam or steelyard weigh say uniformly 1 pound on the platform, no matter whether the piece be near the fulcrum or at the end of the beam; the notches on beam are of equal distances. Why should not the balancing power increase, the greater the distance it is placed from the fulcrum? A. Because the power of a lever is as the ratio of its two arms.

(23) S. B. G. asks: 1. What is meant by each of the following chronological cycles. They are used in the almanacs, but are not generally understood: 1. Golden number, 4? A. The Golden number is the year of the lunar cycle of 19 solar years; after which the new and full moon fall upon the same day that they did 19 years before. The number of the year in the cycle is called the *Golden number*, because it is supposed that it was inscribed in letters of gold in the Greek temples. The cycle is supposed to commence with the year in which the new moon falls on the 1st of January. This happened in the year preceding the commencement of our era; hence to find the number of any year in the lunar cycle, or *Golden number* of that year, add one to the date and divide by nineteen; the quotient is the number of cycles elapsed, and the *remainder* is the *Golden number*. If there is *no* remainder, the *Golden number* is the last, or nineteen. 2. Epact, 3? A. The Epact is the moon's age at the end of the year, or the number of days by which the last new moon has preceded the beginning of the year, and is used in ecclesiastical computations. It is computed from the difference between the number of days in the solar and lunar year, which is 11, and its yearly multiples divided by 30; whence if a new moon fall on the 1st of January, the moon will be 11 days old on the 1st day of the following year. The Epact for that year will be 11, the next year 22, and the third year 33 − 30 = 3, and so on—subtracting 30 whenever the added 11 becomes 30 or more. 3. Solar cycle, 17? A. The Solar cycle is a period of time after which the same days of the week recur on the same days of the year. Its duration is obtained by multiplying the days of the week by the leap year period—7 × 4 = 28 years. Its number for a given year is found by adding 9 to the date and dividing by 28; the quotient is the number of cycles elapsed, and the remainder is the year of the cycle. Should there be no remainder the cyclical number is 28, or the last of the cycle. 4. Dominical letters, F, E? A. The Dominical or Sunday letter in the ecclesiastical calendar is denoted by the first 7 letters of the alphabet. A commencing with the first day of the year, the letter falling upon the first Sunday is the Dominical letter for the year. They recur every 28 years upon the same day of the year. 5. Roman indiction, 12? A. The Roman indiction is a period of 15 years, not astronomical like the other cycles, but entirely arbitrary. It is supposed to have been introduced by Constantine the Great about the year 312 A.D., and had reference to certain judicial acts that took place under the Greek emperors. Its number is found by adding three to the date and dividing the sum by 15; the remainder is the year of indiction.

(24) W. O. D. asks: 1. What is meant by caliber 12 or caliber 14 in speaking of shot guns? From what standard is the caliber of a gun calculated? A. The caliber of shot guns is designated by the number of round balls to a pound. Thus 12 is 0·73 of an inch in diameter, No. 14 is 0·69 inch, etc. Rifles and pistols are designated by their diameter in hundredths of an inch. Thus 40 caliber is 0·40 of an inch diameter. 2. From what standard is a wire or saw gauge calculated? What is meant by saying a saw is gauge 10 or 12 or 14? A. The saw gauge standard is the Stubs gauge, which is also a wire gauge; it is sometimes called the Birmingham gauge. No. 10 is 0·134 of an inch; No. 12 is 0·109 of an inch; No. 14 is 0·083 of an inch.

(25) J. C. asks us if the following, which appeared in a Chicago paper, is correct: How many cubic feet are in a stick of square timber 1 foot square at one end and tapering to a point at the other, and 100 feet long? The answer was 25 feet. Orton & Saddler's calculator gives the rule for finding the solid contents of squared or four-sided timber as follows: "Multiply the breadth in the middle by the depth in the middle, and that product by the length for solidity." A note says: "If the tree taper regularly from one end to the other, half the sum of the breadth of the two ends will be the breadth in the middle, and half the sum of the depth of the two ends will be the depth of the middle." In this case the breadth and depth of one end would be 0. Following the rule, the breadth and depth at the middle would be 6 inches, and the example would be 6 times 6, equals 36 inches, multiplied by 100 feet equals 3,600, divided by 144, equals 25 cubic feet. A. We believe this answer to be incorrect. Haswell's rule for computing the volume of a pyramid is, multiply area of base by perpendicular height and take one-third of product. This will give us a cubic contents of 33⅓ feet.

(26) F. S. asks for a good recipe for making up citrate of magnesia, such as is sold by druggists? A. The following receipt will make a quantity sufficient to fill 12 bottles. Take of:

Magnesium carbonate	4 oz.
Citric acid	8 oz.
Sugar	12 oz.
Water	9 pints.

Flavor with essence of lemon, then dissolve and filter. Fill the bottles at once and add to each 30 grains of potassium hydrogen carbonate, and cork securely. The bottles must not be filled up higher than the shoulder.

(27) B. A. asks: 1. Is there any varnish or wash for water color drawings to give them a glaze or shiny appearance? If so, please inform me where it may be had or how to make it? A. A varnish that is sometimes used consists of:

Dextrine	2 parts.
Alcohol	½ "
Water	2 "

Previously, however, prepare the drawing by coating with 2 or 3 coats of thin starch or rice boiled and strained through a cloth. 2. Do you know of any cement or adhesive substance that will glue broken pieces of meerschaum together? A. Try a little white of egg, thickened with finely powdered quicklime or by a mixture of newly baked and finely powdered plaster of Paris mixed with the least quantity of water.

(28) J. D. McC. asks if liquid albumen will remain pure or sweet by being securely sealed and protected from the air? A. Yes; if protected from air, it will remain sweet, but it is almost impossible to securely protect in anything so that air will not have access to it.

(29) E. S. B. asks how carbolate of iodine is made. I have looked in all the books on chemistry that I know of, and cannot find anything about it. A. Carbolate of iodine is not a chemical compound, but a preparation much used for catarrhal affections. It is prepared by moistening chopped lint in a bottle with equal parts of spirits of ammonia, tincture of iodine, and carbolic acid.

(30) D. H. asks: What is cyanogen of ammonia? I came across it in reading the other day where it was used in connection with the hardening of steel, but on my applying to a druggist he did not know what it was. A. Cyanogen of ammonia is the term applied to the grouping of the atoms of cyanogen, hydrogen,

and nitrogen in steel. It is entirely theoretical, and does not exist in a free state. Ammonium cyanide is a crystalline salt, and can be obtained of any druggist. It may be that you have confounded the latter with your cyanogen of ammonia.

(31) C. G. asks how to make new whisky barrels look old? A. By washing the barrels with a solution of iron sulphate (green copperas), the wood will become darker.

(32) J. M. K. asks: How the oiling process on black walnut furniture is done? A. For fine oil coat on black walnut, first make what the varnishers call a filler, of whiting and burnt umber in proportion to make the color correspond with the color of the wood. Rub these up with boiled linseed oil and with it about one-tenth the quantity of whiting and umber, of litharge as a drier. Make mass of consistence of paint. Rub this into the surface of the wall—not with a rag—and allow it to dry. One coat will probably be enough. Then rub the surface with boiled oil. After this is dry, if a higher finish is required a French polish rub will answer most wants.

(33) J. L. asks: How to make a paste to stick pasteboard together that will not be affected by dampness, and at the same time be pliable, so it will not break when the board is bent? A. Use the following: gum shellac 3 parts, caoutchouc (India rubber) 1 part, by weight. Dissolve the rubber and shellac in separate vessels in ether free from alcohol, applying a gentle heat. When thoroughly dissolved, mix the two solutions, and keep in a bottle tightly stoppered.

(34) G. and V. L. ask: What is the present value of bar aluminum? Is there much demand for it? Where is the principal market to dispose of it? A. Bar and sheet aluminum is now on sale in New York at $1.50 per ounce. The price in Paris and London is from 75 cents to $1.00 per ounce. There is very little used except for experimental purposes. Jewelry, mathematical and optical instruments are made of it and its alloys, as aluminum bronze. There would be a large demand if it could be made cheaper.

(35) H. H. requests: Let me know how to soften an oilstone, and what oil is best to use on it. And are the tops and bottoms of violins curved by pressing, or are they gouged out? A. Oilstones cannot be softened; there are different grades of oilstones hard and soft. The best oil to use on an oilstone is kerosene; water is better on a hard stone. The best violins have their tops and bottoms cut out to swell, by hand, from boards from five-eighths of an inch thick to three-quarters of an inch thick. Cheap violin tops and bottoms are pressed from thin wood.

(36) C. M. writes: 1. Do you know of any place where files are made by the "sand blast" process? A. No. Files are generally cut, tooth by tooth, by means of hammer and cold chisel. Files are cleaned and sharpened by means of the sand blast. See SCIENTIFIC AMERICAN, March 3, 1883, "Resharpening Files." 2. Also do you know of any concern that cleans stove castings by same process? A. No. Cleaning stove castings by the sand blast would be an expensive process compared with the present means of the pickle tub and wire brush.

(37) H. W. S. asks: Which are the best, machine or hand riveted boilers? A. Hand riveted boilers.

(38) J. H. writes: Please inform me what kind of solder is used for soldering band saws. I have tried it with tinsmith's soft solder, but it seems it is too hard; as soon as I bend the saw, the weld separates, otherwise the weld is better than the usual way with silver. A. The usual solder is spelter, but good tinman's solder is effectual—composition, two of lead and one of tin by weight. But the metals should be pure. The saw should be cleaned with the file and washed with the usual saturated solution of zinc and muriatic acid. Then apply the solder, and grasp the joint with a hot tongs to keep the solder fused until the saw is heated.

(39) J. K. says: You will please give me a receipt for making a mixture of acids, to make bright again tarnished brass and copper. I have seen it used by men who wished to make bright the small brass bells, such as are used on masquerade suits. I wish to use it for the same purpose. The bells were first dipped into the acid, then into clear water, and then put into fine sawdust to dry; when taken out, they had a bright shine. A. Clean the brass by warming it and dipping in water charged with washing soda, then into clear water to remove the grease. Then dip in a bath of one part by measure of sulphuric acid, one part sal ammoniac, two parts nitric acid, and four parts water. Dip for a moment, then dip in clear water, and dry in hot sawdust.

(40) A. S. P. asks how the name, etc., is stamped on books in gold? A. Gilding on book covers is done by means of engraved brass or electrotyped patterns, heated and pressed on the substance over the gold leaf, which is fixed by an albuminous size—white of eggs. 2. How lead pencils are stamped in gold? A. The gilding on lead pencil wood is done in a similar manner by a stamp. In both cases white of eggs for size, gold leaf for material, heat and pressure for means are used.

(41) L. D. writes: Having tried several methods, but without success, of removing a letter in stipple, printed with aniline blue mixed with what is known as Boston drier upon a costly piece of muslin, I would be pleased to be informed by you what could be used to remove the same without injury to the fabric. A. Hydrogen peroxide is probably as good a reagent as you can use for this purpose. See description of its properties in SCIENTIFIC AMERICAN SUPPLEMENT 339.

(42) J. M. D. writes: Please inform me how to make solder that will stand from 800° to 1,000° F. without fusing? A. Silver solder will stand more than 1,000° F. Or a solder of silver 2 oz., antimony 1 oz., will stand more than 800° F.

(43) C. B. W. writes: There are two boilers in every respect identically the same, excepting crown sheets, one being circular, the other flat. I think that the former (crowned) boiler generates more rapidly than the other. If right or wrong, please give reasons? A. We think the difference will be scarcely appreciable, as there will be more heating surface exposed with the flat crown, but the circular crown is stronger and gives better circulation.

(44) S. H. asks: 1. Is there any particular proportion between the amount of rags and sulphuric acid used in making glucose, and what is it? A. First extract the starch from the rags, and boil the solution containing the same down to a density of 5° to 10° Baume, then use the acid in the proportion of 5 lb. to 100 gal. solution. 2. What is the best thing to use to neutralize effectually muriatic acid, so that the neutral compound shall be insoluble in water? Chalk does not seem to kill the acid completely, as soda carbonate still produces effervescence no matter how much chalk is added. A. Try silver oxide; silver chloride is the only insoluble chloride in water. 3. How does nature supply the constant drain on her store of oxygen? Is it being steadily reduced, so that it is only a question of time when the air we breathe will no longer support life? A. The supply of oxygen is obtained from plants, which exhale oxygen. The composition of the air is practically constant, and any diminution of oxygen is not appreciable. 4. Does a bullet partake of the motion of the rifle if discharged as the hunter is following the game with his gun, when the animal crosses his line of sight at a right angle? A. The bullet will have the motion of the rifle added to its own movement.

(45) C. B. H. asks: What number of cubic feet of compressed air under a pressure of from 80 to 100 pounds per square inch will be required to drive a 10 horse power engine 10 hours? A. At 100 pounds pressure it will require 200 cubic feet per hour for 10 horse power. This will require 2,400 feet of air to be compressed to 200 cubic feet of about 8 volumes into 1, each hour.

(46) A. P. asks in regard to drying wood with superheated steam. Can it be successfully done? Would it be as likely to check as when dried with hot air? What is the better plan of superheating steam? A. Superheated steam may enable you to make a hotter drying room. We do not know that it has many advantages and is liable to cause trouble. Eighty pounds boiler pressure with sufficient pipe will enable you to boil the sap out of the wood. The best way to prevent checking is to heat the wood in steam for a short time or until the wood gets thoroughly heated through, and then ventilate slowly, keeping up the heat in the dry room.

(47) J. R. M.—The following is a description of the apparatus and process of manufacturing birch oil: "The apparatus consists of a furnace, a boiler, a tin pipe, a trough into which water is continuously brought from a mountain brook, a barrel, and a glass jar. The furnace is made of loose stones, so arranged that the fuel is put in at one end and the smoke goes out at the other, through an old piece of stove pipe. Over the furnace is the boiler, which is merely a wooden box, about three feet wide, four long, and three deep, with the bottom covered with sheet iron to prevent burning. The boiler has a wooden lid, so that it can be tightly closed, and from the top leads the tin pipe. This pipe runs into the water trough and through it, so that the water always surrounds and cools it. The end of the pipe, after coming out of the trough, opens over a barrel, and in this barrel, exactly under the end of the pipe, is placed the glass jar. This constitutes all the plant." The boiler is filled about a third deep with water; the birch bark and twigs are shoveled in until it is full; the lid is placed, and the fire started in the furnace. For hours the fire must be carefully watched, and fresh fuel continually furnished. The material in the boiler becomes heated, the oil in the twigs extracted and mixed with the water. At boiling heat, the steam arising from the water and oil passes through the tin pipe and becomes chilled by the water in the trough; a condensed liquid is the result; and this mixture of oil and water escapes from the pipe, when it naturally separates. It drips into a glass jar placed over a barrel; the heavy oil sinks to the bottom of the jar, while the water flows over and is saved in the barrel, to be again reboiled the next day. The oily substance saved in the jar is the oil "pure and undefiled."

(48) E. H. asks how to color finished wrought iron articles without heating them, so as to make the articles have a blue black color? A. Finished wrought iron cannot be colored blue black without heating. It may be varnished or painted. It may be oxidized by acids to retain a brown, but a permanent blue black must be induced by oxidation by heat.

(49) C. M. H. & Co., ask: 1. Is there any advantage in distance between the point of application of the power and any resistance that it is proposed to overcome, provided that the medium through which the power is transmitted be devoid of elasticity and exactly parallel to the direction of motion, the power acting in the same line? A. None whatever. 2. Does this or does it not apply to a case where a horse is hitched to a vehicle, the trace being fastened to the hame at exactly the same level as it is attached to the vehicle, the road being always perfectly level? A. We think the draught is easier under the conditions named. We do not see the parallel between the two questions, however.

(50) E. B. K. asks: From which will I get the best results—a 7 in. silvered glass reflector, or a 3 in. achromatic objective? Wishing to construct a telescope with the 3 in. objective, using two lenses, eye and field, what focal distance should they have, and what power would such a telescope have? A. The 7 in. silvered glass reflector will give the best results and the most light, always provided that both are of equal class in the perfection of finish and definition. The 7 in. reflector should be 7 ft. focus with a small plane reflector for the Newtonian form, which gives the best results as to image, but sacrifices a part of the light; such a telescope, if first class, should bear a power of 300. The 3 in. refractor should be from 40 in. to 45 in. focus, and if first class should bear a power of 250.

(51) K. B. asks: 1. Can tar bone be rendered fluid merely by action of steam or heat? A. By boiling in water—and the effect of steam is similar—bone is converted into gelatine and dissolves, forming a solution clouded by suspended fat and vascular tissue, and solidifying in a jelly on cooling. 2. Bone, being an organic matter, ought to be soluble like hair, hide, or wood fiber. Do you know of any process or chemicals effecting it? A. The bone cartilage is likewise soluble in hydrochloric acid. 3. Of what is celluloid composed? A. For description of celluloid see page 3617 of SCIENTIFIC AMERICAN SUPPLEMENT, No. 227.

(52) P. A. S. asks for a receipt for making the percussion powder for metallic cartridges? A. The priming used in percussion caps is made by triturating 100 grains fulminating mercury with a wooden muller on marble with 30 grains water and 60 grains gunpowder. A solution of gum mastic in turpentine is used as a medium for attaching the fulminate to the cap.

(53) C. S. B. and F. H. T.—For cleaning buckskin you might try the following: Make a solution of weak soda and warm water, rub plenty of soft soap into the leather, and let it remain in soak for two hours, then rub well until quite clean. Rinse thoroughly in a weak solution of soda and yellow soap in warm water, but not in water only, else it dries hard. After rinsing, wring it well in a rough towel and dry quickly, then pull it about and crush it well until soft. Your best plan, however, is to have them cleaned at a professional dyer's.

(54) N. E. L. asks the proper size of the ports of a cylinder 3 x 5 in., speed 200 revolutions per minute? A. Steam opening, $\frac{5}{16}$ x 2⅜ in.; exhaust, ¾ in. x 2⅜ in.

(55) T. N. H. asks how to apply French polish to inlaid woodwork? A. Lay on a coat of fine shellac varnish. When dry rub it down with fine emery paper and lay on another coat. Repeat until you have a fine, smooth surface, then with a flat camel's hairbrush lay on a final coat of fine furniture varnish. The following gives good results: Take of rather thick shellac varnish and boiled linseed oil equal parts. Shake it thoroughly whenever used. Apply sparingly with a cloth and rub briskly until the desired polish is secured.

(56) J. T. T. says: In making a one-sixteenth in. cut lengthwise through a seamless brass tube 1½ in. diameter by 12 in. long, it springs open about three-sixteenths in. Can you tell me how to prevent it? If tube was cast brass, would it spring as much when cut open? A. Before splitting the tube anneal it by heating red hot and slowly cooling. Drawn brass tubes are hard. Cast brass tube will not spring open.

(57) G. S. asks: 1. Do you think a good, strong cask would be strong enough to generate steam for an engine 1½ in. bore, 3 in. stroke, if connected with a coil of pipe placed in a stove near by the cask, having double heads and braced? A. No; do not risk it. 2. I saw something about using mercury flasks for boilers for small engines (as above); is it possible to use them as such? A. Yes. You will find in the SCIENTIFIC AMERICAN SUPPLEMENT for June 28, 1879, a cut of a boiler so made. 3. How are Pharaoh's serpent eggs made? A. See SCIENTIFIC AMERICAN, vol. xliv., No. 4, and vol. xlviii., No. 6.

(58) J. P. P. asks concerning Connelsville coke—how made, from what, etc.? A. The Connelsville coke derives its value from a very rich seam of bituminous coal in Western Pennsylvania, said to be the purest vein of bituminous coal in the United States, and very similar in quality to the Durham vein in England, which is also famous for its coke producing qualities. The coking is done by burning off the volatile matter or hydrocarbon gas in large ovens.

(59) J. F.—Wheel No. 2 will give from 10 to 15 per cent the most power, and is an improvement over No. 1. Both plans are old. You will get better results from No. 1 by reducing the number of chutes.

(60) S. N. G. writes: Say two rubber bags, sixty gallons capacity, as used for oxyhydrogen light, be placed one on top of the other under 250 pounds pressure, will the gases be forced from each tube with same power as if the bags were separate under same pressure? A. The pressure would be same in both cases. The plan you suggest is in common use, and is preferred on account of the facility with which both gases can be put under exactly the same pressure. Of course there will be the difference of the weight of the upper bag, but this is so slight as to be of no account.

(61) R. W. G. asks: 1. Could a steel sphere or spheroid be permanently magnetized? A. Yes, but if perfectly symmetrical and homogeneous it would not exhibit polarity until fractured. 2. If so, what would determine the position of the magnetic axis? A. It would not be determined so long as the sphere remained perfect. 3. Do the variations of the needle in an electric storm indicate an increase or a decrease in the earth's magnetism? A. Probably neither. The needle is affected by electric currents. 4. Does the number of sun spots sensibly diminish its heating power on the earth? A. It is generally believed to make no material difference. 5. What kind of an eye piece would be best, and of how high a power, for a telescope having a meniscus lens of about 36 in. focus, with a diameter of 2½ in., as an object glass? A. Low power. 6. Would it be best to use this with full aperture, or to diaphragm it down with diaphragms in the tube or over the glass? A. Full aperture on nebulæ and faint objects. Use a diaphragm outside of the objective for the planets and a very small aperture for the sun.

(62) F. B. J. says: I have a brick house with stone foundation for cellar; the stone portion is constantly damp; and in time of great thaws from snow and ice, as also from rains, a portion of the north side leaks or oozes water under the foundation into the floor. How can I prevent it? The cellar is otherwise dry, except at this place; 5½ feet of walls are under ground. A. Where water comes under walls five feet below the surface, it will be difficult to keep a cellar dry. In some wet locations in New York city, cellars are made with bottoms somewhat on the flat-boat bottom shape, and heavily cemented on the under side, and with a drain for carrying off the water.

(63) H. L. asks: 1. For a solution for making the yellow oiled clothing that teamsters wear instead of rubber coats and pants? A. Dissolve 1 oz. of beeswax in 1 pint of the best boiled linseed oil over a gentle fire, applying when cold with a piece of rag, rubbing it well in, and afterward hanging up to dry, which will take about 4 days. 2. Also a solution for making aprons that are used in slaughter houses; they are soft and pliable, black on one side, and show the canvas color on other side, but will not let water soak through. By giving me above information through your paper you will greatly oblige a reader. A. Let 4 oz. of India rubber in small pieces be softened in 8 oz. of oil of turpentine, then add 2 lb. of boiled oil, and boil for two hours over a slow fire. When dissolved add 6 lb. boiled linseed oil and 1 lb. of litharge, and boil until an even liquid is obtained. Apply warm.

(64) G. S. S. writes: We build our row boats by commencing at the keel with strips one-half by seven-eighths inch in size, nailing one to another until we reach the top. What is the best material to put in the joints as we build? A. Cotton cloth saturated with thick white lead paint.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

R. McW.—The mineral is pyrite (iron sulphide), and may carry gold. An assay will be necessary to determine its value, the expense of which will be $5.00.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

March 11, 1884,

AND EACH BEARING THAT DATE.

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

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Boiler furnace, steam, J. B. Smith *et al.* 294,924
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