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Agents wanted to sell Territory in the States of Ohio and Michigan, for one of the best things ever invented. Address R.S. G., lock box No.17, Seneca Falls. N.Y. Mills for Grain, Paint, Ink, &c. Ross Bro's, Williamsburgh, N. Y.
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All Blacksmith Shops need a Holding Vise to upset boits by hand. J. R. Abbe, Manchester, N. H.

Parties desiring Steam Machinery for quarrying stone, address Steam Stone Cutter Co., Rutland, Vi Cabinet Makers' Machinery. T.R.Bailey&Vail.

Painters and Grainers by the thousand do their best graining quickly with Pat. Perforated Metallic Graining Tools. J.J.Callow, manuf.,Cleveland,Ohio.

For Hand Fire Engines, Price \$300 to \$2,000. Address Rumsey & Co., Seneca Falls, N.Y. Over 800 different Style Pumps for Tanners, Paper Mills, and Fire Purposes. Rumsey & Co.

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Steam Boiler and Pipe Covering—Economy afety, and Durability. Saves from ten to twenty per Safety, and Durability. Saves from ten to twenty per cent. Chalmers Spence Company, foot East 9th St., New York-1202 N. 2d St., St. Louis, Mo.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable, W.D. Andrews & Bro.414 Wuter st.N. Y.

The Berryman Heater and Regulator for Steam Boilers—No one using Steam Boilers can afford to be without them. I. B. Davis & Co.

Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa. J.R.Abbe, Manchester, N.H., sells Bolt Vises, Circular Saw Mills, with Lane's Patent Sets; more than 1200 in operation. Send for descriptive pam phlet and price list. Lane, Pitkin & Brock, Montpe

Key Seat Cutting Machine. T.R. Bailey & Vail. Tree Pruners and Saw Mill Tools, improve ments. Send for circulars. G.A.Prescott,Sandy Hill

Dickinson's Patent Shaped Diamond Carbon Points and Adjustable Holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24 and Nov. 20, 1869. 64 Nassau St., New York.

Five different sizes of Gatling Guns are now manufactured at Colt's Armory, Hartford, Conn. The larger sizes have a range of over two miles. These arms are indispensable in modern warfare.

The Berryman Manuf. Co. make a specialty of the economy and safety in working Steam Boilers. L. B. Davis & Co., Hartford, Conn.

Gauge Lathe for Cabinet and all kinds of han-lies. Shaping Machine for Woodworking. T. R. Bailey & Vail.

Shafting and Pulleys a specialty. Small orders filled on as good terms as large. D. Frisbie & Co. New Haven, Conn.

All Fruit-can Tools, Ferracute, Bridgeton, N.J. For Steam Fire Engines, address R. J. Gould,

Always right side up—The Olmsted Oiler, enlarged and improved. Sold everywhere.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union It on Mills, Pittsburgh, Pa., for lithograph, etc.

Peck's Patent Drop Press. Milo Peck & Co. New Haven, Conn.

Mining, Wrecking, Pumping, Drainage, or Andrew's Patent, inside page

Hydraulic Presses and Jacks, new and second hand. E. Lyon, 470 Grand Street, New York.

For the best Endless Bed or (Farrar) Surcer, address Davis, Hatch & Co., 436 North 12th Street Philadelphia, Pa. Machinists-Price List of small Tools free

Gear Wheels for Models, Price List free: Chucks and Drills, Price List free. Goodnow & Wightman, 23 Corn hill, Boston, Mass.

Spur and Bevel Wheels and Spindles, or great durability, cast to order by Pittsburgh Steel Cast ing Co. All work warranted.

The Berryman Steam Trap excels all others. The best is always the cheapest. Address I. B. Davis & Co., Hartford, Conn.

Gauges, for Locomotives, Steam, Vacuum, Air, and Testing purposes—Time and Automatic Re-cording Gauges—Engine Counters, Rate Gauges, and Test Pumps. All kinds fine brass work done by The Recording Steam Gauge Company, 91 Liberty Street, New York,

Absolutely the best protection against Fire
-Babcock Extinguisher. F. W. Farwell, Secretary, 407 Broadway, New York.

For best Presses, Dies and Fruit Can Tools, Bliss & Williams, 118 to 120 Plymouth St., Brooklyn, N.Y.

The best Lubricators, Oil Cups, Gauge Cocks, doll Cans, are "Broughton's." Circulars sent on ap-leation to H. Moore, 41 Center Street, New York.

R. H. Gillmore, Keokuk, Iowa, wants best carriage gate, to be operated from carriage.

Lathes, Planer, Shaper, Shafting, 30 Boilers, Engines and Steck of Machine Shop, for sale very low. Henry McCollum, Long Island City, N. Y.

Arrangements are being made to manufacture a small oscillating engine for the use of farmers and others requiring a little power, but whose limited means and knowledge of the Steam Engine prevent them from buying the more expensive and complicated machines. Agents are wanted now to sell models made under the same patent. E. P. Ryder, 19 Ann St., New York.

For Sale—A set of the Patent Office Reports (mechanical) from 1847 to 1869, inclusive—50 vols.—price \$65. T. Bradburn, bookseller, 29 Ann Street, New York.

A Superior Printing Telegraph Instrument (the Selden Patent), for private and short lines—awarded the First Premium (a Silver Medal) at Cincinnati Exposition, 1872, for "Best Telegraph Instrument for private use"-is offered for sale by the Mercht's M'f'g and Construction Co., 50 Broad St., New York, P. O. Box 6865.

Williamson's Road Steamer and Steam Plow with rubber Tires. Address D. D. Williamson, 32 Broad way, N. Y., or Box 1809. Steel Castings "To Pattern," from ten lbs.



A. P. asks how to temper steel dies and

F. E. C. says: How can I make translucent cloth for hotbed frames?

E. F. S. asks how to prevent soft metals such as tin, lead, etc., from clogging files.

W. M. asks: When and where were bolting firstintroduced for boltingflour

S. A. L. asks: What kind of leather is generally used in making blacksmith's bellows?

M. C. asks: Can a card be saturated with hosphorus and preserved for use, and will it be fiextble?

P. R. R. asks: Can any of your readers decribe a process for tempering steel springs by compresacribe a p

A. L. asks: What is the best wood to make insect cabinets of, and what is the best form for the same? W. H. H. asks: Can you tell me how to nake a pickle for taking sand off castings, such as small

gear wheels, etc.?

J. F. A. wishes to know with what material he can coat the inside of tin cans, to prevent ink and other fluids from being affected by the tin.

E. D. R. asks: What is the best method of mixing fresco colors, and what ingredients are used to make them flow freely and cover well?

C. M. asks: How can the glue joint between the back and sides of a violin be undone without injuring the instrument or spoiling the varnish? E. B. asks for a recipe for making dextrin

wants to use the dextrin for sticking purposes. W.S.B. asks: What is meant by summer nd winter strained lard oil? What process does the

lard go through to keep it from congealing? C. B. asks if there is any method of tough-aing or preparing wax for flower making so that it will ening or preparing wax for flower making so that it will not be liable to soften in warm and harden and crack in

cold weather. J. D. asks for a recipe for a waterproof liquid cement, to be used for putting patches on bags, in the place of thread. It would be very useful to thou sands of farmers.

G. M. D. says: How can I mark or print let ters and figures on metal that has been finished and plated with silver? I have seen such work, but cannot

A. P. asks: Will the power of a 10 horse enginedrive a machine or machinery 100 feet away from the engine as easy as it would 10 feet away? The machinery is to be driven by a belt or belts from the line shafting.

N.J. J. asks: What kind of fish would be besttoraisein a lake one mile in diameter? The water is eight feet deep, and the lake has no visible inlet nor outlet. The water is at all timesbright and clear and has an agreeable taste

J. R. says, in regard to R. and W.'s query about the balance wheel: Supposing that W. is right will he be kind enough to explain the action of the gy-roscope governor, illustrated and described on page 184 of the current volume of the SCIENTIFIC AMERICAN?

C. E. C. says: Can some one give instructions for annealing gold so that it can be conveniently worked into rings, drawn into wire, etc., without cracking? I am often troubled with gold coin and good scraps, which are as brittle as cast iron.

J. C. K. asks: What is the best preparation for setti g the thimble skein on axles? I use the dregs of paint heated over a slow fire to the consistency of a batter. Is there anything better? In large wagon factories, how do they cut out the hub for the thimble

G. D. N. asiks: Is there any work published treating wholly or in part upon electro-magnetic motors? Where can it be obtained? Is vulcanized rubher or dentist's hard rubbers conductor of electricity? What is the necessary size of a battery to ring a bell? It must be active for a month.

P. L. says: We use equal parts of first quality clay and ground brick in the manufacture of our retorts for distilling phosphoric acid; and yet they sometimes crack over the heated furnaces. We manufacture them in a warm room, fire the kiln with care, and subject all to the same charges, heat of flame, etc. What is the cause of our trouble?

D. H.E. says: I have lost the sliding weight to my platform scales, commonly called the P. The lever is graduated from 0 to 100 lbs. in half pound notches, and there are additional weights, 100, 200, 300, and 400. There is a cup at the end to put shot in to keep the balance; but it has been emptied also, otherwise I could easily put on the platform U.S. standard weights and make my new Boring Machine for Pulleys—no limit to lead P of the right weight. Please tell me how to get it to the proper weight.

H. A. B. asks: What proportion of burnt clay should be mixed with quicklime to form a hydrau-lic cement? The lime is to be measured before slacking, the clay after g inding. Should the clay be burned in a very hot fire and how long should it be exposed to the heat? ()faoft magnesian limestone and American chalk. which would make the best lime, and what would be the relative quality of each?

J. R. has read Professor Young's lecture on our present knowledge of the sun, and asks for explanation on the following point: The professor asserts that a contraction of the volume of the sun, equal to 240 feet of its diameter, would account for all the heat it gives off. "If we freeze a pail of water, it gives off heat while it is freezing, but the thermometer will indicate no fall of temperature, until it is all frozen." The greatest den. sity of water is at a temperature of 39° Fah.; and if it becomes colder, it expands, in contradiction to the fact quoted by Professor Young. How is this?

J. R. asks: What are the limits of expansion in an engine provided with an ordinary D valve in the steam chest? The admission of steam is cut off by a plate valve (sliding over the opening which admits the steam into the steam chest). The D valve is connected in the same way as in an ordinary engine; the plate valve, however, is worked by a crank pin of a whee which makes twice as many revolutions as the shaft of the engine. The main valve has 1-16 of an inch lead and % inch outside laps. The steam port and the said opening are % of aninch wide and both valves have 2% inch-

D. F. says: We use what is called a gas pump in our oil well to draw gas up through the large casing between it and the tubing. What will be the difference in the amount of vacuum created by a ten inch cylinder and by a fourteen inch? They are piston pumps. How many lbs. per square inch would the vacuum be for each pump? They would both be extinged. cuum be for each pump? They would both be acting on

T.K. B. says that polished steel becomes in a manner scaly, after being hardened, by the cold air striking it. "I use soap to coat the steel with, stillit does not overcome the difficulty perfectly. I am told there is a liquid for coating steel, while heating it, in such a manner that the cold air does not strike it. I would be obliged to you or some of your readers for a process better than the soap."



T. P. says: In your answer to F. E. D. as to atting up cones so that the band will be equally tight on all the pulleys, you say that the sum of the diameters of all the pulleys will be the same. In my experience I find that steps in cones made all the same will not do. Please explain. Answer: For crossed belts the sizes will be the same. This is what we these stated. Read the reply more carefully.

M. J. B. says: Please state which is the cost perfect book on mineralogy, and where it can be obtained. What is the price of it? Answer: Get " Dana's Mineralogy" of your bookseller

E. A. P. sends a description of parhelia and asks for explanation. Answer: This phenomenor was explained, on page 182 of our current volume, as due to floating crystals of snow or ice in the air; and the same explanation would apply in the present case. The prismatic effects at noon were probably not so fine as they would have been with the sun nearer the horizon.

A. G. F. says: I have occasion to run a hy-draulic press at a distance of 250 or 300 feet from the power which runs the pumps. Can I not dispense with the shafting, place the pumps near the engine and use an enarged pipe for connecting the pumps with the cylinder of the press, without material loss of power? Can I use pipe 250 or 300 feet long, and if so, what should be the relative increase of size of pipe for 300 feet over the size required for 10 feet? Answer: You can dispense with the shafting and set your pumps near engine, using a pipe to conduct the water. You need not increase the size of the pipe. The supply of water is so small that an enlargement of the pipe is unnecessary for so short a distance as 900 feet.

J. F. C. says: 1. What convexity should a pulley have to allow a belt to run and adhere to its best advantage? 2. Is it best to run a thin and broad belt or a thick and narrow one? 3. Is it best to run one broad belt of sufficient capacity to convey the power of the en gine: or would it be better to divide it and run two of half the width each? Answer: 1. One half inch to a foot in breadth of face. 2. A thin belt up to a breadth which will render it unmanageable. 3. That would de pend upon the amount of power to be transmitted. For thirty horse power engine, we should use a single belo of full width, if certain that it would be kept properly laced or otherwise well secured to take even strain across its full breadth.

A. T. Z. says: I have a turbine water wheel of 16 horse power driving a run of stones. Upon the top of the upright shaft of water wheel was a pinion 16 inches diameter and 2 inches pitch, with iron teeth, driving one of 2 feet diameter with wooden teeth on the stone spindle, giving proper speed to stones, but making a jarring noise in the teeth and shaking the building. Thinking the pitch too large for the diameter of wheels pitch and the same diameters as before, but found them work no better. Can wheels of above sizes be made to drive a run of stones and work smoothly? If so, what is the cause of the trouble with mine? Answer: We are inclined to think that your tro ble is due to want of proper balance of your turbine. Wheels of the sizes mentioned can no doubt be made to run smoothly.

W. H. M. asks: If a pump of 2 inches diameter has a stroke of 3 feet, what amount of water in cubic inches does it draw, and what is the rule for finding the same? Answer: To find the area of a circle, multiply the square of the diameter by the decimal '7854 To find the cubic contents of the cylinder, multiply the area by the length. In your example $2\times2\times7854\times86=118$ cubic inches of water and a little over, for each stroke

H R. asks: Can you inform me of what materials the elastic rollers used on printing presses are made? Answer: Glue and molasses. Increase the quantityof glue to make a stift roller; you will need this in hot weather.

M. M. T. asks how glass becomes porous, if it ever is so. Answer: All glass is more or less porous some coarse bottleglass is so much so that it will not insulate for electrical purposes.

J. F. C. says that G. T. P. can make the best red seali g wax by mixing 1 lb. shellac, 1 lb. Venice tur-pentine, 1/2 lb. Chalk and 1/2 lb. English vermilion.

H. P. has an aquarium made of a wooden ame and glass sides, and wants a cement to make it watertight. Answer: Mixequal quantitiesof drywhite lead and red lead in a paste with mastic varnish. Use as soon as mixed.

W. E. A. says: I have a plan for taking water through the surface condenser of a marine engine by which the motion of the vessel is made to perform the duty of the circulating pump now used. Is there, to your knowledge, any thing of the kind in use? The plan has been often suggested and more than once tried in various forms. Success has not been met with in any case in such a degree as to lead us to anticipate its general adoption.

C. E. C. asks how to mend rubber boots. Answer: See page 165 of our volume XXVI.

J. H. W. says: I have seen it stated somewhere that the workmen in deep mines were entirely unaware of the occurrence of the severe shocks of earthquake which were felt last fall in California: and, as so manytheories have been promulgated to account for these phenomens, I have been expecting some of the scientists to base—if this statement be correct—a more probable theory upon it. If true, it would indicate, of very near the surface, and the old doctrine of interna commotion (gaseous or otherwise) causing upheaval of the crust, a doctrine still held by many, would be unten able. Answer: The statement that the workmen in deep mines were unaware of the shocks and undulations taking place on the surface would require the concurrent testimony of numerous witnesses before any scientific men would put any confidence in it. It sometimes happens that, owing to great geological faults and fissures, the earthquake waves are not propagated oversmalldistricts of country: they remain like islands in the raging sea. This fact has several times been noted, but in such cases there is no motion either on the surface or in mines. That there should be wave motion on the surface and none at a moderate depth below, is in the high-est degree improbable; on the contrary, animals living in caves and holes are the first to perceive the shock. and often give note of an approaching earthquake by rushing to the surface.

J. E. M. asks: Does heat or cold affect the power of a magnet; also whether the movement of a piece of steel would be more rapid towards a strong magnet than towards a weak one, provided the same piece of steel be placed at the same distance away from each? I think that the stronger magnet would attract a larger piece of steel than the weaker one; but under the above named conditions, the movement of a piece of steel would be just as rapid towards the weaker as towards the stronger one. Am I fight or wrong? Answer: Alternations of heat and cold, sudden contraction or expansion, and percussion are decidedly injurious to the strength of a magnet: and we should say that a nowerful magnet would attract a given piece of steel towards it more rapidly than a weak one. Better try the exper-

F. G. asks: How can I make a good and theapelectric battery? Answer: You can buy a battery cheaper than you can make one, but if you wish to try your hand at the business, we can recommend what is called Daniell's pattern as being easy of imitation. Make yourself a copper cup of the capacity of a pint measure, and a second cup, holding a gill, out of sole leather. In the copper cell, put a mixture of eight parts of water and one of oil of vitriol, saturated with blue vitriol, and pour some of the acid water without the copper into the leather cup. Cast a solid sylinder of zinc and amaigam-ate it; plunge this into the inner leather cup and connect it by a copper wire soldered to it with the outer cups. Several of these cups would constitute a battery. Now read about it in your school philosophy, and you will learn what further to do.

H. R. asks: 1. Is there any glue or substitute for the same that will stand exposure to wet weather? Answer: Take cacutchouc, 15 or 20 grains, chloro-form, 2 fluid ounces; dissolve and add 1/2 ounce powdered

M. H. asks: What is the best way to fasten felt or any similar material to zinc? Answer: Try paint ing the zinc with a thick coat of white lead; let it dry and then use stiff hot glue,

F. W. D. says: Please enumerate the varius colors of which white is composed, and the order in which they must be painted upon a circular dok, so that, when properly revolved, it will present a white surface. Answer: Divide your disk radially into five equal parts, and paint each of these with the seven colors of the solar spectrum, namely, violet, indigo, blue, green, yellow. orange, red. Put these colors on radially. Painta black bull's eye in the center of the card, and blacken the circumferential edge. Revolve rapidly, and you will see only a grayish white instead of the colors

F. C. asks if the borax treatment for pre-erving meat is detrimental. Answer: No.

J. H. J. Your plan for steam engine is old. Watercolors are used for the atrical scenes.

A. P. should send his volumes for binding to our office. Charge, \$1.50 per volume.

A. C. asks: I. Who designed and built the Thames tunnel (England)? 2. Who designed and built the Great Eastern? Who launched her? Answers: I. Sir Mark Isambard Brunel. 2. Isambard Kingdom Brunel, son of the former. Built by John Scott Russell & Co.

Z. asks how to preserve natural flowers with wax. Answer: Take paraffin, melt it and dir. the flowers in very carefully.

D. F. T. says, in reply to O. K., who asks if it is advisable to drive a 4% feet mills tone with a quarter twist belt from the driving shaft to spindle: From experience, I should say no, unless you use a long belt. Your belt should be 9 or 10 inches if you want it to do any work. [In our reply to 0. K., we originally advised a long 8 inch belt. The figure was by mistake, printed 5 inches.-EDs.]

J. B. T. asks for a recipe for bluing gun barrels. Answer: See page 10 of our volume XXV.

W. T. B. says in answer to D. F. W., who sked how to cut a crack in a bell clean, to stop the discordancy: I have used a circle of common soft Russian stovepipeiron, runni gata velocity of 5,000 revolutions, to cutteeth in a large saw. I could do it very quickly, but the under side of the saw was so hard that it could not be filed. It would cut the whole length of a twelve inch flat file in 1% minutes.

J. W. K. encloses a mineral specimen found in limestone, and a black mineral, and asks what they are. Answer: The blackmineral is very softbitumin our shale. The other is flint.

B. O. M. asks how to bronze cast iron brackets. Answer: Read Byrne's "Practical Metal Worker's Aggistant."

C. S. asks: Will you please send me the name of any work treating in detail on the construction of balloons? I wish to know of what quality of silk, the kind of varnish, formula for cutting the segments, etc. If it is feasible, I intend to construct a balloon capable of carrying 30lbs. of apparatus, and make continual record of atmospheric phenomena, with the rise of a captive balloon at an elevation of 3,000 feet. Answer: General instruction in regard to form and mater al, cutting, varnishing the silk, with formula for weight in relation to bulk, etc., will be found in the article Aerostation in Good and Gregory's "Pantalogia," also, but not so full, in Vol. I. Partington's "Philosophy"; also in article Aerostation in Eucyclopedia Londonensis; the last, perhaps, is the best. See also Simpkin's "Aerial Navigation," London, 1845; Wise's "Aeronautics," an American publication, and Glaisher's "Up in a Balloon." All of these books are probably in the State Library at Albany. Experiments with captive balloona sustaining self recording meteorological instruments would be full of interest. We fear, however, that the first heavy gale would sweep them away.

MARCH 29, 1873.]

W. G. C. asks: Would it take more power to prevent water escaping by a χ inch hole at the bottom of a pipe, 6 inches in diameter and 100 feet high, filled with water, than it would require to prevent water escaping by a χ inch hole at the bottom of a pipe, χ of an inch in diameter and 100 feet high, similarly filled? Or, again, would it require a different power to prevent water from escaping from a χ hole at the bottom of a pipe 100 feet high, and tapering in its diameter from 4 inches at the top to χ of an inch at the bottom, the pipe being full of water? Answer: The required force would be the same in each case, as the pressure of a liquid at an orifice is proportional to the head of water above it, and bears no relation to the size or form of the conalning vessel.

M. R. asks: 1. Will a horse pull a heavy toad up hill easter on low or on high wheels, and why? 2. Weight of vehicle being the same, which pulls easter, a load divided over 4 wheels or over 2 wheels, and why? Answer: 1. Within ordinary limits, a horse should pull the heavier loads with high wheels, because in running over



an obstacle, as at A, the larger wheel distributes the forward effort to better advantage, in 'prizing' itself and load over it, than does the smaller wheel. Should the horse be attached drectly to very large wheels, by short traces or chains, there

would be a tendency to raise him from his feet, and thus to prevent theeffective application of his strength, which might, in extreme cases, more than compensate for the anticipated gain. 2. On soft ground, 2 wheels would cut in more than 4, the same load being carried, and thus would require more effort. On hard roads, we should expect 2 wheels to do best, as the weight of 2 wheels and their friction would be avoided.

- H. B. J. sends a mineral. "I took it from a lump of quartz which was full of small seams and pieces. The specimen was originally larger than an egg. Is it copper?" Answer: It is a valuable copper ore, containing about sixty per cent of copper, the rest being sulphur and from.
- E. C. D. sends us a stone, and asks what it s and if it is an indication of coal in the vicinity. Answer: The specimen is carbonaceous shale, but it does not promise the existence of coal in the neighborhood, neither does it decide against it. A fragment of rock gives no evidence one way or the other, as the same rock is found both above and below the coal measures. The geological sequence of the strata must be observed.
- I. P. H. sends us a mineral specimen found in hematite. He asks what it is, and if it will affect the iron in the blast furnace. Answer: It is an infusible argillaceous rock, and will simply increase quantity of slag.
- C. G. C. encloses two samples of minerals and wishes to know what they are called in geology and of what they are composed. Answer: Both specimens are feldspathic products, the soft, pliable one being kaolin, much used in porcelain manufacture.
- H. D. asks: 1. What is caustic ammonia and how is it prepared? What is the expense of it? 2. What is the cheapest way to manufacture hydrogen gas for balloon purposes? Answer: Caustic ammonia is the aqua ammonia of the druggist, and costs from ten to twenty cents a pound according to purity and concentration. It is manufactured by heating quick lime and sal ammoniac together and absorbing the gas in water as it comes off. The cheapest hydrogen upon the whole is made by acting upon scrap iron or zinc by dilute sulphuric acid. We advise our correspondent to read up on both these questions in almost any elementary treatise on chemistry.
- T. H. P. says: Last spring we put up a small 7 x 12 engine, the boiler being an upright one, 6 feet highand containing 37 flues. We fed with cold water until winter, when the freezing of the pipescaused us to adopt another plan. We then placed our feed barrel below the level of the engine bed, and run the exhaust into the barrel to heat the water. This works very well so far as heating the water is concerned, but it has the disadvantage of collecting the tallow used for lubricating the cylinder; and after passing through the pump, it is forced into the boiler. We use neither filter nor mud drum. What would be the best way of cleaning this grease out of the hotler? How would it answer to use lye and convert it into soap, and then blow it off? If this yould answer, how much ought to be used? What would be the best method of cleaning the feed pipes, which are coated inwardly with greasy matter? We want to use the boiler for about 6 weeks more, only, Answer: Try using crude mineral oil for lubrication, as recommende recently by one of our correspondents in this column If that does not answer, we should use a worm heater We should suppose that economizing in the use of tallow might give good results in more ways than one.
- J. T. B. asks: 1. What is the proper rule for determining the sectional area for the rim of a fly wheel suitable for any power of engine? 2. What is the rule for determining the sectional area of a lever crank of any length, suitable for any given power or pressure on piston? 3. What is the rule for sectional area of an engine bed suitable for any pressure on piston, and any length of crank? Answers: 1. Answered in article or fly wheels, on page 177 of this issue of the Scientific AMERICAN. 2. Multiply theoressureon the crank pin by the distance from the center of pin to point at which the thickness is required and by 17; divide the product by 100,000 times the square of the depth in a line perpendicular to both the lines of the shaft and of the crank. The result is the probable thickness of web with which a crank will just break. To be safe, take a pressure on the crank pin at least six times as great as the anticipated pressure. 3. Multiply the area of piston by the steam essure and divide by 3,000. The quotient will be the

ast allowable sectional cross area of the bed.

- C. S. C. sends a mineral specimen and would like to know its value and what it maybe used for. Answer: It could be used in making brick and coarse pottery.
- E. P. C. encloses four mineral specimens for examination. Answer: No. 1 is indurated clay. No. 2 is the same, but purely argillaceous. No. 3 is compact limestone. No. 4 is siliceous limestone, containing minute crystals of pyrites. You have been bor ng through the Trenton or Lower Silurian limestone and entered the calciferous formation. You must be very near the granite or underlyingrocks. If you do not strike water the moment you reach these, you should give it up. We presume the strata in your region dip southeast; but not knowing their precise disposition at Wequiock, it would be tidle to prophecy at this distance. Keep on till you touch granite.
- E. B. asks: 1. If the spectrum of iron shows 65 lines, does this indicate that iron consists of sixty five terrestrial elements? 2. Can it be ascertained what particular line the color substance of flowers and leaves will throw in a spectrum, by burning leaves, etc., in a fresh state? Answer: 1. It is generally supposed that the number of lines and their position in the spectrum is characteristic for each metal. All of the iron lines belong to iron, the potassium lines to potassium, etc. The number and location vary for each metal. There are only 65 terrestrial elements, all told, and iron is one of them. 2. The absorption bands produced by the coloring matter of plants have been studied and described by different authors. When the leaves are burnt, the coloring matter is destroyed, and the lines on the spectrum are there produced by the mineral constituents of the ashes.
- H. N., Jr., asks: What will remove red ink from writing paper? Answer: The red ink is readily removed by hydrochlorite of soda, which can be purchased under the name of "Javelle water." Chlorine water and a solution of bleaching powder will also destroy the color.
- J. H. S. asks: Where can I find a reliable mechanic's companion? Answer: See our advertising
- H. A. W. says: In this county, Edgecombe, N. C., there are many locations in which accurate sur-veying cannot be done in the ordinary way with a compass, on account of the great variation of the needle, due to local causes. These difficulties are most generally met with in the neighborhood of marl beds; and a variation of one half degree in stations but a few yards apart is not unusual in attempting to run lines in close proximity to one of these beds. With only one exception, I have always found marl in locations where the needle was seriously affected. This is a flat sandy country, and no iron ore was ever found in it, to my knowledge. The true explanation of this variation of the needle is of practical importance to the people of this section. Marl is of great value as a fertilizer for our lands; and if the fact could be established that the minfound in all marl beds in this section, and only there, then much trouble and expense incurred in Boking for marl deposits might be saved by the use of proper instruments. Answer: The deviations of the needle, are some times due to magnetic currents in the earth, but more generally to deposits of iron. Any marl that acts on the needle in the manner described must contain considers ble iron, or there may be beds of iron beneath it. It is not probable that a "diviner's rod" or any kind of instrument can be devised for pointing out marl; but in mineral explorations for iron the magnetic needle has been successfully employed by Major T. B. Brooks, of Michigan. This explorer, who has had great exper ence in the use of the compass, thinks that the thickness of rock or earth which covers the iron deposit may be de termined by using a dip compass and solving the triangle thus observed. While the deviations of the ordinary needle compass are so great as to interfere with the ac-curate running of lines, the solar compass, invented by Colonel Burt and used in all the western surveys, can be employed.
- W. M. K. says: It is a well known fact that musical notes are produced by the regular vibrations of the air, so many vibrations in a given time producing a given note; and the higher the number of vibrations in a given time, the higher will be the note produced. These notes of different degrees of hight and duration, com bined and arranged in certain ways, compose music; and these vibrations acting on the nervous system through the organs of hearing are capable of producing various emotions. As these effects are produced by vibrations acting on the nervous system, would not the same results be obtained by electric shocks acting on the nervous system and corresponding in number and arrangement to the vibrations of the air? Has the subject been experimented on, and with what results? Answer: In the mechanism of the ears, there are a great number of nerve filaments which traverse the organ andare known under the name of Schultze's bristles. These slender threads catch waves which come to them with the ra pidity of rifle bullets and render the vibrations fit for reception by the brain. There are 8,000 bristles, each one of which bas its own pitch and is thrown into vibration when the proper note reaches it. It does not follow that electricity could be interpreted by the same apparatus, unless sound was produced. Electric shocks are one thing, sound waves are quite another, and there is probably no analogy between them.
- C. E. says: Will some surveyor, civil engineer, or astronomer please inform me through your columns the difference (by actual observation) between true north and magnetic north, for this year, in the city of New York? The variation changesfromyear to year, and day to day, and our correspondent can determine it for himself with a theodolite according to instructions given in books on surveying.
- W. C. A. says: When it is stated that a book is 8vo., how am I to know length and breadth in inches, thus impressing upon my mind the size of the book? Answer: Usual 8vo size is 9\x6 inches or a little less. Royal 8vo. is about 11x7, but it may be a little smaller or a little larger.
- G. B. L. asks: 1. Are inserted teeth, for circular saws for sawing logs into lumber, better than solid teeth? 2. Can the number of teeth in the saw be diminished, say to one fourth or one sixth of the number generally used, with good results? 3. When the lower half of a cylindrical boiler only is exposed to fire and the lower water gage is half the radius above the line of fire surface, is there danger of explosion should the waterfall below the lower gage, unless it falls below the line of exposure to fire? In other words, can water be converted into an explosive gas, under the circumstances described, the heat being transmitted to the water line through two or three courses of brick? Answers: 1. Inserted teeth are largely used and, properly constructed, are found advantageous in ordinary work. 2. We are hoping to obtain the results of experiment on this point, and are as yet unprepared to give a satisfactory answer. 3. No.

- D. M. C. says, in reply to H., whose horses are troubled with corns: I am a horse shoer and have had some experience with corns in horses' feet, and think the causels the shoebear ng too hard on the heel. I treat them with the best success by taking a farrier's knife, and cutting them out, as deep as possible, without cutting to the quick; then, holding the foet upside down, I put in a few drops of turpentine, holding it a few minutes to soak in. Then I take oakum soaked in tar and fill the hole, to keep out dirt and gravel. Fit the shoe with a stiffheel, so that it will not bear on the heel of the foot. Corns seldom trouble after being treated in this manner, and soon disappear entirely.
- H. S. T. replies to A. H. S., who enquires for a rat and mouse proof filling for his walls: I have seen dry saw dust used with every success; the vermin soon get disgusted in trying to get through it. It is also the best thing that can be used to guard against cold.
- A. W. T. says, in reply to H. J. H: To give metal articles a lustrous black coating. The inside bottem of a cylindrical iron pot, about 18incheshigh, is covered half an inch thick with powdered bituminous coal. A grate is then put in and the pot filled with the article to be varnished. The lid is then put on and the pot heated over a coke fire. When the bottom of the pot has been heated for fifteen minutes, the coal has been mostly converted into coke. The pot is then removed from the fire, and, after standing ten minutes, it is opened for evaporation and the articles will be found coated as desired. This coating will stand considerable heat, and disappear at beginning of redness. It is adapted for iron, steel, tinned iron, brass, zinc and pottery. Smallerarticles like hooks and eyes may be coated by heating them, in a sheet iron drum like a coffee roaster, with small pieces of coal until they present the desired appearance.
- W. G. W. says that S. W. P., who enquires on page 154 about learning phonography, should go to the fountain head for the surest instruction. The inventors' own pure and simple system is the easiest to learn, the mostreliable in reporting, and is unmistakably legible in every word. His name is Isaac Pitman, Paternoster Row, London, and his books can be obtained through any bookseller. "The system is taught in my neighborhood very successfully, and is being introduced into the junior schools as an eminently useful educational auxiliary."
- B. G. replies to J. S. L., who wants to know how to have good water in his well: I have the best pump water in the neighborhood; my plan was the following: Empty the well, suspend (by a string) a coarse canvas bag, with three or four good sized lime stones and one or two lumps of charcoal in it. Have the string long enough to nearly reach the bottom of the well. In a week or two, take out the charcoal, throw back the lime stones into the well with five pounds of soft coal. Put a round or square wooden shoot up at the back of the pump; carry the shoot up higher than the pump for freeventilation. If the pump is out of doors, put a "tee" on top; if under cover, a fine wire gauze will do. J. S. L. can cover up his well, and I think he will have no more trouble in getting a drink of good water at home.
- W. T. B. says, in answer to D. H. S., Jr., who asked how to remove the taste of smutfrom wheat. To remove taste and smell from smutty wheat, dry you wheat thoroughly, so that the dust of the boll, when broken, will not adhere to the grain. Then run it through your smutter, and back your bins, and, if the air does not purify it in a few days, sprinkle on as much water as you need to toughen the hull of the wheat before grinding, adding one part bromo-choralum to twelve parts of the water.
- W. T. B. says, in answer to O. K., who asked if a burrstone could be driven with a quarter twist balt direct from shaft to spindle: I have used the quarter twist belt direct from shaft, for running millstones, successfully. But for 4½ feet stones, I used a twelve inch belt, which I think small enough for the capacity of that sized stone, namely, 25 bushels wheat or 50 bushels corn per hour. The distance between shaft and spindle was twenty feet.
- J. M. says that D. can color his extract of lemon with tincture of curcums. The tincture cau be made by putting 1 ounce pulverized curcums in one pint sloohol; mix, and it is ready for use, but it becomes stronger by standing. Half an ounce of the tincture is sufficient to color one quart of the extract of lemon.
- P. A. B. says, in answer to F. C: Heat your screw driver to a cherry red heat, to two inchesfrom the end. Dip in cold water one inch, then rub the point on a piece of brick or anything that will make it bright. When the color at the point comes to a light blue, dip in water.
- N. J. F. says, in reply to P., who asked how tomake Grecian paintings: Mix equal parts balsam of fir and common turpentine (both should be colorless); shake well and put away in a warm place for a day or two, shaking occasionally. Select a photographic por trait with clear lines and soft shadows, put it into water for a few hours, when the photographic print, if mount ed, can be removed from the card. Wipe the paste off carefully and wash well. Then to each side and to the top and bottom, paste strips of paper; the edges should lap very little. After the paste has dried and the strips adhere firmly to the photograph, place the latter in the center of a frame or stretcher, to which paste the other ends of the strips of paper. This suspends the photograph in the center of the stretcher. Then with a large soft brush dipped in spirits of turpentine, moisten the back of the photograph and immediately pour on the scribed; rub it with the Anger or entire surface of the back and continue to do so till the picture is seen as distinctly on one side as on the other Then put away to dry where no dust can mark it. When perfectly dry, prepare a pallet of oil colors mixed with coppy seed oil (to prevent drying too rapidly). Then on the back, lay the hair color smoothly over the hair, the flesh color smoothly over the entire face, excepting the eyes and lips; over the eyes put pure white, over the lips the proper shade of red. Paint the drapery accordig to fancy, allowing for the colors to sink in When perfectly dry, if cracked, go over again with the same colors and shades; if not cracked, paste (with comnon flour paste) smoothly to a piece of card board; pres till dry, then sponge the face, and, with a little clarified linseed oil on the tip of the finger, go over the picture.

 Prepare a pallet of colors for the finishing touches. Deepen the shadows, raise the high lights, put a natural flush on the cheeks, paint the pupils of the eyes the prop er color, put in the light with pure white, deepen the spirited touches about the lips and mouth, touch up the drapery, and you have "a thing of beauty" which will be a "joy forever." I neglected to mention that the background should be painted on the back of the picture and he wholesurface of the back covered with color before it is pasted to the card board.
- A. S. says, in answer to S.'s question of making sulphate of nickel: Dissolve metallic nickel in a

glass flask nearly filled with a mixture of 8 parts of water and 1 part of sulphuric acid; set the flask in a sand bath apply moderate heat until a more or less dark green so intion has been obtained, which, after settling and clear ing, should be decanted off in a porcelain evaporating dish. Set the dish into a sand bath, apply moderate heat and evaporate slowly until a thin skin is formed on the surface of the fluid, then remove the dish from the sandbath and let it rest undisturbed in a cool place for 24 to 48 hours, during which time crystals of sulphate of nickel will be formed on the sides and bottom of the dish; pour off the mother lye from the crystals, and put the latter in a glass or porcelain funnel provided with a paper filter through which the last portions of the mother lye may pass and the crystals dry. Preserve the crystals in a well closed glass or stone ware vessel. Sulphate of nickel by itself, without beingcombined with other salts, will not make a good plating solution. Another mode of preparing sulphate of nickel is by dissolving metallic nickel in diluted sulphuric acid by the action of a galvanic battery.

J. D. H. says: It seems clear to me that the answer to "J. L. B.'s" question, why a glass jar on a wet cloth may be filled with hot liquids without breaking, is simply this: The water in the cloth retards the heating of the bottom of the jar and thus obviates that sudden unequal expansion of the parts of the jar which would otherwise take place. Would not setting the jar in a vessel containing a little water answer the same purpose?

COMMUNICATIONS RECEIVED.

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

On Our Present Knowledge of the Sun. By G. W. T.

On a Method of Supplying New York City with Salt Water. By J. P.

On the Transplanting of Trees. By A. K. S. On Distinguishing Fibers in Mixed Goods. By C. S.

On the Government Works at Hell Gate. By M. G.

On the Collection and Reduction of Photographic Wastes, such as Silver and Gold. By C. L. L.

On Boiler Strains and Perpetual Motions, By J. C.

On the Laundry. By J. K. D.

On the Cause of the Gulf Stream and other Ocean Currents. By J. P. W.

On Positive and Negative Forces. By E. B. On Phonography and Phonotypy. By E. B. S.

[OFFICIAL.]

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