

(7) E. N. P. asks: Will you give me formula for calculating the horse power when the fall of water is 16 feet, and volume or flow 450 cubic feet per second? I find a rule thus, but I don't exactly understand it: "To the actual head or depth of fall, add the height due to the velocity of the water in the head race. Multiply the sum by the volume of the flow of water per second, and by the gross power in foot pounds (62.4) per second; this divided by 550 gives the gross horse power." Please give me explanation of what constitutes "the height due to the velocity." A. "The height due to the velocity" is the additional power given by the velocity of the current, and is obtained by dividing the square of the velocity of the current in feet per second by twice the distance that a body falls in one second. This quotient multiplied by the constant one and one-tenth (1.1) gives the height due to the velocity of the water in the head race; the velocity being the cubic feet of flow divided by the area of the sluice in square feet. The formula as given is  $\frac{V^2}{2g} \times 1.1$ , where V = velocity;  $2g = 64.333 =$  twice the height a body falls in one second. The rest of your rule is correct.

(8) H. N. asks: 1. What is the proper size of smoke stack for a horizontal boiler 3 feet 6 inches by 9 feet, forty 2 1/2-inch tubes? A. At least 20 inches diameter. Your draught cannot be strong, as it will be cramped in the tubes. 2. The distance the brick wall should be from rear end of boiler? Is there a rule for either or both of the above questions? A. 18 inches; there is no rule. 18 inches is more than necessary for draught, but there should be room for a man to work.

(9) P. R. C. asks: What acid is commonly used for cleaning mortar, etc., from brick work before penciling, and should it be used full strength? A. Use diluted muriatic acid, one part of acid to three of water.

(10) G. A. H. writes: 1. I have some samples of pig iron which I wish to coat with some anti-rust preparation that will not weaken the luster or rub off when the samples are handled. Can you tell me of such a preparation? A. Try a solution of gum arabic or a thin mastic varnish. 2. A friend has a very old and choice piece of Japanese carved landscape in ivory, which has grown yellow. Is there any way to cleanse the same and whiten the ivory without injury to the delicacy of the carving? A. Benzine carefully used will answer.

(11) J. W. asks: How far can the best known fire engine throw water horizontally, when it has to pump the water out of a reservoir? A. 210 to 215 feet; it is claimed that 240 to 250 feet has been accomplished on test trials.

(12) A. C. asks if there is more strain on one part of the main rod of a locomotive than another. If so, what part, and why? A. No; not from the direct action of the steam, but there may be lateral strains more at one point than another.

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

F. H.—It is a very impure but finely divided kaolin or china clay, and could be used for making pottery or in the present condition as a soft polishing compound. —S. L. M.—It is carbonate of lime colored with sesquioxide of iron.

COMMUNICATIONS RECEIVED.

On Electric Storms. By J. A. On the Aurora Borealis. By E. E. M.

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 as early as Thursday morning to appear in next issue.

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Manufacturers of hydraulic or steam presses for extracting oil of castor beans, cotton seed, or tallow may find it to their advantage to send illustrated catalogues and price lists, with export discounts to W. C. P. O. Box 3, 184, New York.

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Curtis Regulator, Float, and Expansion Trap. See p. 364. A Portable Electric Lighter for \$5 00 is being extensively sold by the Portable Electric Light Co., of 79 Water Street, Boston. It is an economical and safe apparatus for lighting for home and business purposes. Their illustrated circular is sent free.

Woodworking Mach'y. Bentel, Mergentant & Co., p. 382. Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Machine Diamonds, J. Dickinson, 64 Nassau St., N. Y. 50,000 Emerson's Hand Book of Saws. New Edition. Free. Address Emerson, Smith & Co., Beaver Falls, Pa.

Gould & Eberhardt's Machinists' Tools. See adv., p. 382. Walrus Leather. An extra fine lot of heavy trimmed walrus for polishing metals. Greene, Tweed & Co., N. Y.

For Heavy Punches, etc., see illustrated advertisement of Hilles & Jones, on page 382.

Barrel, Key, Hoghead, Stave Mach'y. See adv. p. 382. Magic Lanterns and Stereopticons of all kinds and prices. Views illustrating every subject for public exhibitions, Sunday schools, colleges, and home entertainment. 116 page illustrated catalogue free. McAllister, Manufacturing Optician, 49 Nassau St., New York.

Renshaw's Ratchet for Square and Taper Shank Drills. The Pratt & Whitney Co., Hartford, Conn. Woodworking Mach'y. Rollstone Mach. Co. Adv., p. 382.

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Cope & Maxwell Mfg Co.'s Pump adv., page 366. For Mill Mach'y & Mill Furnishing, see illus. adv. p. 364.

Red Jacket Adjustable Force Pump. See adv., p. 366. Common Sense Dry Kiln. Adapted to drying of all material where kiln, etc., drying houses are used. See p. 366.

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For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 349. Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 350.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 350. 4 to 40 H. P. Steam Engines. See adv. p. 350.

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