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 asearly as Thursday morning to appear in next issue.

Rowland's Vertical Engine. Wearing parts of steel. Broad bearings. F.C.& A.E.Rowland, New Haven, Conn. Ladies can wear boots one size smaller after using German Corn Remover. 25 cents of druggists.

Owners of steam boilers can save fuel, repairs, and delays by using Hotchkiss' Mechanical Boiler Cleaner, which removes all mud or scale making properties from the boiler. Send for circular. 84 John St., New York.

Uniform in price and quality. Van Beil's "Rye and Rock." \$1 per bottle.

Wanted .- An experienced Machinist and Tool Maker, who is also able to design and construct light machinery. Address, with references, A. B., Box 773, N. Y.city. 4 Roll Planer and Matcher; simple and substantial; weight, 3,500 lb.; price, \$500. O.L. Packard, Milwaukee. Wis.

The man who invented the German Corn Remover is a public benefactor. 25 cents. Sold by all druggists. Houghton's Boiler Compound contains nothing that

can injure the iron, but it will remove scale and prevent its formation. Houghton & Co., 15 Hudson St., N. Y. Lead Foil for Secondary Batteries. E. M. Wood &

Co., Worcester, Mass.

Manufacturers and others, send postal at once to Manufacturers' Gazette, Boston, Mass., for first uumber free. Ready first week in July.

TarredRoof'g, Sheath'g Felts. Wiskeman, Paterson, N.J. Silica Paints not mixed); all shades, 40 Bleecker St., N.Y.

Callow's Lettering Pat., illus. p. 358. Catalogue free. Supplement Catalogue.-Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the Sci-ENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York,

Propellers, 12 to 26 in. Geo. F. Shedd, Waltham, Mass. Abbe Bolt Forging Machines and Palmer Power Hammers a specialty. S. C. Forsaith & Co., Manchester, N. H. List 26.-Description of 2,500 new and second-hand Machines, now ready for distribution. Send stamp for the same. S. C. Forsaith & Co., Manchester, N. H.

Combination Roll and Rubber Co., 27 Barclay St., N. V. Wringer Rolls and Moulded Goods Specialties.

Cope & Maxwell M'f'g Co.'s Pump adv., page 397. Punching Presses & Shears for Metal-workers, Power Drill Presses, \$25 upward. Power & Foot Lathes

Prices. Peerless Punch & Shear Co., 115 S. Liberty St., N.Y. Improved Skinner Portable Engines. Erie, Pa.

"Rival" Steam Pumps for Hot or Cold Water; \$32 and upward. The John H. McGowan Co., Cincinnati, O. The I. B. Davis Patent Feed Pump. See adv., p. 13.

The Eureka Mower cuts a six foot swath easier than a side cut mower cuts four feet, and leaves the cut grass standing light and loose, curing in half the time. Send for circular. Eureka' Mower Company, Towanda, Pa.

Pure Oak Leather Belting. C. W. Arny & Son, Manufacturers. Philadelphia. Correspondence solicited. Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Wood Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O. Experts in Patent Causes and Mechanical Counsel.

Park Benjamin & Bro., 50 Astor House, New York Split Polleys at low prices, and of same strength and earance as Whole Pulleys Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Malleable and Gray Iron Castings, all descriptions, by Eric Malleable Iron Company, limited, Eric, Pa

4 to 40 H. P. Steam Engines. See adv. p. 414.

National Steel Tube Cleaner for boilertubes. Adjustable, durable. Chalmers-Spence Co., 10 Cortlandt St., N.Y. Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa. Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

Gardiner's Pat. Belt Clamp. See illus. adv., p. 413. Nickel Plating, -Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna line, crocus, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94

Presses, Dies, Tools for working Sheet Metals. etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn. N. Y. | produces a vacuum which tends to hold the valves. The Sweetland Chuck. See illus. adv., p. 396.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Soloman's Parallel Visc, Taylor. Stiles & Co., Riegelsville. N.J. Skinner's Chuck. Universal, and Eccentric. See p. 397.

For best Duplex Injector, see Jenks' adv., p. 413. C. B. Rogers & Co., Norwich, Conn., Wood Working

Machinery of every kind. See adv., page 414. Peck's Patent Drop Press. See adv., page 14.

For the best Diamond Drill Machines, address M. C. Bullock, 80 to 88 Market St., Chicago, Ill.

Brass & Copper in sheets, wire & blanks. See ad. p. 13. For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Co., Buffalo, N. Y.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

The None-such Turbine. See adv., p. 413.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10.000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Wren's l'atent Grate Bar. See adv. page 13.

Diamond Tools. J. Dickinson, 64 Nassau St., N. Y.

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

Eagle Anvils, 10 cents per pound. Fully warranted.

Baxter Wrenches fit peculiar corners. Indispensable to first-class mechanics. Greene, Tweed & Co., N. Y.

Houston's Four-Sided Moulder. See adv., page 14. lew Economizer Portable Engine. See illus. adv. p. 12. Cutters for Teeth of Gear Wheels formed entirely by machinery. The Pratt & Whitney Co. Hartford, Conn. Rue's New "Little Giant" Injector is much praised for its capacity, reliability, and long use without repairs. Rue Manufacturing Co., Philadelphia, Pa.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

Long & Allstatter Co.'s Power Punch. See adv., p. 13. Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

For Mill Mach'y & Mill Furnishing, see illus. adv. p.12. Don't buy a Steam Pump until you have written Valley Machine Co., Easthampton, Mass.

Saw Mill Machinery. Stearns Mfg. Co. See p. 13. Use the Vacuum Oils. The best car, lubricating, engine, and cylinder oils made. Address Vacuum Oil Co., No. 3 Rochester Savings Bank, Rochester, N. Y.

Wiley & Russell M'f'g Co. See adv., p. 396. For Machinists' Tools, see Whitcomb's adv., p. 12. Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

For Mining Mach'y, see ad. of Noble & Hall, p. 14.



HINTS TO CORRESPONDENTS.

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

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

We renew our requestthat 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 lahor to obtain such information without remuneration.

Any numbers of the Scientific American Supple-MENT referred to in these columns may be had at this office. Price 10 cents each.

(1) S. L. R. writes: 1. We have a boiler 15 feet long, shell 41/2 feet in diameter, having eighty 3inch flues. We wish to burn shavings and sawdust. How much grate surface should we have? A. About 36 square feet. 2. What kind of grate? A. A thin, plain grate with narrow openings. 3. How high should the chimney be and what size the flue? A. 6 feet, and 30 inches square. 4. The engine is 14x30. What should be the size of the steam pipe leading to the engine, and what size the exhaust? A. Steam 31/2 inches diameter, exhaust 51/2 inches diameter. The furnace should be at least twice the usual depth for coal,

(2) E. J. C. writes: A well known writer on stationary engmes says of the curved or coiled pipe that connects the boiler and steam gauge: "The cock which is placed at the lowest part of the inverted siphon pipe is designed to draw off any water which may have collected in it; if the water was not drawn off it would rise into the gauge and the steam pressure would be incorrectly indicated." Please explain. A. It would act like a sinhon gauge, by the difference of height of column of the liquid in the two legs of the siphon; but as these siphous are usually made, the inaccuracy would be inappreciable.

(3) L. G. G. asks: What is the best and most economical way of producing a bright surface upon several iron pins, 14x1/2x3, having the fire scale still on? A. Use emery wheels.

(4) A. D. W. writes: If your correspondent, J. A. D., will put a cock into the top of the air chamber of his Niagara pump and fill it with water it will be all right. Such at least is my experience with one of them. I take it the steam takes the place of the air, and then a current of air causes condensation, which

(5) G. G. M. asks if there is not some mistake in reference to \$500,000,000 gold weighing 4,500 tons, as stated in No. 24, late volume, under head "The sub-treasury gold wagon." A, Yes; it should be 1.000 tons.

(6) W. W. asks: Will the boilers used in ranges, some of which are warranted to stand 200 tb. vertically or horizontally.

(7) E. L. B. asks: Can you inform me how the hydrostatic press and jacks came to be commonly called hydraulic press and jacks? A. We cannot; either term is correct. When the pressure is being exerted, the fluid is in motion: it is then hydraulic. When the pressure is obtained, and the water is at rest, it is then properly hydrostatic.

(8) D R asks how to feed turtles and fishes? How often should icesh water he supplied? How long will a turtle live with nothing to eat? A. Feed the turtles and fish on earth worms after they have been placed in grass or moss over night to scour them of all earthy matter, then cut them up to one quarter of an inch and feed to the animals. Look out that none are left after the animals have had all that they require, Remove from the aquarium what are left, or decomposition will take place, which will spoil the water and turtles. Raw beef answers well as a food for fish. In a Geiser's Patent Grain Thrasher, Peerless, Portable, true self-supporting fresh water aquarium the water and Traction Engine. Geiser M'f'g Co., Waynesboro. Pa. needs never to be removed if the proper kinds of plants seconds, thirty seconds, two minutes, ten, twenty, and water until clean.

three months without food, a young turtle one month.

(9) A. W. asks: How much steam pressure will a boiler stand, 15 inches diameter by 30 inches high, made of cold rolled copper, No. 21 English wire gauge? A. Not over 16 lb. per square inch. The heads water pressure to at least 80 lb. before using

(10) E. F. J. asks if any benefit is derived from combining magnesium with steel. A. A half per cent of magnesium changes coarse-grained into finegrained steel and greatly improves the quality. The magnesium is introduced through an opening in the cover of the crucible, after inserting some small bits of charcoal, in order to remove the free oxygen. Without this precaution there would be danger of an explosion.

(11) C. wants to know how to make shoe blacking. A. Mix intimately 1 pound of molasses, 1 pound of best bone black, in very fine powder, and 1/4 pound olive oll; then add 14 pound sulphuric acid, previously diluted with 34 pound water. The whole is allowed to stand for three hours or longer, and afterward as much water is added as is necessary to give it the proper consistence.

(12) G. I. J. asks: Is there any device by which I may regulate the strength of the current from a powerful electric battery? The ordinary resistance coils will not do. I wish to change the strength gradually by means of a resistance placed at some point in the circuit. A. You can make resistance coils that will answer your purpose, by making a wooden reel in the shape of a cross, and winding uninsulated wire upon it so as to have an air space all around each convolution. If the current heats the wire so that it will burn wood, you may place strips of asbestos board along the edges of your reel.

(13) M. E. W. asks how to find the point at which to place the weight on a safety valve so that steam will blow off at the required pressure. A 1. Multiply the pressure per square inch by the area of the valve: the product is the total weight required upon the valve. 2. Divide this total pressure by the weight to be hung on the valve lever; the quotient is the number of "leverages" which you must give the weight from the fulcrum. Suppose 100 lb. steam and 12 inches area of valve; then total pressure on the valve is 1,200 lb.; and if the weight be 80 lb.. then $1,200 \div 80 = 15$ 'leverages." Now, if the distance from fulcrum to center of valve be 3 inches, then the weight must be set at 3x15=45 inches from fulcrum, or 42 inches from certerof valve. Of course this does not take into account the effect of the lever or weight of the valve.

(14) O. R. M. asks for a simple method of testing or assaying specimens of rock. A. Charge into a 6-ounce crucible, I ounce each of the ore and dry bicarbonate of soda, 2 ounces of litharge (free from silver). 16 ounce of argol, and cover with 1/4 inch of dry sait. Heat the crucible until the contents are in a quiet state of fusion, remove from the fire, cool, break, and clean the lead button by pounding on an anvil. If the button weighs more than, say, half an ounce, scorify it down in a scorifying dish in an open muffle. Heat 11/4 inch bone ash cupel in the muffle, drop into it the button, and keep up the temperature of the muffle to a bright red heat until all the lead has been scorified off and absorbed by the cupel, and the small bead of gold or silver (if the ore contains any) becomes well rounded and clear. The ore must be finely powdered, and the whole of it passed through an eighty-mesh sieve.

(15) A. S. asks for information as to the direct determination of silver in galena on Volhard's principle. A. From two to five grammes of the galena, according to its supposed tichness in silver, are very finely ground and intimately mixed in a porcelain mortar with from three to four times its weight of a flux composed of equal parts of soda and saltpeter, placed in a porcelain crucible, covered, and heated over a burner to thorough fusion, when the mixture is well stirred with a glass rod. It is then let cool and placed in an evaporating dish partly filled with water, in which the melted matter is softened, dissolved out of the crucible into the dish, which is then heated, and the watery solution is filtered into a flask. The residue on the filter, after being well washed, is rinsed back into the dish, very dilute nitric acid is added, and the whole evaporated to dryness. The dry residue is taken up in water acidulated with nitric acid, heated, and filtered into the same flask in which is the aqueous solution. The residue is washed with hot water, the filtrate is allowed to cool in the flask, ferric sulphate or iron alum is added, and the liquid is titrated.

(16) H. J. asks how to make a good quality of domestic grape wine? A. Put 20 lb. of ripe, fresh picked, and well selected grapes into a stone jar, and pour on them six quarts of boiling water. When the water has cooled enough, squeeze the grapes well with the hand; cover the jar with a cloth, and let it stand for three days; then press out the juice, and add How would you arrange it to obtain the best results y A Yes; for moderate pressures, say, not over 40 lb.; we week, scum, strain, and bottle it, corking loosely. When have seen them set in masonry; they may be set eithen the fermentation is complete, strain it again and bottle it, corking tightly. Lay the bottles on their side in a

> (17) A. W. asks: By what means can an enameled surface be gilt with a name, same as on a lead pencil? A polished pencil, having a coating of shellac, can be stamped with gold by aid of a heated dve: not so an enameled surface—the gold will rub off entirely. A. Use thin gold size and a hot brand

> (18) A. B. asks how to case-harden small articles. A. Make a paste with a concentrated solution of prussiate of potash and loam, and coat the iron therewith; then expose it to a strong red heat, and when it has fallen to a dull red, plunge the whole into cold

are used for oxygenation. A good sized turtle will live sixty minutes, and that which is not deposited by one hour's subsidence is thrown away as useless for grinding lenses. The use of the gum arabic renders the water slightly viscid.

(20) J. N. L. asks: 1. Is there any liquid fuel, sootless and smokeless, that could be used in bed should be braced with care, and it should be tested with chambers having no flue or means of keeping up an ordinary fire? A. We know of no cheap fluid that we can recommend for such purposes. Fires without flues to carry off the products of combustion should never be used in sleeping apartments under any circumstances, 2. If gasoline or other liquid will answer for such purpose, about what would be the cost per hourto heat 1,000 square feet 100° Fah.? A. Gasoline cannot be used in this way.

> (21) R. W. S. writes: I have a telegraph line afew rods over one mile in length. Wire is No. 14, well insulated. Have two twenty ohm sounders on the line and six cups, gravity battery all at one end. When battery sets one way I get no current at all. Reverse it, and the sounders work faintly. What is the trouble? Is main line of too great resistance for batterv. or are the grounds weak? Have had some experience in making grounds, and never before had anything which would not work well. I thought four cups wouldrun the line. A. If your line wire is iron, the resistance is too great; you must use a larger wire or more battery. If your wire is copper, your grounds or connections must be at fault.

(22) C. W. R. asks how the magic solder wire is made, such as pedlars sell for mending tinware, copper, etc. It is some kind of composition of chemicals runtogether, then drawn out into wire, and is to be used without the acid, simply by holding the light or heat underneath the place to be mended, then simply let the solder melt. A. For an easily fused program together in a cracible or iron pot, at a very moderate hear; bismuth, 1 part: tin, 3 parts; lead, 2 parts, and cast in slender sticks. For the common solder wire melt together equal parts of tin and lead and pour it through a vessel having a very small opening in it, into a tub of water. If the metal is the right temperature, and if the apertured vessel is supported the proper distance above the water, the stream of melted metal will be cooled, forming a more or less perfect wire.

(23) N. E. writes: 1. I am running a band saw, and have a great deal of trouble with the lap. We use common solder, but it will not hold the ends together but a short time. The saw is two inches wide by onesixteenth thick. How long should I make the lap, and what is the best solder, or how can I braze it? you give me a receipt to make a solder better than the common solder that tinsmiths use? A. Make your lap about an inch long. Coat the adjacent surfaces well with borax paste, and wire the two ends together with iron binding wire. Support the joint over a large piece of charcoal, and apply pieces of silver solder to the edges of the joint, having previously coated the solder with borax. Now with a strong blow pipe flame heat the saw at the joint until the solder flows. 2. I have about 100 of the Scientific American I wish to bind. What is the cheapest and the best binding that I can get? A. We know of no cheaper way than to employ a bookbinder.

(24) W. W. C. asks: 1. How can I preserve some manuscript written on common paper and with an ordinary lead Pencil so that it will not rub off, or in other words, how can I make the writing indelible? A. Lead pencil marks cannot be rendered indelible, but if the lines are washed over with a clear solution of 1/4 oz. of gum arabic in 6 oz. of water they will not rub off readily. 2. Two bodies of exact size and shape, but of unequal weight, and each presenting an entirely smooth and non-compressible surface to the atmosphere, are dropped from a given height at the same time: will they reach the ground together? Some philosophers say they will, others say they will not unless they be dropped in a vacuum. A. In a vacuum, yes; in the air, no; the heavier body is capable of overcoming the resistance of the air more easily.

(25) J. J. S. writes: I wish to know something of the nature of nitro-glycerine. Please answer the following questions through Scientific American: 1. After being prepared, and coming suddenly or otherwise in contact with air, does it (the air) have any effect on its explosive properties? A. The air has little or no effect upon it. 2. In its liquid form for what purposes is it generally used and when so used? How is it exploded? A. Chiefly in blasting, in tunneling, and mining. It is used extensively for cracking the rock in the bottom of "dry" petroleum wells. It is exploded by fulminating or percussion caps by electric spark or fuse. 3. Where is it made, and cans is it generally put up in ? Also the difference in explosive power while in liquid form, and such preparations as "giant powder," "dynamite," and other high explosives having nitro-glycerine as a basis. A. See article on nitro-glycerine, pages 344, 345, current volume of the Scientific American. The cartridges usually from four ounces to five pounds or more. With regard to the relative efficiency of dynamite, giant powder, and nitro-glycerine, consult Mowbray's "Trinitrogly-4. I read of two empty glycerine cans being found in the woods somewhere in Pennsylvania by two small boys. A man to whom they were shown attempted to open them, causing an explosion, thereby losing his whole arm, tearing it from his body. Now, the cans being empty, how do you account for the explosion? What are the most serious objections to its being handled in liquid form? A. Such packages always retain a little of the explosive adhering to their sides after their contents have been poured out,

(26) W. C. R. says, in answer to N. J. A., who asks for the best method of preserving fence posts: My experience is to bore a large hole in the end of the post that is to be put in the ground, fill it with salt, and then plug the hole tight with a wood plug."

(27) C. M. K. asks: Can you inform me of (19) R. W. inquires how to prepare emery any means by which the flesh can be taken from the for optical purposes. A. Mix four pounds of the flour bones of small birds, leaving a perfect skeleton? A. emery of commerce with one ounce of powdered gum | The following method will answer in some cases: Put arabic, and then throw the powder into two gallons of the bonesin a strong, warm alcoholic solution of caustic clean water. Collect the deposits at the end of ten potash for a short time, then immerse them in running