

Business and Personal.

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Agricultural Implements and Industrial Machinery for Export & Domestic Use. R. H. Allen & Co., N. Y.

Manufacturers of Circular Saw Mills, please send Description and Price List to Jos. Minchener, Troy, Ala.

Wanted—Small clean iron castings. Makers, send address, Box 3, No. 160 East 48th St., New York.

For Sale—Two Hydraulic Presses, with double power pumps, new; 12 in. ram, 8 ft. lift, clear space 8 ft. platen 48x52. Also three new Power Elevators, Merrick's make, below cost. John Howard, No. 1740 Ritzenhouse St., Philadelphia, Pa.

For Sale, cheap—The Pneumatic Machinery used in Sinking Piers at South St. Bridge: Compressor, Engine, Knowles Pump, Receiver, Gauges, &c., all perfect and complete. Address F. W. Getz, 420 Library St., Phila.

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Leather and Rubber Belting, Packing and Hose. Greene, Tweed & Co., 18 Park Place, New York.

Wanted—A small machine that will, by touch, register, one at a time, the number of articles handled. Address Edwin A. Simonds, Erie, Pa.

For Sale—Engine 20x36, one 16 ft. Engine Lathe, one large Blower, four dawk Engines, two Steam Pumps. Bull & Co., Indianapolis, Ind.

The Bastet Magnetic Engine for running Sewing Machines, Lathes, Pumps, Organs, or any light Machinery, 1-32 to 1/2 horse power. Agents wanted. Address, with stamp, 1113 Chestnut St., Philadelphia, Pa.

Wanted—A few good Machinists; must be first class performers on following instruments, viz.: E flat Cornet, E flat Clarionette, E flat Tuba, Snare Drum. Address H. B. Smith, Smithville, Burl. Co., N. J.

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For Sale—At a great Bargain, Grain Elevator, Hay Press, and Warehouse, all in excellent repair and good location. Address C. A. Gleckler, Farmington, Iowa.

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Vertical Tubular Boilers, all sizes. Send for price list. Lovegrove & Co., Philadelphia, Pa.

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Wanted—Charge of Weaving Department, Cotton or Satinet, by a practical, experienced man. Address A. B. C., P. O. Drawer No. 5, Greenville, N. H.

Wanted—Tubular Condenser. Boston P. O., 3306.

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Hotchkiss & Ball, Meriden, Conn., Foundrymen and workers of sheet metal. Fine Gray Iron Castings to order. Job work solicited.

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Spinning Rings of a Superior Quality—Whitinsville Spinning Ring Co., Whitinsville, Mass.

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Diamond Tools—J. Dickinson, 64 Nassau St., N. Y. Patent Scroll and Band Saws, best and cheapest nuse. Cordesman, Egan & Co., Cincinnati, Ohio.

The Original Skinner Portable Engine (Improved), 2 to 8 H.P. L. G. Skinner, Erie, Pa.

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Our new catalogue of drawing materials will be sent on receipt of 10c. Add. Keuffel & Esser, New York. Temples and Oilcans. Draper, Hopedale, Mass.

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For Best Band and Scroll Saws, Universal Wood Workers, Planing and Matching Machines, address Bentel, Margedant & Co., Hamilton, Ohio.

Wind Mill Rights Cheap—One county in each State to give for introducing the mill. For terms, &c., address E. S. Smith, Good Hope, Ill.

Wanted—Address of Makers of Papier Maché Ceilings. Address J. Farnsworth, Des Moines, Iowa.

Corner Cutting Machine, Chocolate Mill, Bolt Cutter, Letter Press and Stand—all at Bargains. A. B. Cobu, 197 Water St., New York.

Hamilton Rubber Works, Trenton, N. J., Manufacturers of X pavement Hose, and any size, also Belting, Packing, Car Springs, and Rubber for Mechanical use. Send for price list.

Notes & Queries

C. S. R. will find that celluloid is a substance suitable for his purpose. See p. 23, vol. 33.—C. H. D. will find a good description of soluble glass on p. 148, vol. 33.—F. H. will find a description of the transfer fluid, for transferring engravings to wood, etc., on p. 138, vol. 30.—M. M. will find directions for preserving natural flowers on p. 204, vol. 23.—F. L. W. will find directions for stuffing birds on p. 250, vol. 30.—B. W. B. will find directions for setting carriage axles in this issue.—N. D. will find a recipe for hydrofluoric acid, for embossing glass, on p. 203, vol. 33.—M. G. will find an explanation of the difference between the heights of the tides in different localities on p. 65, vol. 28.—D. W. G. will find a formula for safety valves on p. 107, vol. 31.—A. B. F. will find a description of a Bunsen burner on p. 287, vol. 33.—N. S. will find directions for forming a sun dial on p. 409, vol. 29.—F. W. D. will find directions for silverplating without a battery on p. 408, vol. 33. For a similar gold plating, see p. 116, vol. 33. For silverplating with a battery, see p. 133, vol. 30.—G. G. will find a good recipe for black ink on p. 22, vol. 33.—J. F. A. can caseharden his steel cams by the method described on p. 69, vol. 31.—M. S. can prevent an accumulation of rust on his machinery by following the directions on p. 169, vol. 33.—W. E. D. will find a good recipe for gold lacquer on p. 240, vol. 34.—A. S., J. H. T., A. J. W., Jr., J. McC., E. G. P., A. L., W. H., and J. K., 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) P. M. H. A. K. asks: How many horse power will it take to run a 60 inch circular saw through a 2 feet log of hemlock or oak? A. Ordinarily about 10 horse power to every 1 inch of feed in each revolution of the saw. In order to give anything like a correct estimate, the amount of feed to each revolution, the number of teeth, and speed of the saw should be given. Sixty inch saws are run to cut all the way from 5,000 to 40,000 feet of oak and hemlock per day.—J. E. E., of Pa.

(2) A. B. W. asks: 1. Of what size and of what kind of glass should a lens be to take a photograph 2 feet square, the object to be about 18 to 20 feet from the glass, and the focal distance 2 or 3 feet? A. You should have a photographic view camera of 2 feet focal length. The size of the glass may be two or three inches diameter. 2. Could such a photograph be taken easily? A. Not very. 3. Please give me a process for taking negatives on glass. A. Consult some text book on photography.

(3) F. F. says: I see in the SCIENTIFIC AMERICAN SUPPLEMENT mention of a meteor which passed near Boston on February 5. The article says that, "after traversing a path which consumed a second in time," it gradually slackened speed, and finally became motionless. At the speed at which it must have been moving, how could it have become motionless? A. The article says that the meteor moved from east to south, which implies a change in its line of motion, so that, when the direction was in the line of sight, it became motionless to the observer. This was probably caused by the body being deflected by the resistance of our atmosphere.

(4) N. A. E. asks: How can I use crayons on drawing paper without leaving streaks? A. An even tint can be produced by using the tip of the finger, or a small pointed piece of india rubber, or a paper or leather stump, to be bought of a dealer in drawing materials.

(5) X. Y. Z. asks: What are coprolites? A. They are the fossil excrements of extinct animals, and are found in immense beds in some countries. They are valuable as manure.

(6) H. T. asks: Is it possible that a direct-acting steam pump can work with a variable cut-off so that the steam expands down to 15 lbs.? A. We know of no direct acting pump having a variable cut-off.

(7) J. W. asks: 1. Will a cupola 6 inches in diameter be large enough to melt and run into one piece 20 lbs. of cast iron? A. No. 2. What is the largest amount it will run into one piece? A. It might run 10 lbs. 3. The bottom of the coal and iron door is 3 feet 2 inches above the bottom of the cupola; is this high sufficient? A. Yes, for the diameter of the cupola.

(8) G. W. C. asks: 1. Is there such a thing as a drill for drilling square holes? A. No. 2. Is there any probability of one being invented? A. No.

(9) C. S. C. asks: 1. Is tool steel the best for making tuning forks? A. Yes. 2. What temper is required? A. Temper it to a blue. What grade of soft iron is best for electro-magnets? A. Ulster or Norway iron is best.

(10) B. S. says: I have a portable engine, and the boiler is cracked. The crack is about two inches long; it is situated just above the grates, near the mud valve, and it leaks slightly. Is there

any way of stopping the leak without having the boiler patched? A. Cement may be used. See p. 331, vol. 32. The best plan is to patch the boiler.

(11) F. L. asks: What is the safe working pressure for a boiler made of wrought iron gas pipe, of 2 inches internal diameter? A. You can carry 100 lbs. per square inch.

(12) G. C. W. asks: Will white lead harden under water? A. No.

(13) A. asks: 1. Will copper, when melted, flow as freely as lead? A. No. 2. Will copper give as good an impression of the mold as lead? A. No. 3. Will a black lead crucible stand sufficient heat to melt copper? A. Yes.

(14) W. M. B. asks: Would the wear from friction on a pulley be greater in using a wire band than with a leather belt? A. Yes.

(15) F. D. L. asks: Is there any flux, welding compound, or means whereby a steel face can be united to the jaws of a cast iron vise by putting the steel in the mold, and pouring thereon molten iron? A. Steel faces are welded to cast iron in the way you mention, without the employment of any flux.

(16) W. S. F. asks: Is there any other way of making steel name stamps than with a chisel? A. We know of no way of making them save with chisels and files, but they could no doubt be stamped with suitable dies.

(17) H. D. S. S. asks: Is there a machine shop in the country that has the capacity of building two locomotives a day? A. We know of none.

(18) P. E. L. asks: Can cone friction couplings be used on a shaft running at 140 revolutions per minute, transmitting 30 horse power, one part of the coupling to have a lever attached to throw the same in and out of gear while running? A. Yes. Friction pulleys will answer the purpose well.

(19) W. H. C. asks: By what process may cast steel be annealed so that it can be easily cut with a chisel? A. Heat it slowly to a cherry red, and let it cool off, well covered with slaked lime.

(20) J. S. M. asks: 1. Is the pump on an engine to force the water into the boiler? A. Yes. Where is it generally situated? A. Beside the boiler. 2. By what means is it worked? A. By an eccentric, cam, or crank.

(21) E. G. asks: How can I keep cider sweet for the market? A. If after the first racking the fermentation still continues, it is better that the operation should be repeated as often as any scum rises to the surface. The final racking should be performed in fine weather. When the bottles are filled they should be set by, uncorked, until morning, when the corks must be driven in tightly, and secured by wire and melted rosin or any similar substance.

(22) B. asks: What is the best method of calcining borax? A. Put it in a capacious cast iron pan over a moderate fire.

(23) F. B. M. asks: How can white lead paint be made from old lead pipe? A. Roll the lead out into a thin sheet and place it in an earthen pot with a little vinegar in the bottom. Then bury the pot in fermenting stable dung or spent tan bark. The acetic acid of the vinegar corrodes the metal, forming a superficial coating of acetate of lead. The carbonic acid set free by the decomposing vegetable matter displaces the acetic acid, combining with the lead and forming the carbonate (white lead). The acetic acid thus released attacks more metal, which is again carbonized, and thus, with a small charge of vinegar, the operation is continued a long time, and a large quantity of lead changed into carbonate.

What is the weight of a medium-sized locomotive? A. About 30 tons, with the tender.

(24) J. C. R. asks: How can I mold chalk? A. Ground chalk, if moistened with a little gum water, may be pressed into a mold in a compact mass, by means of hydraulic pressure.

(25) G. M. Jr., asks: What is the process of making deodorized alcohol or cologne spirit from common alcohol? A. Alcohol employed in perfumery should be free from all smell of fusel or other oils. Atwood's (patent) alcohol is deodorized by distillation over permanganate of potassa. Spirit of wine, brandy, and alcohol distilled over soap lose their empyreumatic odor and taste entirely. At about 215° Fah., the soap retains neither alcohol nor wood spirit. The empyreumatic oil which remains in combination with the soap which forms the residuum of the distillation, is carried off at a higher temperature by the watery vapor, which is formed during a second distillation, the product of which is a soap free from empyreuma, and is fit to be used again for similar purposes. The concentration of the alcohol increases in this operation more than when the soap is not employed, because this compound retains the water, and the alcoholic vapors which pass over are more concentrated. Thirty-three pounds of soap are enough for one hundred gallons of empyreumatic brandy; and direct experiment has shown that, under the most favorable circumstances, the soap can retain 20 per cent of empyreumatic oil. The soap employed should contain no potassa; it should be hard or soda soap, and ought to be completely free from any excess of fatty acids or fluids, otherwise it may render the product rancid or impure. Common soap, made with soda and oleine, has satisfied all the conditions in practice. If this soap is employed, it is better to add a little soda during the first distillation.

(26) C. A. asks: 1. Would a horizontal engine 2x3 inches propel a boat, large enough for 2 persons, up stream? A. You could use this engine in a boat 20 feet long. 2. What size of boiler would she want? A. Make one 2 1/2 feet in diameter and 4 feet high. 3. What speed would she make? A. Probably 5 or 6 miles an hour.

(27) A. L. asks: How can I vulcanize caoutchouc? A. Parkes' method is now generally adopted. The caoutchouc is immersed in a mixture of 30 parts of bisulphide of carbon and 1 part of chloride of sulphur. It is next placed in a room heated to 70° Fah.; and when all the sulphide of carbon has been volatilized, the process is so far complete that it is only requisite to boil the material in a solution of about 18 ozs. of caustic potassa to 2 gallons of water, the vulcanized caoutchouc being next washed to remove excess of alkali.

(28) C. S. A. asks: Please explain how the jetties at the mouth of the Mississippi river are made. A. See p. 273, vol. 32.

Are they now at work on the tunnel between New York and Jersey City? A. Yes.

We have some glasses that were dipped into water with milk on them; the hot water seemed to set the milk, leaving a milky stain on the glasses, that we cannot wash off. How can we make the glasses look clear again? A. Try a little common washing soda.

How is dry steam made? A. By using a well constructed boiler or a superheater.

(29) D. R. asks: 1. In tinning brass, which is the best method, by cream of tartar boiling or by protoxide of tin solution? A. The cream of tartar method is in more general use. 2. What is the time required to do it? A. It varies from 10 minutes to half an hour, and sometimes longer. 3. In polishing smooth sheet brass to a high finish, how shall I prepare my wooden wheel after the leather is applied to the rim? A. Glue emery to the cutting wheel; and for polishing, use a brush wheel and a rag buff to finish with.

(30) J. M. asks: 1. How much incline per foot should an electro-copper plate have to insure success in arresting very fine gold dust? A. Amalgamated copper plates, set in sluices for obtaining very fine gold, are put at an incline of from 1 to 1 1/4 inches per foot. 2. Do strata of red sand found in aluminum or modified drift generally contain gold dust? A. We believe so.

(31) W. J. G. asks: 1. Does it make any difference in the expansion and contraction of mercury, in a thermometer, whether the tube is sealed or not? A. Yes. 2. How can I regulate automatically the heat in a close box, so that I can secure a certain temperature? A. It can be done by heating the box with steam or water at a fixed temperature.

(32) R. C. asks: At how many revolutions per minute could I run with perfect safety a grindstone 6 feet in diameter and 8 inches wide on the face? A. It would not be well to run the stone faster than 75 or 80 revolutions per minute. This is on the supposition that the stone is as strong as a built-up millstone.

(33) J. G. R. says: I have an engine of 1 inch cylinder and 2 1/4 inches stroke, and want to build for it a boiler which will make steam rapidly and which will stand about 25 to 30 lbs. pressure. Of what size, material, and form should it be? A. Make a cylindrical boiler 10 inches in diameter and 2 feet long. Copper is a good material; it should be about 1/2 of an inch thick, with heads from 3/4 to 1/2 inch thick.

(34) M. E. J. asks: Supposing a ball of immense weight to be rolled around on the surface of the earth, would it affect the center of gravity? If it did, suppose a ball of the same weight could be fired from a cannon around the earth without touching the surface, would that affect the center of gravity in the same way? A. The effect you mention would be produced in both cases.

(35) J. M. Y. asks: At what speed should water move in a draft tube under a water wheel to give the most power to the wheel? A. If you make the draft tube with the same area of supply, and allow it to dip into the water a few inches at the bottom, you will have a satisfactory arrangement, provided the tube is airtight. It is very important to attend to the latter point.

(36) J. F. B. asks: 1. Can water be raised 10 feet high by a wheel 10 inches in diameter, 3 inches wide, the floats being fastened on a square shaft? A. You will have no trouble in raising the water to that height, with 100 to 150 revolutions a minute. 2. What should be the size of the pipe in which it is to be raised? A. A two inch pipe will answer very well.

(37) C. D. B. asks: If I let steam into a vessel of boiler plate, 2 feet in diameter and 6 feet long, to the pressure of 100 lbs. to the square inch, how long will it take for the same to lose its pressure? A. If the air surrounding the boiler is still, the radiation will take place at the rate of between 3 and 4 units of heat per hour for each degree of difference between inside and outside temperatures.

(38) S. P. S. asks: 1. How high may I carry the water in a boiler constructed with an inside case, without danger of filling the inside case? I wish to generate steam at the rate of 1 cubic foot per minute for each linear foot of the boiler, and the water is 6 or 7 inches wide at the water line. Will the water collect in the steam room to any great extent if the water line is kept 4 inches below the top of the case? A. You will have to make some experiments to determine this matter definitely. We imagine, however, that you will find it necessary to carry the water at least 6 inches below the top of the case. 2. We have an engine which runs at 120 revolutions per minute, with a fly wheel 8 feet in diameter, the rim being 14 inches wide and 3/4 thick at edges, and 1 1/4 inches thick in the middle. We need to stop it some times quickly, and as the bottom of the wheel is close to the ground, I propose to use a brake. What pressure is it safe to put upon the wheel? A. You will probably find it safe to apply pressure equal to the tension of a belt on the fly wheel when the engine is doing its greatest amount of work, and this will be more than sufficient for your purpose.

(39) C. S. P. asks: 1. What size of boat, ribless pattern, will be large enough to carry 12 or 15 persons? A. Make it 30 feet long and 6 1/2 feet wide. 2. What size of boiler is necessary for an engine 4x6 inches? A. Make a boiler 3 feet in diameter and 4 feet high. 3. What size and pitch of propeller will be necessary to run the boat as fast as possible? A. Propeller 2 1/2 feet in diameter and of 3/4 feet pitch.

(40) T. K. G. asks: 1. Will a simple coil of pipe do for a superheater? A. Yes. 2. Can there be any joints in the same, either of malleable or cast iron, without the difference in expansion causing a leakage of steam? A. We think that such joints might be made tight. 3. Is a check valve necessary between the boiler and superheater to prevent the return thereto of the superheated steam, in case the flow of steam at the outlet was checked or retarded? A. Some kind of valve is required. 4. Why is there no economy in fuel in distilling in *vacuo*? A. There might be some trifling economy if the cost of maintaining the vacuum were not counted; but it would be very slight, as the diminution in the total heat of evaporation would be very little.

(41) W. G. says: I have a steam pump with a 22 inch cylinder, 700 feet underground, and I am obliged to carry the exhaust steam to the surface. Of what size should the exhaust pipe be so as not to have any back action on the engine? A. The exhaust pipe should have an area at least as large as the exhaust port of the engine. 2. What is the cheapest and best material to make it of? A. Make it of galvanized iron.

(42) R. J. M. says: 1. I am about to construct an engine with a 4x1 inch cylinder. What should be the size of the ports and exhaust? A. About 1/3 of piston area. 2. How large a fly wheel would I need? A. From 9 to 10 inches in diameter. 3. What should be the size of the boiler, using charcoal for fuel? A. Make it 10 inches in diameter and 2 feet long. 4. Could I use a wood cylinder, allowing the wood to be half an inch thick? A. Not with satisfactory results.

(43) I. Y. asks: Does it make any difference how high a dam is on a stream of water if the wheel uses all the water? For instance, we have a mill running 10,000 spindles, and it holds the water just inside the dam and no more. We want to run 2,000 more spindles; would raising the dam give us any more power? A. Under the circumstances stated by you, raising the dam and doing nothing else would produce no effect on the power.

(44) S. T. M. asks: Why is the letter E placed on the left hand side of an ordinary surveying compass, transit, or similar instrument, and the W is placed upon the right? A. Some instruments are graduated with the E on the right, but the more usual arrangement is as stated in your question. We do not know who first adopted the graduation; but the reason for it is easily explained. Suppose a line to which the compass is directed has an E bearing; then in an instrument graduated like a mariner's compass, the N end of the needle would point to W, because in taking a bearing the needle is stationary and the graduated circle revolves; so that a bearing to the right of N is read off from N towards the left, and *vice versa*. Hence, if the instrument were graduated as in the mariner's compass, it would be necessary to reverse the readings before entering them in a notebook.

(45) E. R. asks: How can I fix gold on picture frame moldings? A. First give the wooden frame a coating of hot size and whiting both articles must be of the best quality. Smooth this coat down with a pumicestone and water, and thoroughly dry. Melt some glue size in water, and apply with a soft camel's hair brush. Let dry, and wet a part at a time as required, and press the gold leaf on lightly, and blow on it with the mouth to level it. Burnish with an agate tool.

(46) T. B. C. asks: 1. Does sulphuric acid lose its affinity for watery vapor by use? A. It gradually becomes diluted by absorption of the aqueous vapor, and becomes correspondingly less efficient. The rapidity with which this takes place depends altogether upon the apparatus itself and the method of working it, and it can be determined by experiment. 2. Is the acid decomposed or otherwise rendered worthless after using for a certain length of time? A. The acid is not decomposed, but combines with the water to form a hydrate. The acid may be recovered again with all its original strength by evaporating the liquid in large glass or porcelain lined vessels.

(47) F. C. R. asks: What size of engine is best for a boat 25 feet in length and of 7 feet beam? A. One about 4x6 inches would probably answer.

(48) F. H. asks: 1. Do the screw propellers used on ocean steamers have two, three, or four blades? A. They generally have either three or four blades. 2. What is the number of blades on the propeller screws used on the White Star Line? A. We believe that three-bladed Hirsch propellers are used on the steamers of this line.

(49) B. A. J. asks: Why do frozen mercury and red hot iron produce the same sensation? A. They both disorganize the flesh.

(50) T. M. D. asks: What would be a safe pressure to carry in a boiler 12 inches high and 10 inches in diameter, made of 1/2 inch copper, with a 3 inch flue? A. Safe pressure will be about 15 lbs. per square inch. 2. Would the above boiler do for running a sewing machine with an engine 1 1/2 inches bore and 3 inches stroke? A. Yes, if it be well set.

(51) C. F. and others ask for a recipe for a nickel-plating solution. The following is a good one: Digest the nitrate of nickel in ammonia until it will dissolve no more. Then add a cold, saturated solution of Glauber's salt (sulphate of soda)

until a precipitate begins to form. Heat gently for some time, filter, and allow to cool. It is then ready for use.

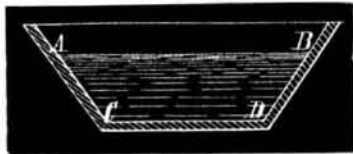
(52) I. F. F. asks: 1. Which is the deepest well in the world? A. The brine well at Kissingen, in Bavaria, is 2,000 feet deep. We believe there is one in Paris nearly 3,000 feet in depth. Perhaps some of our readers can tell us of deeper ones. 2. Can water be taken out of a well 20 yards deep by any other way than by steam, wind, animal, hand, or other power? A. No. Some kind of power be required.

(53) M. H. K. says: We recently melted some silver, using muriate of ammonia and borax as flux. On taking out the ingot it usually shows a granulated surface, similar to that frequently seen on zinc-coated articles. In this case the surface showed (under a glass) fine cracks following the lines of the granulations. Please explain both granulated appearance and cracks. A. The fissures were probably caused either by some impurities in the fluxes employed or contaminations in the metal. When silver is fused, it absorbs oxygen from the air, which is again liberated on cooling.

(54) C. J. A. asks: How much variation would the sixteenth of an inch at the muzzle of a rifle make in the flight of a ball, over 1,000 yards of ground, supposing the gun to shoot correctly, there being no wind to vary the ball in its flight? A. Length of gun from breech to muzzle, in feet:: 3,000:: 0.0625: variation at target, in inches.

(55) J. P. B. asks: 1. How can I find the specific gravity of a fluid with a specific gravity bottle containing 100 or 1,000 grains? A. The liquid to be examined is brought to the temperature of 60° Fah., and with it the bottle is filled up to the mark. It is then weighed, the counterpoise being on the opposite scale pan. Divide the weight thus obtained by the weight of an equal volume of pure water at the same temperature. The quotient will be greater or less than unity as the liquid experimented upon is heavier or lighter than water. 2. How much ought a fluid to weigh before dividing it by the contents of the bottle, whose specific gravity is 1.2? A. The specific gravity of the bottle itself is not taken. A counterpoise of the exact weight of the empty bottle is made from a bit of brass, an old weight, or something of the kind, and carefully adjusted by filing.

(56) J. P. M. asks: What is the meaning of "area of way in square feet," and "wet perimeter in feet?" A. If water flows in a trough at



the level, A B, then the area of way is the area of the cross section of the water, A B C D; and the wet perimeter is the length of the line of contact, A C D B, of the cross section of the water with the cross section of the trough.

(57) R. S. M. says: 1. I want to run two 60 saw gin stands at the distance of 300 yards. What size of shaft shall I use? A. Use 2 1/2 inch shafting. 2. What distance should the bearings be apart? A. From 7 to 10 feet. 3. Does the length of the shaft tend to weaken it? A. Yes.

(58) E. D. Z. asks: 1. In building a small sloop, what kind of putty shall I use in the nail holes? A. Mix 10 lbs. whiting with 1 lb. white lead, adding enough linseed oil to give the putty the proper consistence. 2. What size of iron wire rope should I use for the jib stay and for the shrouds, one on each side of the mast, for a main sail of 216 square feet and a jib of 106 square feet? A. Probably the smallest size made for ship's rigging will answer very well.

(59) S. A. C. asks: Would a process, by which the surface of wrought iron while being forged to the desired shape, could be made susceptible to being hardened by plunging red hot in cold water, be of any practical value? A. Yes.

(60) W. F. asks: Why will not smoke ascend through the flues and up the chimney of a boiler which has lain still for four or five days? A. Probably because the draft is imperfect and the connections cold.

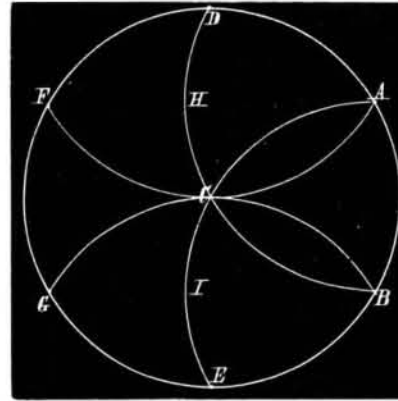
(61) S. D. K. says, in reply to S. H. B., who asked concerning building skiffs: Having decided on the length and width of the boat, take a piece of rough board, as wide as the boat is to be high, and as long as the greatest desired width of the boat. Saw the ends on a bevel of about 4 inches to 1 foot. Then select the boards for the sides, saw the ends to the same bevel as the cross section, and find the center of each. Then nail them by their centers to the beveled ends of the cross section, driving two nails each side half way in so that they can be easily withdrawn. Bring the boards together at both ends, fit stem and stern posts, secure them well, turn the boat bottom up, and true off with drawing knife and plane. Then nail on the bottom, turn over again, true off the top fit knees, knock out the cross section, and the boat is done. This will make a boat as fast as can be made, and of perfect shape. The boat, when finished, should be alike at both ends, and (for speed) about one sixth wide as it is long. The bottom should form a curve of about 1/4 of an inch to a foot, both fore and aft and athwartships, as straight lines are not compatible with speed.

(62) J. M. M. says, in answer to J. E. J., who asks if an achromatic spyglass of 50 power would be of any use for astronomical purposes: I have a glass of 35 power, which shows the globular form of the planets, the moons of Jupiter and Saturn, rings of Saturn, sun spots, etc. I have also told the time of day from a clock 10 miles distant. I can discern a man over 20 miles away on a clear day.

(63) C. A. K. says, in answer to R. I. C.'s query as to power for grinding: I have run two pairs of 54 inch burrs with an engine of 25 horse power, grinding 100 bushels per day of 10 hours (80 bushels corn and 40 wheat). The speed of engine was 150 revolutions, that of burrs, 109.

(64) D. J. F. says, in reply to R. T. C., who asks how much wheat should a 4 foot stone grind in a day: A 4 foot stone in good order, properly dressed and furrowed, should only grind from 10 to 12 bushels per hour, and do first class work. You can grind from 18 to 24 bushels per hour if you want to, but you cannot do good work at this pace.

(65) R. A. says, in solution of the problem of constructing a perfect square with compasses, without the aid of any other instrument: This is in the rigid sense, impossible, as a square is a figure bounded by right lines. The solution by W. S. D. (who assumes a line, though he omits it in the diagram) only determines the points through which (or to which) the lines should be drawn, but they cannot be drawn with compasses. But the solution is faulty, for he cannot measure half an arc with compasses alone: he only guesses at it. The following solution is subject only to the



objection first stated: From A and B as centers, describe the arcs, B C D, A C E; with C as a center, describe the circle, A B E G F D; with D and E as centers, describe the arcs, A C F, B C G; then will the points, A, B, G, F, form a rectangle, the portion of which between the points, A and B, and the points, H and I, where the right lines from A to F and from B to G would meet the arcs, C D and C F, is a perfect square. My square is not drawn, neither is W. S. D.'s, but the same process which is necessary to complete his will complete mine.

(66) E. R. H. says, in answer to F. A. R., who asks for a rule for measuring ear corn in a crib. Multiply the length, breadth, and height in inches together, and divide by 3,888. The answer will be the number of bushels of shelled corn.

(67) M. R. says, in reply to a correspondent who asks for a remedy for corns: Bind raw cotton on your corn at night before going to bed, and then saturate the cotton with spirits turpentine. It will remove the most obstinate corn, either hard or soft, in four or five applications. The skin will be apt to peel off the toe, but this is rather an advantage, as it helps to remove the corn.

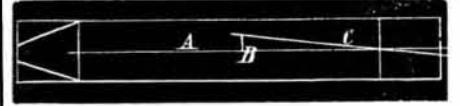
(68) O. P., of Rosloff, Russia, says: In reply to G. W. F., who asks in which position (top or bottom center) of the crank does a locomotive engine exert the most power, you say that there is no difference. I contend that there is a difference; for if the engine is going forwards, and the crank is at the bottom center, it has the full power of the whole area of the piston on it; whereas when the crank is on the top center, the piston rod takes up some of the area of the piston, thus giving less room for steam. When the engine is in back motion, the conditions are reversed. In engines with piston rods running through the whole cylinder, your answer would be correct. Am I right? A. No. When the engine is going forward and the steam is on the rod side of the piston head, the guide bars are relieved of the weight of the connecting rod, guide blocks, cross-head, etc., which quite compensates for the loss of area due to the piston rod.

(69) H. E. W. says, in reply to W. A. S., who asks how he can straighten wire: Put one end, after the wire has been annealed, in the lathe; and fastening the other end so that it cannot turn, start the lathe, and by thus twisting the wire will become perfectly straight and stiff, and not be injured in the least.

(70) C. H. S. says, in reply to M. J. M., who asked for a good rule for setting thimble skains: The first thing is to lay out your axles correctly. For the gather, measure off on the bottom of the axle half the diameter of the wheel. Then make a point, at 1/4 the amount of gather you want, back of the center of your axle at the point measured off. A line from this point, through the center of the axle at the shoulder, will give the gather. For the pitch: Measure as before 1/4 the size of the wheel on the side of the axle. Then measure up, from the bottom of the axle, 1/4 the size of your hind boxing at the shoulder and at the point you have measured off. At this point measure off, above the half diameter of your boxing, one fourth the amount of pitch you want. Thus: If you want your wheels to stand 4 inches wider at top than bottom, measure up 1 inch, etc. A line, from this point through the point at the shoulder will give the pitch. Then measure from this line, each way, half the size of your boxes, and your axle is laid out. To set the skains, it is only necessary to square down on the end of the axle from the lines you have drawn, each way. Then using their point of intersection as a center, strike a circle the size of your skain inside, at the front end, and taper it to that, uniformly from the shoulder. As a cement to fasten them after they

are thus fitted, you will find nothing better than white lead and linseed oil, made as thick as it can be applied nicely.

(71) E. D. P. says, in reply to M. J. M.'s question in regard to setting thimble skains: Draw a line, A, through the center of axle; measure back from shoulder one half the height of wheel: then mark the dish of wheel, B; about the center line



from this mark, draw line, C, crossing center line at shoulder, and extend to point of skain, which will give you center of skain. Half the diameter of skain below this line will give side of skain at butt and point.

(72) J. E. T. says, in answer to the query as to the side of the largest cube that can be cut from a ball 12 inches in diameter: It is evident that the longest possible diagonal of the cube is 12 inches. Now the square of the longest diagonal of a cube is equal to three times the square of either side; therefore the square of diagonal=144, which divided by 3 gives 48. The square root of 48=6.9282+=side of square. [This answer is correct. A. I. F. and J. D. E. have sent similar replies. L. S. W.'s reply, on p. 287, vol. 34, is erroneous.—Eds.]

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

J. W. F.—It consists principally of salt, with some blue dye.—T. I. H.—They are rolled fragments of quartz.—I. R.—The principal constituents are silica, silicate of alumina, and oxide of iron. A complete analysis would show the presence of 5 or 6 other constituents. The cost of the analysis would depend upon its completeness. If you desire a qualitative analysis, with the total amounts of solid mineral and organic constituents, the cost would be \$12, and the amount of water required will be 1/2 gallon; if a complete quantitative analysis, as well, the cost would be \$35, and the amount of water required 2 gallons.—L. M. N.—It appears to be resin, containing tarry matters, borax, and paraffin.—W. M. S.—Your boiler scale is not dangerous. It is clay, oxide of iron, and carbonate of lime.—N. D. S.—It is decomposed granite. The shining scales are muscovite.—J. F. W.—It is aventurin, and a specimen of it is in every mineral cabinet.—G. B. L.—No. 1 is sulphide of zinc. No. 2 is oxide of iron and clay.—A. W. D.—No. 1 is sand, clay, and quartz, of no value. No. 2 is sulphide of zinc.—J. T.—We find only iron pyrites.—J. S. W.—It is celluloid.—S. L. S.—It is trap rock, containing a small percentage of iron. It is not an iron ore.—R. G. S.—It is sulphuret of iron and copper.—C. A. B.—From its appearance, it would be well to give it a practical trial as fire clay. It should be profitable.—L. W. S.—They are beautiful crystals of selenite, commonly called gypsum or sulphate of lime.—C. W.—It is principally nitrate of soda, with a small percentage of chloride of lime and magnesia.—H. E. B., of Wilson, N. C.—It is hydrated sesquioxide of iron or brown hematite. It is probably worth mining.—A. B. R., of West Burke, Vt. They are sulphides of iron and copper.—We have several letters from which the specimens have escaped in course of transit; and we recommend our correspondents to put each specimen securely in a box and mark it with the name and address of the applicant.

J. L. asks: What is the process employed in making photographic tin types?—A. P. asks: How is mica split?—C. A. K. asks: How can I find the area enclosed between the arc and the radius vectors of an ellipse (said radii being drawn from one of the foci), if the semi-axis major, the angle subtended by the radii, and the eccentricity of the ellipse are given?—J. T. asks: Can any one oblige me by describing the photo-engraving process and the photo-lithographic process?

COMMUNICATIONS RECEIVED.

The Editor of the **SCIENTIFIC AMERICAN** acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

- On a New Hydrometer. By H. W.
- On a Pendulum in a Mine. By J. M. H.
- On the Glacial Epochs. By J. H.

Also inquiries and answers from the following: C. J. R.—G. A. P.—J. T. H.—N. R.—E. A. D. P.—J. D. E.—N. M. W.—J. W. S.—C. C. L.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who makes lamp chimneys of tempered glass? Who sells drawing instruments? Who sells an engine worked by ignited petroleum? Who makes the best lenses for photographic portraiture? Why do not dealers in photographic chemicals advertise in the **SCIENTIFIC AMERICAN**?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.