

Business and Personal.

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Mechanical Working Drawings a Specialty. Pemberton & Scott, 37 Park Row, room 30.

Assays of Ores, Analyses of Minerals, Waters, Commercial Articles, etc. Technical formulæ and processes. Laboratory, 33 Park Row, N. Y. Fuller & Stillman.

Vertical Scientific Grain Mills. A. W. Straub & Co., Phila.

Telephones.—Send two stamps for Working Cut with instructions. Electric Supply Co., Providence, R. I.

Wanted.—A first-class business man with \$10,000 to invest, and capable of assuming the general management of a Machine Shop and Foundry in Western Canada. Shop now in operation; connections first-class; and security unquestionable. F. W. Glen, Oshawa, Ontario.

Wanted.—A Second-hand Planer and Matcher to work 12 in. G. B. Lartigue, Blackville, Barnwell Co., S. C.

Wanted.—6, 8, and 10 horse Engine Patterns, horizontal; 60 to 72 inch Swing Lathe; 2 Ton Geared Pulley Blocks. Address Lock Box 50, Marietta, Ga.

Wanted.—Parties to manufacture a first-class Side-hill Plow on Royalty. P. Bouchet, 140 W. 28th St., N. Y. Agency wanted for Patented Specialties in Machinery. J. H. Kelly, 46 Cortlandt St., N. Y.

Wanted.—Machinery, new or 2d hand, for Laying Window Lines, etc. P. O. Box 641, Boston, Mass.

Superior Hoisting Engines, all kinds, sizes, and prices. 96 Liberty St., N. Y. Lidgerwood Manuf. Company.

New Lathe Attachments, such as Gear Cutting, Tap and Spine Slotting. W. P. Hopkins, Lawrence, Mass.

Wanted.—A good 2d hand Power Hammer, medium size, steam or belt. Ramsay & Latrobe, Baltimore, Md.

The Cameron Steam Pump mounted in Phosphor Bronze is an indestructible machine. See ad. back page.

Friction Clutches warranted to drive Circular Log Saws direct on the arbor; Upright Mill Spindles, which can be stopped instantly; Safety Elevators, and Hoisting Machinery. D. Frisbie & Co., New Haven, Conn.

Telephone Supplies.—All the parts but the diaphragm of a pair of Telephones, with instructions for completing it, sent on receipt of \$5. C. E. Jones & Bro., Cin., O. Sperm Oil, Pure. Wm. F. Nye, New Bedford, Mass.

Walrath's Improved Portable Engines best in market; 3 to 8 H. P. Peter Walrath, Chittengo, N. Y.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

For book on Lubricants, R. J. Chard, 134 M. Lane, N. Y.

2d Hand Iron Planer built by Smith of Salem. Plane 13 ft. x 30 in.; price \$300. A. C. Stebbins, Worcester, Mass.

Cornice Brakes. J. M. Robinson & Co., Cincinnati, O.

John T. Noye & Son, Buffalo, N. Y., are Manufacturers of Burr Mill Stones and Flour Mill Machinery of all kinds, and dealers in Dufour & Co.'s Bolting Cloth. Send for large illustrated catalogue.

Power & Foot Presses, Ferracite Co., Bridgeton, N. J.

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 Packing Company, 37 and 38 Park Row, N. Y.

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

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

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing metals. E. Lyon & Co., 470 Grand St., N. Y.

Wanted.—Second-hand Gun Stocking, and other Gun Machinery. Address V. A. King, Lock Box 81, New Haven, Conn.

For Boulton's Paneling, Moulding, and Dovetailing Machine, and other wood-working machinery, address B. C. Machinery Co., Battle Creek, Mich.

Patent Scroll and Band Saws. Best and cheapest in use. Cordesman, Egan & Co., Cincinnati, O.

Chester Steel Castings Co. make castings for heavy gearing, and Hydraulic Cylinders where great strength is required. See their advertisement, page 190.

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

For Best Insulated Telegraph Wire, Telephone Wire, and Flexible Cordage, Eugene F. Phillips, 67 Stewart St., Providence, R. I.

Silver Solder and small Tubing. John Holland, Cincinnati, Manufacturer of Gold Pens and Pencil Cases.

Lansdell & Leng's Lever and Cam Gate Valves. Cheapest and best. Leng & Ogden, 212 Pearl St., N. Y.

Best Machinists' Tools. Pratt & Whitney, Hartford, Ct.

Hand Fire Engines, Lift and Force Pumps for fire and all other purposes. Address Rumsey & Co., Seneca Falls, N. Y., U. S. A.

The Turbine Wheel made by Risdon & Co., Mt. Holly, N. J., gave the best results at Centennial test.

Vertical & Yacht Engines. N. W. Twiss, New Haven, Ct.

Fast Boat Engine Castings of the type of the celebrated Steam Launch Flirt for sale. Price, with working drawings, \$25; the same finished, \$150; larger sizes at proportional rates. Send for description. H. S. Maxim, M. E., room 74, Coal and Iron Exchange, or P. O. Box 1849, N. Y.

Bound Volumes of the Scientific American.—I have on hand about 200 bound volumes of the Scientific American, which I will sell (singly or together) at \$1 each, to be sent by express. See advertisement on page 190. John Edwards, P. O. Box 773, N. Y.

NEW BOOKS AND PUBLICATIONS.

MAGNETIC VARIATION IN THE UNITED STATES. By J. B. Stone, Ph. B. C. S. Published by the author, P. O. Box 446, Boonton, N. J. Price \$1.50.

This is a compilation of observations made in America from the year 1640 up to the present time, tabulated and arranged for the use of surveyors. The author in his practice has found no tables giving the allowance to be made for difference in variation, and in the present work he supplies the need, the data given

being of especial use in surveys by the compass for the recovery of old lines. A valuable résumé is given of the progress in the investigation of the subject of magnetic variation from the earliest periods of its discovery in England to the present time. The book is excellently written, and the tables are clearly and accurately printed. The work will doubtless prove of much practical value to surveyors generally.

A HANDBOOK OF VOLUMETRIC ANALYSIS. By Edward Hart, S. B. John Wiley & Sons, Publishers, 15 Astor Place, New York city. Price \$2.50.

A clearly written and well illustrated text book, succinctly yet fully covering its subject. The methods described are in accordance with the latest advances, and the instruction given is practical and well calculated to interest the student. The publishers deserve great credit for the excellent typography of this and some other text books they have recently issued. Nothing is so annoying to the learner as fine or poor type and inferior illustrations, while, on the other hand, large clean characters and clear comprehensible engravings, such as are here before us, render many a dry subject inviting.

WOODWARD'S ORNAMENTAL AND FANCY ALPHABETS. Published by Geo. E. Woodward, 136 Chambers street, New York city.

This contains one of the largest collections of ornamental alphabets that we have ever seen published—and all the designs are tasteful. Monograms of almost all conceivable combinations of letters are an especial feature of the book, and the author shows much artistic skill and ingenuity in devising new fancy initials. The work is well suited to the needs of architects, draughtsmen, and designers generally.

The Journal of Physiology is the title of a new journal just introduced by Messrs. Macmillan & Co. It is edited by Dr. Michael Foster, F. R. S., with the co-operation of Professors Gannage (Manchester), Rutherford (Edinburgh), J. B. Sanderson (London), England, and of Professors Bowditch (Boston), and Martin (Baltimore), America.



F. C. S.—See SCIENTIFIC AMERICAN, March 16, 1878, p. 172.—E. C. C.—See answer to L. A. G., SCIENTIFIC AMERICAN, March 9, 1878, p. 155.—B. C.—See answer No. 12, "Notes and Queries," March 2, 1878.—C. L. C.—Your method of solving the example is correct. It is a very good way.—"Boiler Owner."—You do not send sufficient data; but you will find rules by which you can make the calculation for yourself, in the SCIENTIFIC AMERICAN of November 7, 1874, p. 288.—A. G. L.—See SCIENTIFIC AMERICAN, November 27, 1875, p. 339.—C. A. H.—See SCIENTIFIC AMERICAN, May 1, 1875, p. 273.—P. C. M., A. B. C., J. J. S., and others.—We do not recommend special manufactures in these columns.—W. D. P.—Apply to the makers who advertise in the SCIENTIFIC AMERICAN, or insert a notice in the "Business and Personal" column.—O. G. B.—You do not send sufficient data in regard to the engine. Anthracite is generally more efficient than average bituminous coal, in a well designed furnace.—F. S. D.—We think the steam pipe is rather small.—A. J. A. D., and others.—If you will address some of the booksellers who advertise in our columns, you can obtain information in regard to a number of such books.—R. K. T.—Your data are insufficient. Consult Trautwine's "Engineer's Pocket Book," which will enable you to make the calculations.—A. E. C.—A model maker will cut the gear for you. It can also be done in most machine shops.—C. J. W.—See SCIENTIFIC AMERICAN, December 27, 1873.—C. F. G.—We could not answer the question from the data sent. The boiler may not be steaming well, or the engine may be wasteful. These matters can only be determined by experiment.—J. C.—Your data are insufficient.—J. S. R.—The description would occupy more space than we have at command. Consult some good treatise, or examine the process.—M. S.—It would require several days to make the calculation properly. You should refer the matter to an engineer. Dry docks are preferable to slips for large vessels, generally subjecting them to less strain. Both slips and docks pay well when they are in constant use.—G. W. S.—You can make the balloon either of silk or cotton. Full directions for determining the proportions are given in the SCIENTIFIC AMERICAN for January 30, 1875. For addresses of manufacturers insert a notice in the "Business and Personal" column.—J. C. B.—Address the manufacturers.—P. H.—Concerning U. S. mining laws see p. 1644, SCIENTIFIC AMERICAN SUPPLEMENT, No. 103.—C. M. R.—Please send sample of paper referred to in No. 16, SCIENTIFIC AMERICAN of February 16, 1878.—W. H. DeV.—See specifications of patents, 119,394; 150,179; 187,511.

- (1) J. F. P. asks: Is steam visible? A. No.
- (2) M. T. H. asks: Why is borax used in welding steel? A. To prevent oxidation of the surfaces to be united.
- (3) L. A. C. asks: What would be the proper lift of valves of a fire engine piston pump, to obtain the best results? A. Make the lift sufficient to give openings equal to the area through the valve seat.
- (4) G. F. F. asks: What canal company offered a premium for a steam canal boat which would not wash the banks? A. You probably refer to the premium offered by the State of New York, which has been awarded.
- (5) C. S. M. asks: Can I magnetize a piece of good steel $\frac{1}{4}$ of an inch in diameter, with a Callaud battery of 16 jars? It is for the bar in a telephone. A. Yes.
- (6) G. W. asks: 1. In the choice of an occupation, how does mechanical engineering compare with business pursuits in point of financial returns? A. While some of the largest fortunes have been made

in mercantile pursuits, a professional life offers almost as many inducements in a financial point of view, and more, perhaps, on other accounts. 2. Which is the more advantageous, to enter a good machine shop or take a course of study at a scientific school? A. If you have made up your mind to be an engineer, we would recommend two or three years of steady application in a machine shop, and then a course at a technical school.

(7) E. E. H. writes: We have no dentist in this county. Can you give me some instructions as to how a tooth should be filled? A. You will find instructions for home dentistry in the SCIENTIFIC AMERICAN, March 2, 1878, p. 136. In all cases where it is practicable, it is advisable to consult a skillful dentist, even though this necessitates a trip to some place where there is one.

(8) D. J. B. writes: Some of the papers state that locomotives have been built at Jackson, Mich., in 3 hours. We do some quick work in our shop, but that story discourages us. A. We should be pleased to hear from the parties to whom this rapid work is credited.

(9) O. E. S. asks whether there is any virtue in "divining rods," and where he can obtain one. A. We believe the only treasure ever discovered by these rods is that which passes from the pockets of the credulous to those of charlatans.

(10) W. O.—1. The method of crossing river bars is as described by you. 2. To mark the squares on a chessboard it might be better to paint them; but you can use a decoction of logwood, afterwards applying a solution of pearlash.

(11) W. P. H. asks: Will a locomotive exert a greater propelling force with the quarter center above or below, or is the force the same? A. The same.

(12) J. L. asks: Which is stronger, the boiler sheet or the seam where it is riveted, in any $\frac{1}{4}$ inch shell boiler riveted with $\frac{1}{2}$ rivets, 2 inches lap, rivets $\frac{3}{4}$ inches apart? A. The sheet is about twice as strong as the seam, generally.

(13) J. O. D. asks: Which is the most advantageous in a sharp 15 foot boat, to have a small screw geared to revolve rapidly, or a large screw directly actuated by the engine, economy of space and cost not to be considered? A. It is best to use as large a screw as can be kept well submerged.

(14) J. H. T. asks: What will prevent stovepipes from leaking, where wood stoves are used in a steam drying room? A. A good draught prevents ordinary leaks. Extraordinary ones require refitting or wrapping the pipes.

(15) S. C. P. asks: How are the high degrees of heat, in melting metals, measured? A. The air thermometer is sometimes used for the measurement of high temperatures. There are a number of pyrometers used, in which the principle is the expansion of various refractory substances by heat. Siemens' pyrometer is an electrical apparatus for the same purpose. Sometimes an amalgam or alloy, the fusing point of which is known, is used. Besides these there are the various forms of calorimeter invented by Rumford and others.

(16) W. P. writes: I have a return flue boiler set in an arch. In the lower part of each end is a handhole exposed to heat. I find it difficult to keep it packed. I have tried sheet lead, but it melted, and am now using rubber and white lead. Is there such an article as fireproof packing? A. You might use asbestos packing.

(17) J. W. S. writes: We have an engine running 70 revolutions per minute, and an upright shaft connected to the engine shaft with bevel gear, which runs 50 revolutions. Now A. claims that by running the engine 40 revolutions, and changing the gear so as to make the upright shaft run 50 revolutions, he can do the same work as at present. B. thinks that he cannot. Who is right? A. You cannot do as much work as before, after reducing the speed of the engine, whatever sizes of gear wheels you use.

(18) W. C. H. asks: Can you give me some formula whereby cotton cloth can be made waterproof and lightproof? If not lightproof, of yellow or some other non-actinic color. I wish to make a photographic dark tent convertible into a camp tent. A. Boil the fabric in a solution of 1 oz. aluminum acetate and 1 quart of water; then for 20 minutes or more in an aqueous solution of 4 ozs. quercitron and 2 ozs. copper sulphate; wash, and pass first through a solution of 5 ozs. of potassium bichromate, then through the aluminum acetate bath, and finally through boiling soapsuds.

(19) F. W. B. asks: 1. Will rubber, after being dissolved in bisulphide of carbon and spirit, return to its former state on being moulded? A. As we understand you, yes. 2. Where can bisulphide of carbon be obtained? A. Through any dealer in chemicals.

(20) F. A. B. asks: Does the paper for printing postage stamps require to be damp before printing? A. We believe so.

(21) E. M. asks: How are lithographic crayons made? A. White wax, 4 parts, gum lac, 2 parts; melt over a gentle fire; then add dry soap shavings, 2 parts; stir until dissolved, and add white tallow 2 parts; copal varnish and lampblack, each 1 part; continue the heat and stirring until a cooled sample will bear cutting to a fine point.

(22) A. & S. ask: How may blocks of wood be prepared to receive a photograph for subsequent engraving and electrotyping? A. Most readily by Newton's or other dry emulsion process. It is better to buy the emulsions ready prepared, with instructions for use, from a dealer in photographic materials.

(23) G. F. B. asks: How is the cheapest electric light obtained? A. At present we know of no electric light cheaper than that produced by the magneto-electric machines which have been described in our columns. The subject is under investigation.

(24) F. P. asks: Is there a practicable way of melting cast iron in small quantities, from 100 to 500 lbs.? If so, what style and proportions would a furnace have to be to answer the purpose? A. A small cupola furnace is best suited for the purpose; but the charge may be fused in a number of large blacklead crucibles in a suitable crucible furnace with a strong draught or blast.

(25) G. B. S. asks: Is there anything that will cut in alcohol or mix with shellac and give it a yellowish cast? A. Use turmeric.

(26) J. A. writes: I have been making vinegar for eight or ten years, using the same barrels and mill. The mill is the Keystone cider mill. My vinegar is getting a darker color every year. The barrels (some 25 in number) were liquor barrels (mostly whisky) with oak staves. What is the trouble, and is there any remedy? I first thought that it might be some iron about the mill, but I have almost come to the conclusion that it is the barrels. A. Better wash out the first in series repeatedly with hot proof spirits, and add occasionally a little gelatin to its contents. The last stock may be filtered with clean, granular, well burned charcoal. If iron is present it may be detected by concentrating a small sample and adding a slight excess of ammonia water or potassium ferrocyanide—the former gives with iron a dark rusty precipitate; the latter, Prussian blue.

(27) W. C. E. asks: 1. How can I polish, permanently, snakewood and similar hard woods? A. Apply several coats of good copal varnish, and when perfectly dry, rub down with moistened pumice stone; then go over it with a flowing coat of clear spirit copal, polishing when dry with rottenstone and a trace of oil. 2. How can silver or nickel be cemented to such woods? A. Melt together equal parts of pitch and gutta percha; apply a film of this hot.

(28) J. H. C. asks: How are objects best preserved for the microscope? A. Use oil of cloves; if previously surrounded by watery solution, wash in alcohol and dry first. Where the preparation will not admit of this treatment, use good glycerin. Mount in dammar lac or balsam.

Which of the metals is the best conductor of heat? A. Silver.

Would not a man weigh less 30 miles above the earth than at its surface? Yes, a little. See p. 207, vol. 37, and answer No. 10, p. 43, current volume SCIENTIFIC AMERICAN.

(29) C. A. S. writes: A furnace has a cold air box leading from out doors. A slide cuts off the air from out doors, and a door lets the air in from the cellar; cellar has standing water in it some 6 x 8 feet square in one end of it. What is your advice as to using air from cellar instead of from out doors, in regard to health of persons living in the house? A. We recommend that the supply be taken from the outer air.

(30) R. C. writes: Early last fall, wanting to conduct water from a well in a somewhat elevated position, to an adjoining field, say 900 feet, I laid down an iron pipe of $\frac{3}{4}$ inch bore. The incline being pretty regular, and the water in the well standing some 12 or 14 inches above where the pipe entered, and which is some 3 feet above where the water leaves the pipe, I was of opinion that the water would run quite freely, but on the contrary it only dribbled slowly from the pipe. So, as an experiment, I blocked up the lower end of the pipe, and in about 3 or 4 hours, when the water had risen in the well some 4 feet, I took out the plug, when to my surprise the water ran quite as slowly as before. Now supposing the pipe to be clear of any dirt, which I feel quite sure it is, how can you account for the water running so slowly? A. From your account, it is probable that there are high points in the pipe where air collects and obstructs the flow.

(31) G. N. writes: I want to galvanize some iron. What acids are used in preparing the iron before putting it into the melted metal? A. Sulphuric or hydrochloric acid and water, equal parts.

(32) A. D. asks: Is there any device patented to obviate the difficulty of one wheel sliding while a train is passing around a curve? A. Yes.

(33) M. B. asks: Can cast iron cut gears be coated with any material which will deaden or pretty much destroy the sound consequent upon running? Is there any metal that they can be made of that will wear well for light work that will be nearly noiseless when running? A. If the gear teeth are of proper shape and properly cut they will run almost noiselessly. Composition brass runs as quietly as anything. Excellent results have also been obtained from gears made of compressed raw hide.

(34) O. M. H. asks: 1. Is turning brass a real trade? A. Brass finishing is a trade in itself. 2. Do locomotive wristpins wear flat on each side, so that when the rods stand in a line with the center of the cylinder, and if the boxes are tightened up there, they will bind when it turns round? A. No. 2. Would you advise a young man eighteen years of age, and of common education and a natural talent for machinery, to learn a machinist's trade, such as building locomotives? A. Locomotive building is an excellent and large field of mechanics.

(35) L. R. writes: I am told that cast iron can be mended like any other metal. Is it so? A. Cast iron may be mended by soldering or by brazing.

(36) A. G. writes: We have in our stock some Holland gin, which has by long confinement in wood become very yellow. I would like some simple method of clearing it without injuring or spoiling the flavor. The color is a great objection to its sale. A. It cannot be readily improved without altering the tone or flavor.

(37) J. C. B. writes: I have been melting brass in a crucible and running into sand moulds, but always get an imperfect casting. I have tried dry moulds and wet ones, and gave plenty of vent. How can I improve my work? A. Try running the metal hotter.

(38) J. P. A. asks: What is Paris green, and how is it made? A. Paris green is an arsenite of copper, the chemical symbol being 2CuO.H2O.As2O3. It is prepared by dissolving arsenious acid in a solution of carbonate of potash, and decomposing the arsenite of potash thus produced, by adding sulphate of copper, when the arsenite of copper is precipitated.

(39) H. G. asks: How much water does a steam boiler require in, say, one hour to furnish an engine of 10 horse power? A. It varies, in different engines in common use, from 300 to 1,000 lbs.

(40) W. H. asks: What is the best instrument in use to test or register the temperature at a glass factory, where the heat rises to 2,500° Fah. or more? A. An air thermometer, or a Siemens pyrometer, can be used for the purpose.

(41) J. C. M. writes: I have a mercurial barometer, the column of which is broken about 6 inches from the bottom. There appears to be an air bubble, about 1/4 of an inch long. How can I unite the mercury? A. We think it will be necessary to remove the mercury, boil it, and then refill the tube.

(42) J. B. writes: I have a steam engine which has been in use two years. The first year I could take hold of the flywheel and turn it around with all ease, when everything was cold; but now I cannot move it, unless I first let steam into the cylinder to warm it. The cylinder is true, and so are the rings; they have not been moved since they left the shop. I use none but extra winter strained lard oil. What is the trouble? A. We presume from your account that the engine is out of line.

(43) J. K. asks for a harmless method of eradicating dandruff. A. Dandruff (Pityriasis) is a chronic inflammation of the skin, characterized by the production of minute white scales or scurf in excessive quantity. The affection is often very rebellious to treatment. Various preparations are sold which are claimed to be beneficial, and physicians sometimes prescribe tonic infusions, purgatives, and the application of sedative lotions. In obstinate cases an internal dose in which arsenic is the essential element is sometimes prescribed. The efficacy and safety of such measures are to be doubted. Probably the best plan is to keep the hair short and shampoo it frequently with a solution of borax in warm water, avoiding rough treatment, which has a tendency to increase the irritation.

(44) M. E. T. asks: Can street lamps burning kerosene oil be lighted by electricity? A. We do not know of any electric lighting apparatus which could be advantageously used for this purpose.

(45) A. S. asks: 1. What thickness and what kind of glass are generally used for microscopic slides? A. Usually finest lime glass plate, one millimeter (about 1/32 inch) thick. 2. Are there not two layers of glass? How are they fastened together? A. Yes, generally. Fastened by marine glue, dammar lac, balsam, etc. Consult Davies' "Preparation and Mounting of Objects."

(46) C. M. writes: Will you please settle a dispute between a friend and myself in regard to the use of chloroform and its effects on a human being? 1. I claim that if administered to a person while asleep it will produce the same effect as it would if the person were awake. He claims that it awakens the person the instant it is applied. Who is right? A. The effect is the same. 2. How much does it require to produce unconsciousness, if applied with a handkerchief? A. It depends upon the person, the age and condition. 3. Does it have the same effect on an intemperate person as upon one who is temperate? A. Yes, generally. 4. Would it be advisable to try an experiment? A. No.

(47) G. P. W. asks: What is the best coating for the finished iron work of machinery, to prevent rust, and to be easily removed when desired? A. A mixture of white lead and tallow is frequently used.

(48) J. D. M. asks: 1. Does increased distance from the motor cause a load to pull any heavier? A. No; if the weight of the connections is disregarded. 2. Does the diameter of a wheel make any difference on a level surface? A. As we understand you, it generally does, in practice.

(49) T. S. L. asks: Is there a rule in geometry for dividing a circle into any odd number of parts, for example, 3, 5, 7, 11, 13 parts? A. We do not think there is any rule quite so general as this. A number of polygons with an odd number of sides can, however, be described geometrically. See Barlow's "Theory of Numbers."

(50) J. H. W. asks: Will a gauge at the top of the steam drum and another at the bottom of a boiler indicate the same pressure? A. No; because the gauge at the bottom is pressed by the water, while the other is not.

(51) H. W. D. asks: What is the best plan for uniting large belts? A. Leather lacing is generally preferred. See SCIENTIFIC AMERICAN, August 7, 1875, p. 83; also, January 23, 1875, p. 52.

(52) A. F. asks: Is steam that is condensed from an iron boiler more healthful for drinking and cooking purposes than well water? A. It is more healthy than some well water, and is equal to the best; though not, perhaps, in taste.

(53) W. S. writes: We have an injector to throw water from a heater into a tank above. When the water is cold it works, but stops as soon as the water gets hot. Can you give us a remedy? A. The only remedy that occurs to us, if you must continue to use the present injector, is to abandon the heater.

(54) D. E. R. asks: Do you think petroleum oil would be a damage or a benefit to boilers, if passed through the cylinder and pumped into the boiler with the feed water? A. If a moderate quantity is used, and the boiler is frequently blown off and cleaned, the use of the oil does no damage, and is sometimes beneficial.

(55) W. M. writes: I wish to run a circular saw 4 inches in diameter, with a coiled spring. If af-

ter being wound up it would make one cut through hard wood (oak) 2 inches in diameter without rewinding it would be sufficient. A. There are spring motors in the market which would probably answer your purpose. Insert a notice in the "Business and Personal" column.

(56) E. S. B. asks: How is floor wax made? A. Two ozs. of pearl ash, 10 ozs. of wax, and about half a pint of water are heated to boiling in a dish, which is frequently agitated, until a thick fluid mass is formed, from which, upon removal from the fire, no watery liquid separates. Boiling water is now cautiously added to the mass, until no watery drops are distinguishable. The dish is again set on the fire, but its contents are not allowed to boil (otherwise myricin would separate out), 8 or 9 pints of water being added, little by little, with constant stirring. Coloring matter may be added if desired.

(57) J. H. C. writes: A steam engineer friend of mine is making a test gauge, and claims that if a square inch be thrown into a circle, the diameter would be 1.25 inch, and undertook to prove it to me by taking a strip of tin 4 inches in length, and showing that it just meets around a mandrel of that size. A. The area of a circle equals the square of the diameter, multiplied by the decimal .7854, and conversely, the square of the diameter will equal the area, divided by the decimal .7854. In the case you mention the area is 1 square inch, and its diameter is therefore $\sqrt{1.273}$. By inadvertence 1.273 appeared as the diameter (in No. 3, answer No. 17) instead of $\sqrt{1.273} = 1.128$ of an inch.

(58) S. M. writes: We are using a wooden wheel covered with glue and emery, to scour metal castings, but the glue scales off. Can you tell us what to put in, or how to prepare the glue to prevent the scaling? A. We judge that the best plans are trade secrets, which are worth the price charged for them to those who buy wheels from successful manufacturers.

(59) W. C. M. asks: 1. Can a man lift more in weight in a coal mine 300 feet deep than he can at the surface? A. Yes, under the same conditions; but the difference would be so slight as to be inappreciable. The pendulum experiments of Professor Airy at great depths in English collieries indicated this difference, but for practical purposes it may be disregarded. 2. Why should there be a falling off in the force of gravity toward the center of the earth? A. Because, as one goes deeper, there is less matter to attract bodies toward the center, while the portion of the crust above exercises a counterbalancing attraction.

(60) C. A. G. writes: Will you please let me know which boiler will give more steam, a return tubular boiler or a locomotive boiler, both having the same size of firebox and the same amount of heating surface, and pressure of steam, and the same draught; both to fire with wood, the workmanship alike, with same size of tubes, but longer in the locomotive boiler? A. The difference, if any, will usually be in favor of the return tubular boiler.

(61) D. H. writes: Supposing it were possible or practicable to construct a wooden trough 10 miles long and for convenience' sake say 6 feet wide and 6 feet in depth, the trough to be perfectly level in all its parts according to a spirit level, would or would not the water in the trough (supposing it to be half filled with water) be perfectly level according to a spirit level, and the water be the same depth at each end and in the middle? A. Any difference of depth that might exist would be too small to be detected by an ordinary measurement.

(62) C. D. asks: Would an air chamber placed on the suction pipe of a No. 8 Blake steam pump, which draws water from a pond 150 feet from pump with a 12 foot lift, and discharges through a pipe running 186 feet horizontal and 60 feet perpendicular, prevent the knocking of the pump piston and the jar in suction pipe? With this exception the pump works well. A. Probably it would, or at all events, it would greatly reduce the shock.

(63) W. G. L. asks: What is the proper way to temper curved dies, for cutting out steel shovel plates, so as to avoid springing and cracks? A. Fill the holes with fire clay and wire to keep it in place. Heat evenly and slowly in a furnace. Lift the dies from the furnace with the face vertical, and plunge vertically into water heated to about 50° and containing about 1/2 lb. salt per gallon. Hold them still at the bottom of the water until cooled.

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

J. M. S.—The following represents the average of two analyses of the mineral kailhaute, by Erdmann: SiO2 29.72, TiO2 28.57, Al2O3 5.99, Fe2O3 6.41, Mn2O3 0.76, CaO 18.80, YO 9.68. Gravity of sample = 3.519 to 3.733. Hardness 6.5.—D. S.—It is quartzite containing graphite and mica schist.—R. E. K.—No. 71 consists principally of a micaceous hornblende schist from the degeneration of a syenite. Contains a trace of manganese. No. 49.—Quartz and orthoclase. No. 56.—Send larger sample if possible.

COMMUNICATIONS RECEIVED.

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

- Double Postal Cards. By G. W. H.
Howe Truss Angle Block. By W. W. R.
Approximating Curve Areas. By L. S. B.
New Fire Escape. By L. B. B.
Atmospheric Contraction and Expansion. By H. R. B.
History of Glass. By A. O. B.
Transatlantic Steam Navigation. By A. J. M.
Plant Propagation. By J. P.
Extension of Patents. By G. W. H.
Infinity of Time and Space. By H. D. T.
Conformator Diagrams. By G. H. M.
Hydraulic Engines. By D. C.
Bicycle Travel. By L. L. F.
Stroke of Locomotive Engines. By J. A. H.
Aerial Navigation. By H. S. B.
Cotton Machinery. By T. W. W.

OFFICIAL.
INDEX OF INVENTIONS
FOR WHICH
Letters Patent of the United States were
Granted in the Week Ending
February 12, 1878,
AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

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