

ENGINEERING INVENTIONS.

A turbine water wheel has been patented by Mr. Elbridge W. Stubbs, of Lincoln, N. C. The invention covers a novel construction of the guides or chutes, and the mechanism for opening them; also a flange ring gate hung upon a yoke pivoted to a support on the top plate, the object being to obtain a discharge of water on the paddles in solid streams through peripheral chutes.

A sand and gravel excavator, separator, and assorter has been patented by Mr. Nicholas W. Godfrey, of Northport, N. Y. This is an automatic excavator, which delivers its scrapings to screens or separators, where they are graded and discharged in different places according to the grades, the mechanism being movable to easily adapt it to the exigencies of ordinary work.

A friction drum for inclined plane cable railways has been patented by Mr. Earle C. Bacon, of Brooklyn, N. Y. There are two friction drums, around which the cable passes, with a brake-band for each drum, both being adapted to be applied simultaneously, also a cog wheel united therewith, and a pinion on a shaft that can be rotated, the pinion being adapted to be engaged with the cog wheel, the object being to facilitate the starting of cars.

An upright tubular boiler has been patented by Messrs. Remi Henry and Hiram B. Taylor, of New Rochelle, N. Y. An annular base tube is connected with the lower ends of a circle of upright tubes, these being connected with a circle of shorter intermediate tubes and a central annular tube, by connecting tubes with right and left screw threads upon their ends, the circular base tube having a blow-off cock and an inlet water pipe, and the central annular tube having a steam pipe.

MECHANICAL INVENTIONS.

A card sharpening apparatus has been patented by Mr. John Brierley, of Easthampton, Mass. The sharpeners are mounted to reciprocate across the faces of the rotating cards and doffers, but the arrangement is such that a uniform pressure is had over the whole width of the cards, to sharpen them without making them untrue.

A gauge attachment for boring bits has been patented by Mr. John Fuller, Sr., of Seneca, Kan. The device consists of a clamp adapted to be placed upon the shank of a bit, auger, or other boring tool, the clamp being constructed to hold a gauge bar in such manner that it will stop the progress of the boring tool when the right depth shall have been reached.

A mechanism for delivering pile warps in looms for weaving double pile fabrics has been patented by Mr. Frank Charcot, of Paterson, N. J. The mechanism covers clamping bars and rollers, between which the pile warps are passed, the bars and rollers being mounted on a frame with means, operated from the hooks of a Jacquard mechanism, whereby the bars and rollers are made to clamp and carry forward the pile threads.

AGRICULTURAL INVENTIONS.

An improved hay stacker has been patented by Mr. Albert Cooley, of Osceola, Iowa. This invention combines, with a base and suitably adapted inclined frame, a movable rake, adapted for the collection of hay in the meadow, and which can, by an attachment of ropes and pulley in the frame, be drawn up, and dumped by its own weight in position on the stack.

MISCELLANEOUS INVENTIONS.

A tag holder, for attaching and detaching tags to bundles, has been patented by Mr. Edward H. Tannehill, of Malvern Junction, Ark. The holder has a hook made integral therewith, adapted to receive a snap spring, with an internal groove closed at one end to receive a tag or label.

A trace buckle has been patented by Messrs. Ferdinand Wetstein and Frank H. Dyckman, of Sleepy Eye, Minn. The buckle is cheap and durable, and is intended to effect a saving in both material and labor in making harness, since it takes the place of leather portions now used, and no stitching is required.

An ointment for the cure of tetter and other cutaneous diseases has been patented by Mr. Manlius Huggins, of Waynesborough, Miss. It is composed of chrysophanic acid, glycerine, oil of sassafras, and other ingredients, in definite proportions, and to be mixed and applied after specific but exceedingly simple directions.

A whiffletree hook has been patented by Mr. William H. Best, of Eastport, Mich. This is an improvement on whiffletree hooks which have spring guards to prevent accidental detachment of the trace eye from the hook, and the novelty consists in the form and arrangement of the spring guard with reference to the hook.

An improved pack saddle has been patented by Messrs. William C. Smith and William L. Hunter, of Lone Pine, Cal. The pack boxes designed in this invention are contrived to be filled and emptied without removing from the animals, and the means are provided for substantial and durable connection to the pack saddle.

An ice creeper has been patented by Mr. Frank M. West, of Mohawk, N. Y. The invention covers a permanent heel plate and a detachable spur plate, the latter having spurs on one side and a screw-threaded shank on the other, so the spur plate may be easily detached from the boot or shoe, and attached when desired.

A timber and lumber stamp has been patented by Messrs. Levi Thrush and Leonard Wilson, of Brookville, Penn. This device covers a special arrangement of ratchets and pawls, whereby, with a simple pressure of the thumb, a changeable stamp whose characters are on wheels loose upon an axis may be operated very easily and rapidly.

An improved buckboard wagon has been patented by Mr. William Lockwood, of Madrid, N. Y. This invention covers details of construction and arrangement of parts, with simple springs and spring braces, durable and inexpensive, to give to the wagon easy riding qualities, while retaining the lightness and ease of draught of the common buckboard.

An improved lace fastening has been patented by Mr. Henry H. Porter, of Littleton, N. H. It is an improvement on a lace fastening patented by the same inventor last year, and provides for an additional cross bar at the bottom surface of the eyelet, to prevent the slack part of the lace from passing back, and holding it in position when the strain is taken off.

A trace carrier has been patented by Mr. Louis T. Anderson, of Carroll, Iowa. The invention covers a buckle frame with a cross piece having a pin or tongue, and a hook with a projecting guard, the pin serving to hold the buckle to the hip strap, the hook holding the cock-eye of the trace, and the guard serving to prevent the horses' tails or the lines from catching in the hook.

A portable counter has been patented by Mr. John T. Perry, of La Grange, Ga. The counter is mounted on wheels, to be readily movable, and standards are erected upon it, between which are hoppers to contain articles to be sold, while on the counter a scale provided with wheels may be made to run under either hopper, besides other novelties in the construction and arrangement of parts.

A picture exhibitor has been patented by Messrs. Abraham J. Dworsky, Marcus B. Kramer, and Simon Phillips, of New York city. It is a casing with a series of swinging doors, with recesses in the inner sides, in each of which picture holding frames are hinged, and with a central standard on which frames are hung, with mechanism for opening or closing all the doors.

A baling press has been patented by Mr. John P. McDonald, of Litchfield, Ill. The bale box is made with close top and bottom, and sides slotted to receive the bands, and there is a double-jointed lever, through which power can be applied by attaching a draught animal to its free end, the press being intended to promote convenience and economy in baling hay, cotton, etc.

A combined tire tightener and jack has been patented by Messrs. Riley McCloskey and Albert E. Tozier, of Walla Walla, Washington Ter. In combination with a lifting screw are fast wheels with reversed ratchet teeth, and other devices, so the jack may be used generally for raising the axle of a wagon for removing the wheel, or for spreading the felloes of wagon wheels for tightening the tire.

An improved bob sled has been patented by Mr. Joseph H. Kerk, of Brady, Clearfield County, Penn. The sled has a platform, or double bolster, and a jointed king bolt, so the bob will be free to move in any direction without affecting the position of the platform, the sled being free to adapt itself to an uneven surface, and being easy of being turned in a very small space without unduly straining any of its parts.

An improved ruler, for drawing lines readily and rapidly without soiling the paper, has been patented by Mr. Monroe Green, of Brooklyn, N. Y. A longitudinal frame is held on a ruler, between the wires of which is a stylographic or like pen, which, drawn lengthwise through the frame, draws a line, the frame being pressed upward by springs, so the pen will not be on the paper when not in actual use.

A cold-air blast centrifugal sirup cooler has been patented by Mr. Albert B. Smith, of Fairfield, Neb. The sirup is thrown by a revolving distributor against the inner surface of a cooling tube, the distributor being operated by compressed air forced into the tube, so the sirup is cooled rapidly, remains several shades lighter, and of a higher specific gravity than that cooled by the slow process.

A jewel support for the balance staffs of watches has been patented by Mr. Walter Ware, of Waverly, N. Y. This invention consists in setting the jewels, or the settings which hold them, at either or both ends of the balance staff, in the spring or springs, so the jewels will yield whenever unusual pressure is brought on them, as by a fall, etc., and the watch will be more permanently accurate.

An improved alarm clock has been patented by Mr. Isaac St. C. Goldman, of Pasadena, Cal. It has a latch plate so combined with other mechanism that when the alarm spring is wound immediately after the alarm has been sounded, the latch plate covers the disk, prevents the lever from passing into the notch, and stops the alarm from being again sounded until it comes to the time for which it is set.

A breeching attachment for carriage shafts has been patented by Mr. Samuel W. Booksh, of Baton Rouge, La. In combination with the thills is a bow with its ends clipped thereto, and its curved rear portion somewhat elevated above a horizontal plane touching the upper surfaces of the shafts; the bow is made strongly, and so connected that the harness breeching may be dispensed with, thus simplifying the harness and lessening the labor of harnessing.

An improved lock has been patented by Mr. David Morris, of Log Cabin, Ohio. The slide bolt is moved in either direction by a wiper, and the bolt is preferably a plain cylindrical rod, fitted to the case, of proper form and size to receive the same, so the bolt may be supported by the case only, making a more permanent and better working arrangement than is afforded by clips, guides, and other attachments to the interior of the case.

An improved process of treating volatile and inflammable fluids and oils has been patented by Mr. Solomon M. Eiseeman, of New York city. It covers so treating crude petroleum, turpentine, etc., that they will be converted into a hardened compact mass, to facilitate transportation and storage, and for convenience in use, an acid, or a substance with acid properties, being incorporated by a suitable medium with the inflammable or volatile fluid or oil. It is an improvement on an invention patented by the same inventor last year.

Special.

T. S. ARTHUR AT SEVENTY-FIVE.

For many years the genial countenance of Mr. T. S. Arthur has been a familiar sight to the citizens of Philadelphia, as he has walked the streets of the city on the route between his home and his office. His name has been a household word among the readers of pure literature throughout the whole country. And "Arthur's Home Magazine," which he has so long and so successfully edited, has secured so hearty and so permanent a welcome in many thousands of the best households in the land, that Mr. Arthur cannot be regarded as a stranger by intelligent people anywhere. The many stories and tales of which he is the author are written in the interest of purity, good morals, and reform, and especially those which are in aid of the temperance work, have been productive of immense good. They have had an exceptionally favorable reception, and have nobly served their purpose of stimulating people to high aims and noble intentions.

It might be supposed by those who have not personally seen Mr. Arthur, that a man who could for years work as diligently as he has, and who could produce the extraordinary amount of superior literary material which has come from his pen, must be one of giant physique and robust constitution. Those who are familiar with his slender form know that it is far otherwise; his constitution was never strong. About 1870 he had suffered to such an extent from physical and nervous exhaustion that most of his friends gave him up as not likely to live long. It seemed as if his work was almost done.

The narration of Mr. Arthur's decline in health, and of his restoration to vigor and the enjoyment of life, is of singular interest, as given by himself to one of our editors who recently enjoyed a protracted conversation with him. Mr. Arthur said, substantially:

"Previous to the year 1870 my health had been very poor. For a number of years I had been steadily losing ground in consequence of the constant physical and nervous strain resulting from overwork. I became so exhausted that my family and friends were very anxious about me. Only a few of the most hopeful of them thought I could live for any considerable time. I was forced to abandon all my most earnest literary work, and I regarded my career in authorship at an end. I was so weak that I could not walk over a few squares without great fatigue. The very weight of my body was to me a wearisome burden. My appetite was poor, and my digestion was much impaired.

"About this time my attention was attracted to Compound Oxygen as then administered by Dr. Starkey. I had heard of wonderful cures wrought by its agency; so wonderful, indeed, that had I not personally known the doctor and possessed the fullest confidence in him, I should have been very skeptical on the subject. I tried the Compound Oxygen Treatment, first simply as an experiment. I knew it could not make me worse than I was, and I hoped it might make me better. That it would do for me what it has I had not dared to hope."

How soon did you begin to realize the advantages of the treatment?

"Almost immediately. Its effect was not that of a stimulant, but of a gentle and almost imperceptible vitalizer of the whole system. Soon I began to have a sense of such physical comfort as I had not known for many years. My strength was gradually returning. This slowly but steadily increased. In a few months I was able to resume my pen, and within six months after doing so I completed one of my largest and most earnestly written books, and this without suffering any drawback, and without any return of the old feeling of exhaustion. For more than seven years after this I applied myself closely to literary work, doing, as I believe, the best work of my life."

Did your uniform good health continue during those years, or did you suffer relapses into your former state of exhaustion?

"The improvement was substantial and permanent. Not only had I no return of the old weakness and exhausted feeling, but I was able to work in my study from three to four hours a day. The constant remark I heard from my friends was, 'How well you are looking.' Nor was it only in strength and vitality that I gained by the use of Compound Oxygen. For twenty years I had suffered with paroxysms of nervous headache, sometimes once or twice a week. They were very severe, lasting usually six or seven hours. In a year after I commenced the Compound Oxygen Treatment, these were almost entirely gone. It is now over ten years since I had such an attack. I was, moreover, liable to take cold, and I had frequent attacks of influenza, which always left me with a troublesome cough. It is very rarely that I now take cold. When I do so I at once resort to Compound Oxygen, which invariably breaks up the cold in from one to three days."

And now, Mr. Arthur, what is your present condition of health?

"It is all I have any right to desire or expect at my somewhat advanced age of 75. I sleep well, and am able to take my proper amount of food, enjoying my meals with regularity and heartiness. My digestion, although slow, is good. I do not confine myself to any particular articles of diet, but eat what other people eat, rejecting of course that which seems to be indigestible, or too rich. I am able to attend to my customary literary work, devoting about four hours a day to it, and that without any sense of weariness except as to my eyes. Were it not for the fact that with advancing years I find my eyesight not as good as it formerly was, I should be able to work longer without fatigue. I enjoy moderate exercise, and take it regularly without that feeling of exhaustion which was formerly so depressing."

The testimonials and reports of cases published by Drs. Starkey and Palen in their pamphlets and advertisements, if literally true, show Compound Oxygen to be the most remarkable curative agent yet discovered. Do you believe them all to be genuine?

"I have the most complete confidence in them. For years I have had personal acquaintance with Drs. Starkey and Palen, and exceptionally good opportunities for observing them, as well in private life as in their professional relation to the public. I am sure that neither of them would or could become a party to any fraud or deception. But facts are of more value than opinions. Let me give you a fact. I publish a magazine, and have had an advertising contract with Drs. Starkey and Palen for over six years. During this time I have published monthly from one to six or seven different reports of cases and cures under their new treatment, or over three hundred in all. Now, in every case I have examined the patient's letters, from which these reports were taken, and know the extracts made therefrom, and published in my magazine, to be literally correct. Stronger evidence of genuineness than this cannot of course be given."

Mr. Arthur, some years ago you gave a testimonial in regard to what Compound Oxygen had done for you; and you also have spoken freely in your magazine con-

cerning Messrs. Starkey and Palen. Do you, in view of your present acquaintance with these gentlemen, and your large experience with Compound Oxygen, indorse all you have said?

"I do, most fully, and without any reservation whatever."

And now, as to testimonials. Have you at any time given a testimonial in favor of other special remedial agents or modes of treatment?

"Never. The first and only time that I have permitted my name to be used in commending a curative agent to public notice and confidence is in the case of Compound Oxygen. This I have done, not from solicitation, but voluntarily, and from a sense of duty. I believe that in the use of this newly discovered substance, diseases long classed as 'incurable' may be greatly ameliorated and very often entirely broken, and the sufferer restored to comparative good health. I also believe, that by its use the liability to disease may be removed, and the general health of the community greatly improved. From what I know of its action, as well in my own case as in that of many others, I am satisfied that if promptly used it will arrest the progress of acute pneumonia, consumption, catarrh, and most of the diseases which originate in colds. Believing this, as I certainly do, and from evidence which is too direct and positive to be ignored, I would be derelict in my duty if I did not do all in my power to induce the sick and suffering to seek relief in the use of so beneficent an agent."

Have you seen and known other persons who have used Compound Oxygen, and have you had opportunities of observing to what extent they have received benefit?

"My observation and my opportunities in this respect have been large. I have been much at the office of Drs. Starkey and Palen, and have become personally acquainted with many who have taken the treatment. In almost every case, where a fair trial was given, decided benefit was obtained. Some very remarkable cases in consumption, rheumatism, catarrh, congestion of the lungs, asthma, etc., have come to my personal knowledge, the results of which seemed almost miraculous."

Do you still resort to the Compound Oxygen Treatment, now that your health is restored?

"I do not, as a regular thing. Only, when I have a cold, as I before remarked, I take it for a day or two, and always with good effect. I find that it helps nature to throw off the cold, by imparting the needed vitality to enable the system to do its proper and natural work. It puts nature into condition to defend itself against the attacks of disease. If there are any cases in which persons are disappointed in regard to Compound Oxygen, I believe them to be those in which patients have been so impatient for speedy cure that they have dropped the treatment before it had opportunity to make its impression on the system. Such people will fly from one remedy, consume large quantities of almost every medicine brought to their notice, and yet continue to be invalids. Compound Oxygen does not cure by magic in a moment. If it claimed to, it would be quackery. But I regard it as one of the most wonderful and beneficent curative agencies ever brought to public notice."

For further and fuller answers to the countless inquiries suggested by the above to thoughtful minds, and to those who are solicitous about their own well-being and that of their friends, mail your address to Drs. Starkey and Palen, 1109 and 1111 Grand Street, Philadelphia. The pamphlet you will receive in reply will set forth full particulars.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office assembly as Thursday morning to appear in next issue.

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"How to Keep Boilers Clean." Book sent free by James F. Hotchkiss, 88 John St., New York.

Stationary, Marine, Portable, and Locomotive Boilers a specialty. Lake Erie Boiler Works, Buffalo, N. Y.

Wanted, a situation in some Southern State, by a mechanical engineer, who is thoroughly and practically acquainted with all branches of manufacturing metal goods and an expert on special machinery. Will take interest or salary. Address J. G. Letteller, 1005 Wilcox Avenue, Chicago, Ill.

Railway and Machine Shop Equipment. Send for Monthly Machinery List to the George Place Machinery Company, 121 Chambers and 103 Reade Streets, New York.

The Hyatt filters and methods guaranteed to render all kinds of turbid water pure and sparkling at economical cost. The Newark Filtering Co., Newark, N. J.

Stephens Bench Vises are the best in use. See ad., p. 173.

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"The Sweetland Chuck." See ad., p. 188.

Hoisting Engines for Mines, Quarries, Bridge Builders, Railroad Construction, etc. Send for catalogue. Copeland & Bacon, New York.

Iron Planer, Lathe, Drill, and other machine tools of modern design. New Haven Mfg. Co., New Haven, Conn.

Pumps—Hand & Power, Boiler Pumps. The Goulds Mfg. Co., Seneca Falls, N. Y., & 15 Park Place, New York.

Fox's Corrugated Boiler Furnace, illus. p. 354. Hartmann, Le Dour & Maeker, sole agents, 134 Pearl St., N. Y.

For Freight and Passenger Elevators send to L. S. Graves & Son, Rochester, N. Y.

Best Squaring Shears, Tinner's, and Cannery Tools at Niagara Stamping and Tool Company, Buffalo, N. Y.

Lathes 14 in. swing, with and without back gears and screw. J. Birkenhead, Mansfield, Mass.

The Best—The Dueber Watch Case.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, \$40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN Patent Agency, 361 Broadway, New York.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

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Curtis Pressure Regulator and Steam Trap. See p. 142.

Woodwork'g Mach'y. Rollstone Mach. Co. Adv., p. 141.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 142.

Drop Forgings. Billings & Spencer Co. See adv., p. 174.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 172.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co., Box 423, Pottsville, Pa. See p. 174.

Steam Pumps. See adv. Smith, Vaile & Co., p. 174.

Cotton Belting, Linen and Cotton Hose, and Mill Supplies. Greene, Tweed & Co., 118 Chambers St., N. Y.

American Fruit Drier. Free Pamphlet. See adv., p. 190.

Best in the world. Patent chuck jaws, emery wheel machinery, and automatic machines to grind straight and sharp. Planer, veneer, logwood, leather, paper mill, plate, cottonseed, and other long knives. American Twist Drill Co., Meredith, N. H. (Established 1865.)

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 20,000 Crank Shafts and 15,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Brass & Copper in sheets, wire & blanks. See adv. p. 190.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Hoisting Engines. D. Frisbie & Co., Philadelphia, Pa.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 190.

Blake's Belt Studs are the best fastening for Leather and Rubber Belting. Greene, Tweed & Co., New York.

Fine Taps and Dies in Cases for Jewelers, Dentists, Amateurs. The Pratt & Whitney Co., Hartford, Conn.

Catalogues free.—Scientific Books, 100 pages; Electrical Books, 14 pages. E. & F. N. Spon, 35 Murray St., N. Y.

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.



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.

When renewed 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 300 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 then 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 valuable.

(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 4 1/2 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.—*Weiss'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 3/4 in.; exhaust, 3 x 3/4 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 4 1/2 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 fire 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 5 1/2 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, 6 1/2 in.; add to this 33 percent for friction of engine and pump, will give a cylinder 7 1/4 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, 2. 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 commence-

ment 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 x 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 *Stubbs 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 & Saddle'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 33 1/3 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 112 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.....	1/2 "
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,