## Scientific American.

## Business and Versonal.

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For Sale-New Steam Launch, 30 x 8 feet; "fast;" Black walnut and Nickel finish; \$1,200; also Side Wheel Steamer, 50 x 16 feet, \$3,000. S. E. Harthan, Worcester, Mass., Manuf. of Engines and Launches.

fining of Beet Root Sugar, speaking German, French, and some Spanish, seeks employment. Good testi-monials. Address P. O. Box 4182, New York city.

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Reliable Oak Leather and Rubber Belting. A spe-

Shaw's Noise-Quieting Nozzles for Escape Pipes of Locomotives, Steamboats, etc. Quiets all the noise of toe. It wears well; is there unnecessary friction? A. philosophers to answer. high pressure escaping steam without any detriment We think not. 2. What speed should a 30 inch top run. (19) F. E. asks: I whatever. T. Shaw, 915 Ridge Ave., Philadelphia, Pa. ner burr have under 15 horse power for grinding corn? the power required to

For Solid Wrought Iron Beams, etc., see advertise- A. About 400 revolutions a minute. ment. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

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Solid Emery Vulcanite Wheels--The Solid Original Emery Wheel-other kinds imitations and inferior. Caution—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Pack-ing Company, 37 and 38 Park Row, N. Y.

Steel Castings from one 1b. to five thousand 1bs. Invaluable for strength and durability. Circulars free. Pittsburgh Steel Casting Co.. Pittsburgh, Pa.

Help for the weak, nervous, and debilitated. Chronic and painful diseases cured without medicine. Pulvermacher's Electric Belts are the desideratum. Book, with full particulars, mailed free. Address Pulvermacher Galvanic Co., 292 Vine St., Cincinnati, Ohio.

Split-Pulleys and Split-Collars of same price, strength and appearance as Whole-Pulleys and Whole-Collars. Yocum & Son, Drinker st., below 147 North Second st., Philadelphia, Pa.

Small Fine Gray Iron Castmgs a specialty. Soft and true to patterns. A. Winterburn, 16 De Witt St., Albany, N. Y.

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Wanted-A first-class Machine forger. One who is a good performer on any instrument in Brass Band. Ref- some light on the subject. Address H. B. Smith, Smithville, erences required. Burl. Co., N. J.

All nervous, exhausting, and painful diseases speedily yield to the curative influences of Pulvermacher's Elec-tric Belts and Bands They are safe and effective. Book, with full particulars, mailed free. Address Pulvermacher Galvanic Co., 292 Vine St., Cincinnati, Ohio.

Diamond Planers. J. Dickinson, 64 Nassau St., N. Y. More than twelve thousand crank shafts made by Chester Steel Castings Co. now running; 8 years' constan use prove them stronger and more durable than wrought iron. See advertisement, page 78.

Emery Grinders, Emery Wheels, Best and Cheapest Hardened surfaces planed or turned to order. Awarded Medal and Diploma by Centennial Commission. Address American 'Twist Drill Co., Woonsocket, R. I.

ply to a chemist, who can give some good recipes .-- C. D.-We could not republish the diagram. If you cannot If you will give us the number and year of the paper containing the article we can probably send it to you.-E. C. H. is informed that the method of balancing cylinders of threshing machines which he mentions is the one in general use, and is, perhaps, the best that could be employed.—T. F. R. asks for a depilatory, and is re-An American, experienced in the manufacture and re- ferred to Cooley's "Cyclopedia of Practical Receipts," ning of Beet Root Sugar, speaking German, French, under the head of "Depilatory."

> (1) G. R. asks: What sized boiler do I need for a small engine, 11/2 inch bore and 3 inches stroke? Would it run a circular saw 7 inches in diameter to saw 1 inch pine? A. To do this work you will need a boiler with from 18 to 20 square feet of heating surface.

(2) S. E. says: Please give a rule for calculating the capacity of smoke stacks, which are found what kind of machinery is wanted. Steptoe, McFarlan in practice to give the best results? A. A good proportion for the chimney is to have its cross section about to f the grate surface, and its height from 40 to 50 feet. Some chimneys having a cross section of only  $\frac{1}{7}$  the grate surface give good results when the boiler is carefully set, but the first figure is safer for general practice.

(3) G. W. K. asks: 1. Is there a way to determine the amount or power a motor will furnish by means of a friction lever brake, saving the number of feet the pulley will run and the number of lbs. pressure on friction bearing, the pulley to be smoothly turned? A. Multiply the unbalanced weight in lbs, by the circumference in feet that the point of attachment would cialty of Belting for high speed and hard work. Charles describe if free, and by the number of revolutions of W. Arny, Manufacturer, Phila., Pa. Send for price lists. the motor per minute. Divide the product by 33,000. 2. I have a water wheel running on cast step with cast

> (4) P. W. N. asks: 1. How much more water will run through a gateway in a dam 10 feet wide and 30 feet high than will run through one 10 feet high and 30 feet wide. A. About  $3\frac{1}{10}$  times as much in the first case. 2. Also the weight of 1 cubic foot of water? A. See p. 184, vol. 32.

> (5) S. B. says: Some of the users of steam engines in this city (Portland, Me.) practice putting salt water in small quantities into the boilers to form a scale to prevent the action of Sebago water on the iron, claim. ing that the water, being very soft, has too much action on it. Is it a good practice? A. If the feed water is pure, we think the action is questionable.

> (6) W. E. M. asks: If I confine steam in a hemisphere, will its force be centrifugal or centripetal? Can there be a motor made on this principle? A. The steam will press outward.

> (7) B. F. T. says: What is the effective actual horse power (not therefore nominal) of a non-condensing engine 14 inches cylinder, 24 inches stroke, 100 revolutions per minute, 70 lbs. steam? I am endeavoring to obtain some simple formula by which correct results may be obtained, and that can be explained to persons not educated machinists or engineers, in connection with our business in furnishing water for horse power. The formula furnished by the SCIENTIFIC AMER-ICAN ought to be considered standard and satisfactory. A. The effective horse power of a particular engine cannot be exactly determined by ageneral rule, butmust be found by experiment. It would be impossible to give an approximate rule of any value for the data sent. Such a rule that would answer tolerably well for one class of engines might be useless for another.

(8) C. D. H. says: A customer wishes me to siphon the water from a well 50 feet deep, having 30 feet of water in it. I have a fall 150 feet. I tell him I can only lessen the depth of water about 12 feet, when the siphon will cease to work. He claims it will empty the well. Which is right? A. You have the right idea. (9) J. G. asks: Which will make the louder report, a gun with a perfectly straight bore, or one Skinner Portable Engine Improved, 21-2 to 10 H. P. that widens a little toward themuzzle? A. Some of the patriots who have recently celebrated the anniversary of the nation's birthday will doubtless be glad to throw

> (10) C. D. O. says: The engine I am runninghas slipped its eccentric. The owner in setting it placed it so that it is a little back of the quarter stroke. I claim that it ought to be set a little ahead of the quarter. Which is right? A. We imagine that your view of the case is the more correct of the two.

> (11) W. K. asks: 1. Whether a boat 30 feet long and 6 feet beam, run by steam, just for sporting purposes, would require a government test and license? A. It does, according to the law. 2. How large a wheel does itrequire for two engines with 2% inch by 4¼ inch stroke? A. Diameter 26 to 28 inches, pitch 3 feet.

(12) J. A. R. asks: Can a person see light

been tried and was not satisfactory. You had better ap- for boiler shell what thickness? If I put in tubes, how many and what diameter? A. Cylinder 2 x 3, boiler 20 inches diameter, 3 feet hight. Steel shells 1/4 of an inch find the number containing it, it is probably one of the thick. Tubes 1½ or 2 inches in diameter. 2. Do you set the same, but it did not work at all. Will you please missing ones which we can perhaps supply.—A. M. S.— think it practicable to drive a carriage on a good road inform me how I can get the size correctly? A. You by steam engine and boiler located on the same and carrying its own coal and water, to travel a distance say of tenmiles? A. Yes, if properly constructed.

> (16) A. D. S. says: In making experiments with small vessels to try the resistance they suffer in passing through or over water, how much should be the allowance for adherence or friction? A. We think you will find full particulars in Mr. Froude's papers, published in the Transactions of the Naval Architects.

(17) W. D. M. O. says: Can you tell me the best work on air, and all its properties, such as motion, resistance, use as a motive power by compression, and similar mechanical uses? Also a work on the generation of gas for power purposes, and compounds which are used to produce gas by contact in a reservoir, and the best work on ballooning? A. Rankine's "Treatise on the Steam Engine " contains a summary of the laws relating to air and various gases. You will find numerous examples of the application of these princi ples in the files of technical periodicals. There is an aeronautical society in England, and we imagine their transactions contain the kind of information you desire. There are also numerous valuable papers in our back numbers.

(18) W. E. S. asks: Is the fulcrum point on a vessel's mast below or above deck when she heels or inclines by the pressure of wind while sailing? The object vessel is 65 feet on the water line, 20 feet breadth of beam, about 48 tons new burden, 10feet draught, and ballasted with 27 tons of iron and lead, with about mixture of 6 parts copper and 1 part tin. Or use old 55 feet hoist of sails. A. It is a good question for young

(19) F. E. asks: Is there any difference in ner burr have under 15 horse power forgrinding corn? the power required to operate stamps, with short A. About 400 revolutions a minute. the same lift and fall in distance, are of the same weight and have the same number of drops per minute? A. There should be no difference, if the resistance due to friction is the same in each case

> (20) C. E. L. asks: Can you give me a rule to cut paper for a tissue paper balloon 10 feet high, so that when paper is pasted together the balloon will be in good proportion? Also what size should the ring at bottom be? A. You will find directions in Blinn's Tin, Sheet Iron, and Copper Plate Worker."

> (21) G. P. H. asks: 1. If I build a boat 16 feet long and of 4 feet beam, of good model, how much power, and what size of a screw propeller must I put in to realize 8 miles per hour in low water against the current in the Ohio river? A. Cylinder 3 x 4, propeller 22 inches diameter, 3 feet pitch. 2. Is a boat of the above dimensions, drawing, when well ballasted, 2 feet, capable of crossing the Gulf from New Orleans to Cedar Keys? A. At certain seasons of the year, when the weather is generally calm, such a voyage might be made.

(22) J. R. G. says: I have got an aquarium with a cast iron bottom; what can I put on it that will a foot or more in length. Secure one end of the bundle keep it from rusting and not injure the fish? A. Dry to the door frame, twist it very tight, and, keeping it the iron thoroughly and give it a good coating of melted parafin. A layer of fine white sand may be sprinkled fastened to the frame, and the door spring is complete. over this as it cools.

(23) R. G. asks: How can I make a strong door snut; an keep it open. extract of tonka bean? A. Take 11b. of the beans, re duce to a coarsepowder, and percolate with alcohol to make 1 gallon.

(24) W. C. L. says: I desire a liquid preparation to close the pores of eggs to preserve them. It A. Thin gum arabic solution is commonly used for this use the house for drying green ash, and want to get heat should be cheap, dry rapidly, and not color the shell. purpose. Eggs are often packed in charcoal. A good method is to store the eggs in water containing about 50 grains of salicylic acid to the gallon. The Germans use linseed oil, which seems to answer the purpose admirably. See Scientific American Supplement, No. 65, p. 1030.

what iron was composed of. The chemist said that iron was an element, and could not be divided. And the doctor thought it must be composed of something. Which is right? A. The chemist was right; iron is an elementary substance.

(26) W. E. T. asks: Where are open hearth steel works located? A. Open hearth furnaces are in operation at Boston, Mass., Providence, R. I., Nashua, N. H., Trenton, N. J., Beaver Falls, Pittsburgh, Nicetown, Philadelphia, and Harrisburgh, Pa., Cleveland the alcohol down to a small bulk over a water bath, add and Canton, Ohio, Springfield, Ill., and Hartford, Conn.

(27) W. B. asks: Can you give the recipe for making the Etruscan color in gold? A. Alum and fine table salt each 1 oz., powdered saltpeter 2 ozs., hot rain water sufficient to make solution. Add sufficient muriatic acid to produce the color desired. The soluarm After coloring wash tion is hest used n soft wa

speed of 4 to 1, with same belt, and calculated size of pulleys the following way, made the sum of one half the circumference of pulleys (pulley and driver) in each will and rules for calculating cone pulleys in "Wrinkles and Recipes."

(32) L. E. M. asks: Will you give me a practical rule for finding gearing for compound geared lathes? A. You will find the information in No. 7, vol. 34, p. 107, that we think will be what you require.

(33) G. P. asks: Will a spring of the following dimensions, 4 inches long, 7 inch diameter, and 1/4 inch pitch, made out of 1/6 inch steel wire. enclosed in a chamber subject to 70 lbs. of steam to the square inch, keep its rigidity under a bolt screwed at 25 lbs.? A. Yes. 2. Will the steam affect its rigidity? A. No: but if it comes in contact with steam in moisture it could be nickel plated.

(34) E. H. M. asks: Will you give a plain rule or reference to some book plainer than Haswell, to ascertain the pitch of teeth in pattern making? A. The information you desire will be shortly published in "Practical Mechanism."

(35) A. W. asks: Is it advisable to grease cog gearing, and the reason why? A. It is best to grease cog gearing in cases in which the wheels can be kept from becoming clogged with dirt, etc.

(36) M. M. M. asks: 1. What is a suitable metal or composition for making castings for an oscillating engine 2 x 4 inches, the castings to be made in a smith fire? The blacksmiths tell me that I cannot cast iron as it will "burn." A. Make your castings of a composition metal such as bell metal, and add one tenth its quantity of tin after the mass is melted. 2. How large should the steam and exhaust ports be? A. Maka the steam ports  $\frac{1}{10}$  the area of the cylinder, and the ex. haust 1. 3. Would plaster of Paris be suitable to cast in? A. Cast in a sand mould faced with plumbago. 4. How could I burnish the castingsafter I had themmade! A. Polish with file, scraper, and emery paper.

(37) R. d'H. says, in answer to query (7) July 21, as to the time when the first movable steam fire engine was used? I know of a very powerful one to have been in use in Berlin, Prussia, as early as 1838, may be earlier. Its great defect was that it took hours before it was ready for service, so that it was jokingly remarked notice of the occurrence of a fire should be given some hours ahead. When finally at work it could throw a number of streams, it was said seven, and by concentrating its full force upon one stream, threw down stout walls. It was contemplated to be sent, if not actually done, to the large Hamburg conflagration in May, 1841.

(38) C. M. B. says: A very cheap and serviceable door spring can be made as follows: Take an old hoop skirt and place it in the fire, keeping it there just long enough to burn the cloth off the wires: remove from the fire and plunge it into cold water. Press and bend the springs together so as to form a bundle or rod twisted, fasten the other end to the door above the end Bytwisting the springs one way, they will keep the door shut; and by twisting them the other way, they will

(39) W. F. W. says: I wish to build a dry house 50 x 50 feet square, to be divided into four rooms. I have a steam boiler 44 inches in diameter, 13 feet long, that I wish to use as a heater. What is the cheapest and best way to construct the heating part? I wish to up to 190° to 220°. A. See SCIENTIFIC AMERICAN, p. 123 vol. 34, February 19, 1876, paragraphs (30) and (43): also p. 107, vol. 36, paragraph (1); also, p. 123, vol. 36, February 24, 1877, paragraph (6).

(40) G. W. W. asks: Why is it that sap of sugar maple at the right season, boiled down, produces (25) W. B. says: A doctor asked a chemist dry, brittle, grainsugar; but as soon as the weather gets warmer so as to swell the buds, the product is wax, that is, it will not grain. A. This is due to the presence of a free acid in the juice. Stir in a little solution of carbonate of soda, boil down, run into a wooden tub with a bung in the bottom, and, when solidified, remove the bung and let drain.

(41) G. H. E. asks: 1. What is the most sensitive and accurate test of the presence of fusel oil in liquors distilled from various grains? A. Evaporate an equal volume of ether, agitate for a few minutes, and then add an equal volume of water. The ether will dissolve any amylic alcohol (the bas is of fusel oil), and the ethereal solution separate into a layer distinct from the diluted spirit. This solution should be drawn off with a pipette into a small dish, and allowed to evapor ate in the air. To a portion of the residue in the dish add a few fragments of iodide of potassium, and gently agitate. In the course of a few minutes, if the original spirit-contained any fusel oil, a distinct yellow color will appear. This color is distinctly visible in a solution containing 0.2 per cent of the oil. The reaction is due to the volatile acids of the oil, and not to the amylic alcohol. Mix another portion of the residue with 11/2 parts of concentrated (pure) sulphuric acid: a red viscid liquid (amyl-sulphuric acid) indicates amylic alcohol, When digested with sulphuric acid and acetic acid or an acetate, fusel oil yields acetate of amyl, having the odor of pear oil. Fusel oil has a strong characteristic odor, and an expert can readily detect very small quantities of (30) M. A. B. asks: Does your SCIENCE it in spirits by evaporating a small quantity of the spirit RECORD contain "Practical Mechanism," by J. R.? A. on the palm of the hand, when the less volatile oil re-No. It is published in book form under the title of mains after the alcohol has evaporated, and is recognized by the sense of smell. 2. What is the present plan in distilleries, employed to get rid of fusel oil? A. iron in quantities ranging from 10 to 15 lbs.? A. In a dered charcoal, are fitted in the helm of the still so that Retainers, made of wire gauze filled with coarsely powthe distillates pass directly through them; the charcoal retains the oil.

Reliable information given on all subjects relating to Mechanics, Hydraulics, Pneumatics, Steam Engines, and Boilers, by A. F. Nagle, M.E., Providence. R. I.



C. H. W. is informed that we cannot find the address he mentions .- Will A. D. T. in "Minerals" of June 16, send his address to C. H. Wise, Boston, Mass?-A. K. Q .- Your question is too indefinite. We do not understand what you wish to know.-A correspondentwrites a card from Primrose. Wis., but the ink is so pale we cannot read it. Will he write again? -J. W. is informed that we know of no method of using mercury as a lifting power. He must ascertain by experimenting .-- J. T. G. is informed that there is no rule applicable to setting idler pulleys. His judgment must vertical boiler and engine attached to back to develop 1 it constructed? A. We never heard of it. dictate the place to put them.—J. H., of Canada.—We horse power at a pressure of 50 or 65 lbs. Please give On my lathe, driving wheel is 30 inches diameter, and endine dimensions of cylinder and boiler, and if I use steel, pulley 3%, making 8 to 1. I wished to use another steam from our boliers to dry houses that are 200 feet

or the object through the aid of light? A. Light, according to Watts, "is the agent which makes us acquainted with the existence of bodies through the organ of sight."

(13) J. B. T. asks: If two bodies, one weighing 1 lb. the other weighing 10 lbs., both being equal in bulk, if let fall from the same height, will strike the ground at the same time? A. Yes.

(14) I. P. F. says: To F. G. W.'s inquiry you say do not put flues in your boiler as small as 1 any of the insectpowders found in the market, inch. I have just completed a boiler with nine 1 inch flues, heads of cast iron, 1 inch thick and 10 inches diameter, 30 inches long, to be set on a stove, and we can get no draught. I have made them of the same dimensions with one 4 inch flue, and they work well. A. We would be glad to hear from our readers who have been using boilers with flues of this size. So far as our experience goes, they generally give satisfactory results. (15) O. C. writes: I wish to construct a

ter, then in alcohol, and dry in clean sawdust.

(28) J. G. L. asks: 1. How many vibrations per second are required to produce the musical tone known as middle C? A. 264.

Can Imake a fine finish on wood by rubbing on boiled linseed oil repeatedly, allowing each coat to dry thoroughly? A. Not what is termed a fine finish.

(29) C. E. D. asks: I would like to know how to get rid of a small red mite on canaries? A. Try

"Complete Practical Machinist."

(31) E. C. H. asks: How can I melt cast small furnace having a good blast.

Is there such a thing as a demijohn cupola, and how is