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Agricultural Implements and Industrial Machinery for Export and Domestic Use. R. H. Allen & Co., N. Y. 500 Machines, new and 2nd hand, at low prices. See page 333, for particulars. S. C. Forsyth & Co., Manchester, N. H.

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The Gatling Gun received the only medal and award given for machine guns at the Centennial Exhibition. For information regarding this gun, address Gatling Gun Co., Hartford, Conn., U. S. A.

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Latest and Best Books on Steam Engineering. Send stamp for catalogue. F. Keppy, Bridgeport, Conn.

D. Frisbie & Co. manufacture the Friction Pulley—Captain—best in the World. New Haven, Conn.

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Chester Steel Castings Co. make castings twice as strong as malleable iron castings at about the same price. See their advertisement, page 333.

The best Sewing Machine in the world—Makes the Lock Stitch, the Chain Stitch, and Embroidery Stitch rom two whole Spools. Agents wanted everywhere. G. L. Du Laney & Co., 744 Broadway, New York City.

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500 new and second hand machines at low prices, fully described in printed lists. Send stamp, stating just what you want. S. C. Forsyth & Co., Manchester, N. H.

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Water, Gas, and Steam Pipe, Wrought Iron. Send for prices. Bailey, Farrell & Co., Pittsburgh, Pa.

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M. Shaw, Manufacturer of Insulated Wire for galvanic and telegraph purposes, &c., 259 W. 37th St., N. Y.

F. C. Beach & Co., makers of the Tom Thumb Telegraph and other electrical machines, have removed to 530 Water Street, New York.

Hyatt & Co.'s Varnishes and Japans, as to price, color, purity, and durability, are cheaper by comparison than any others extant. 246 Grand St., N. Y. Factory, Newark, N. J. Send for circular and descriptive price list.

Power & Foot Presses & all Fruit-can Tools. Ferracute Wks., Bridgeton, N. J. & C. 27, Mch. Hall, Cent'l.

For Solid Emery Wheels and Machinery, send to the Union Stone Co., Boston, Mass., for circular.

For best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay, Brooklyn, N. Y.

The "Abbe" Bolt Forging Machines and the "Palmer" Power Hammers a specialty. Send for reduced price lists. S. C. Forsyth & Co., Manchester, N. H.

Steel Castings, from one lb. to five thousand lbs. Invaluable for strength and durability. Circulars free. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Bumping metals. E. Lyon, 470 Grand Street, New York.

Diamond Tools—J. Dickinson, 64 Nassau St., N. Y. Slide Rest for \$8 to fit any lathe. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

"Dead Stroke" Power Hammers—recently greatly improved, increasing cost over 10 per cent. Prices reduced over 20 per cent. Hull & Belden Co., Danbury, Ct.



G. E. P. will find a description of a cheap galvanic battery on p. 234, vol. 34.—J. M. will find a good recipe for shoe blacking on p. 27, vol. 34.

—H. L. G. will find directions for coloring gold on p. 43, vol. 30.—C. H. will find a recipe for a depilatory on p. 186, vol. 34.—J. R. C. will find something on moles in the skin on p. 347, vol. 32.—W. S. will find directions for straightening wire on p. 299, vol. 34.—L. R. P. will find a good recipe for mucilage for labels on p. 202, vol. 31.—H. R. E. will find directions for making printing inks on p. 298, vol. 31. A cheap battery is described on p. 234, vol. 34.—A. A. will find a recipe for a cement for fastening glass to brass on p. 117, vol. 32.—H. N. H. should varnish his brass with the preparation described on p. 310, vol. 35, for silver.—H. E. N. will find directions for making an incubator on p. 273, vol. 33.—F. W. M. will find directions for galvanizing iron on p. 346, vol. 31.—P. will find an answer to his query as to speed of navy cutters on p. 251, vol. 35.—R. T. M. will find an explanation of his wagon wheel difficulty on p. 298, vol. 31.—E. H. will find a formula for the width of belting on p. 244, vol. 34.—A. B. C. will find an explanation of the transmission of vocal sounds by electric wires on p. 327, vol. 33.—E. B. will find an article on taking the kinks out of sawson p. 11, vol. 33.—J. H. will find directions for lacquer or bronze on cast iron on p. 11, vol. 33. For japanning cast iron, see p. 122, vol. 27.—D. & D. will find directions for enameling leather on p. 122, vol. 27.—M. S., F. G., J. A. T., C. A., J. C. C., G. A. C., and others who ask us to recommend books on industrial and scientific subjects, should address the booksellers who advertise in our columns, all of whom are trustworthy firms, for catalogues.

(1) A. E. H. says: I send you by this mail a piece of copper tube taken from a coil used for cooling brine. You will notice that there has been a chemical action which destroys the copper, but this only occurs when it is threaded, or close to the threads. What is it that produces this action? The coil was put together with plumbago and oil as a lubricant. A. It seems very probable that the corrosion was caused by the galvanic action set up between the copper and carbon (graphite) in contact with moisture and the fatty acids in the lubricant. The salt water is in no way accountable for the corrosion.

(2) W. H. A. says: Please give me the theory, causes, and circumstances attending the undertow on thesea coast. A. The following statement, from Maury's "Physical Geography of the Sea," may be of interest in this connection: "Suppose the case of a long trough, opening into a vat of oil, with a partition to keep the oil from running into the trough. Now suppose the trough to be filled up with wine on one side of the partition to the level of the oil on the other. The oil is introduced to represent the lighter water as it enters either of these seas from the ocean, and the wine the same water after it has lost some of its freshness by evaporation, and therefore has become saltier and heavier. Now suppose the partition to be raised, what would take place? Why, the oil would run in as an upper current, overflowing the wine, and the wine would run out as an under current."

(3) J. O. G. says: You state under the heading of "English Fire Engines" that the engine lifted the water 32 feet in a perpendicular line. Is it possible for a fire engine, with its many joints and imperfections, to raise a column of water 32 feet without the intervention of a foot valve in the suction? A. From all that appears in the statement, we should say that the engine just lifted the water slowly, which would be quite possible, with a very accurately constructed pump.

(4) G. A. A. says: I am building a steam chimney 90 feet high with 6 feet base, with a round flue 2 feet across inside; should this flue run to the top of chimney or not, to get better draft? A. To the top, as we understand you.

1. For a lightning rod, will common gas pipes do? A. It will be better to make the rod of a single piece of metal, with a copper tip added. 2. Is it necessary in connecting lightning rods with city water pipes to connect underground, or can I connect it with a right and left coupling above the ground, say inside the shop? A. It is better to connect it underground.

I intend to reset my boiler, which is a 50 horse power tubular, horizontal. My principal fuel is wet tan. How shall I set the boiler to get best results? A. See p. 339, vol. 33.

(5) O. T. B. asks: How many cubic feet of water per minute will a cast iron pipe 150 feet long of 6 inches bore discharge, if laid horizontally, receiving its supply under 12 inches head and discharging into open air? A. About seventeen, if the interior of the pipe is smooth.

(6) V. asks: Can the water in a newly cemented cistern of 4,000 gallons, which is strongly impregnated with lime, be made fit for drinking, cooking, and washing with by the use of alum? If so, what quantity should be used? The cistern

has been filled and emptied; and having again been filled with rain water, it is not convenient to empty it again. A. The cement lining of the cistern has evidently been allowed a sufficient length of time in which to set and dry perfectly; the result is that the water has dissolved out a considerable quantity of the lime. The greater part of the lime may be removed as sulphate by the addition of a calculated quantity of alum (sulphate of alumina and potash). Take a gallon of the water in question and add to it a strong aqueous solution of alum, of a known strength, in varying quantities, until the precise quantity of the reagent necessary has been determined. This quantity, multiplied by the number of gallons contained in the cistern, will be the total amount required. This is one of the best methods that can be employed in such cases; but it is somewhat objectionable where the water is to be employed for cooking and drinking purposes, as it leaves in solution in the water a notable quantity of the soluble sulphate of potash. There are many other methods by which the lime might be removed from the water; but owing to the poisonous character of the reagents or the impracticability of their application in your case, they are out of the question. Where the water is to be used only for washing purposes, perhaps the cheapest plan would be to precipitate the lime by the addition of a solution of common soap. This answers the queries of several other correspondents.

(7) J. P. M. asks: Will mercury evaporate when heat is applied? How long will it last under a constant heat of 104°? A. Mercury is volatile under the temperature mentioned, and will evaporate, but not very rapidly.

(8) J. W. B. says: Please give me the chemical analysis of quinine. A. The sulphate of quinine [(C₂₀H₂₄N₂O₈SO₄ + 14 (H₂O)] is the medicinal preparation commonly called quinine. The vegetable alkali quinia is obtained from the yellow bark (cinchona cordifolia), in which it occurs mixed with cinchona, and combined with quinic and quinotannic acids.

(9) T. M. asks: 1. How many cubic feet of carbonic acid gas can be obtained from 1 lb. of marble dust? A. About five. 2. What amount of acid per lb. is needed? A. About 1/2 lb. This is the calculated amount; it will require something more than this in practice.

(10) J. D. says: Please give me a recipe for filling the grain of sole or other heavy leather, and making it firm and stiff so that it will resist pressure and dampness, which will not rot or destroy the durability of the leather? A. We understand that very good results have been obtained in similar cases by the use of carbolic acid, but cannot furnish you with the details of the process. It is necessary to have the leather very dry, and to force the acid into the pores by hydraulic pressure.

(11) J. H. N. asks: Does everything that exists on the face of the earth contain poison? A. Every known substance, if taken in excessive quantity, will prove destructive to human life.

(12) W. S. D. says: 1. I have a keel boat, 11 feet 2 inches long, 3 feet 2 inches wide. She draws 16 inches when loaded. I have an engine, inverted cylinder style, with link motion. Cylinder is 2 1/2 inches in diameter with 4 inches stroke; the engine weighs 100 lbs. without wheel. Is the engine (with boiler in proportion) too large for the boat? Would it do to build a boiler a little too small, say 16 x 30 inches, and run the engine with 2 1/2 or 3 cut off? What should be the diameter and height of fire box, and the size and number of tubes for upright boiler of that size? A. Build a boiler large enough to supply the engine. You can use tubes 1 1/2 or 2 inches in diameter. 2. What should be the diameter and pitch of propeller? A. It may be 15 inches in diameter, and have 2 to 2 1/4 feet pitch.

(13) T. J. G. says: In a book of instruction on shooting the following rule is laid down: "When the sun shines from the left, it will illuminate the right side of the back sight and the left side of the fore sight; and when these two points are aligned on the target, it will cause the ball to go to the right of the mark, and vice versa." Now I maintain the very opposite, that is, that the ball will go to the right in this case. Who is right? A. As the sights on a rifle are usually arranged, we do not see how the statement in the book will hold good.

(14) J. H. D. asks: What substance, suitable for a traveller's pocket, will, by burning, best disinfect the air of a room? A. The vapor of burning sulphur (sulphurous acid) is one of the best of disinfectants, but has the disadvantage of a very pungent odor, and in any considerable quantity is irrespirable. Chlorine or bromine water, chloride of lime (hypochlorite of lime), carbolic acid, etc., are very powerful disinfectants, so that a small quantity only will be requisite. Such a quantity may be carried in the pocket. These will not burn, but an ethereal solution of bromine probably will.

(15) E. H. asks: 1. In speaking of cement to be used in making concrete buildings, do you mean ordinary water lime, or some of the imported cements, such as Portland, etc.? A. Rosendale and like cements of this country make a very good concrete. Portland cement makes a very superior concrete. 2. There are concrete buildings in this vicinity, the mortar of which is composed of sand and gravel mixed with quicklime only; would such buildings be durable? A. Walls of concrete in which common lime is the only binding ingredient cannot be depended upon for a permanent career in this climate. 3. Would concrete make a good building for a shop in which to run woodworking machinery, or would the jar have a tendency to crumble the walls? A. When properly constructed and time given them to harden, there is no reason why

they should not answer well. 4. How thick ought the walls to be for a building 30 x 40 feet, 16 or 18 feet high? A. Such a building would require a girder through the center if two stories in height, and the walls would do at 14 inches thick; if one story in height, the walls should be 18 inches thick. 5. Would concrete do for the foundation on ground overflown by water during part of the year, or would it be preferable to lay up a stone wall with hydraulic mortar? A. Concrete would do.

What is the rule for finding the size of shafts for transmitting a given horse power, speed being given? I wish to know how large a line shaft 30 feet long, to run at 300 revolutions per minute, would be needed to transmit the power of a 12 horse engine. A. About 1 1/2 inches in diameter.

(16) C. asks: What is the weight of a 13 inch cast iron ball? A. About 300-37 lbs.

(17) J. H. L. says: 1. I am about to erect an outside cellar of brick; it is to be entirely separate from any other building, and I want to have it frost-proof. It is to be 18 x 22 outside; the outer wall will be 9 inches and the inner wall 4 inches thick, with a space of 12 inches between the two walls. Should this 12 inch space be filled in with something, or left open, to secure a perfectly frost-proof building? A. If your cellar is to be sunk into the ground its whole depth, or the greater part thereof, it would be better to make its outside wall 13 inches, the space 6 inches, and the inside wall 4 inches, the floor joists being extended to rest upon the exterior wall. The intermediate space will answer without filling, if made tight. 2. What is the best means of ventilation? A. A slight ventilation may be provided for the cellar itself without materially reducing the temperature.

(18) J. R. B. asks: Does the ostrich, after laying her eggs in the sand, brood them like other birds, or does she leave them to be hatched by the sun? A. She incubates at night, and leaves them in the sun in the day.

(19) X. says: We are digging a reservoir to supply a trough for horses and cattle on the street; the reservoir is 1/2 mile away, fall about 30 feet. Wood pipe, about 2 inches internal diameter, is used. The reservoir is 17 feet deep. Is it economical to dig the trench for laying the pipe as deep as the reservoir, that is, 17 feet? They are doing this for 25 or 30 rods, in order, as they say, to take all the water from the reservoir (or in other words, from the bottom) in a dry season. A. A regularly graded pipe from the bottom of the reservoir will make the surest job, as in many cases siphon pipes have failed to act, mainly, it is thought, from the common cause—the collection of air at the highest point of the pipe. In this case the use of wooden pipes would be likely to add to the difficulty.

(20) A. B. C. says: 1. I have a cast iron frame for a lamp, that has become soiled by smoke and flies. How can I cleanse it for re-bronzing? A. Use sulphuric acid diluted in water. 2. How can I put on the bronze so that kerosene smoke will not remove it? A. Try the recipe given on p. 231, vol. 32.

(21) J. M. B. asks: Which is the best way to make a telescope speculum, 5 or 6 inches in diameter? A. We would advise you to make your reflector of glass, and silver it. Unless you have had some experience in working specula, you will find it not easy to make and not very good when made. Take a thick piece of glass and grind and polish it to the curve you wish. If you wish it to have 5 feet focus, you must grind it on a curve of 10 feet radius.

(22) W. L. W. asks: What substance could I put on the sights of my rifle to make them visible in the dark? A. Put a little phosphorus on the foresight.

(23) W. H. E. says: I am copying photographs on glass, in oil paints. Can you give me a recipe for a mixture to make the photograph stick to the glass, so that it will not peel off or leave a shiny appearance between the picture and the glass? A. Use a paste made by mixing starch with a little cold water; then add boiling water, and stir until it is of a uniform creamy consistency. Press out the air bubbles and excess of paste from between the picture and glass, and let dry slowly.

(24) P. H. C. asks: How can I obtain the meridian altitude of the sun for any place at any given date? A. From 90°, subtract the latitude of the place, which gives the co-latitude or its equal, which is the distance from the horizon to the equator; then, if the sun is north, add his declination, and if south, subtract it.

(25) E. C. says: In building a new house, second hand brick were used for partition walls, some of which were from an old chimney. Plastering is laid directly upon the bricks, then hard finish and paint. Several coats of the latter fall to cover a stain which comes through from the bricks. What is the remedy? A. The most effectual remedy is to cut out the smoky bricks and replace them with new ones.

(26) E. S. W. asks: 1. How can I construct a portable retort, to make gas of coal, wood, or grease, to fill a 30 x 40 inch gas bag? How large a retort will be required? A. A retort about 18 inches long, having a diameter of about 10 inches and a movable cap at one end, will answer. The retort may be of iron. 2. What degree of heat is needed to bring the gas over? A. The heat of a good coal or charcoal fire will be requisite. You will find descriptions of gas apparatus in any good work on chemistry or chemical technology.

(27) B. S. C. B. says: I have an astronomical glass of 60 inches focus. How can I fix it so that I can look at the sun with impunity, overcoming the extreme brightness? A. Put a diaphragm over the object glass with 1/2 inch aperture; then use a neutral tint shade glass between the eye and eyepiece.