Business and Personal.

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ANSWERS TO CORRESPONDENTS

A. E. C. can repair his meerschaum pipe by following the directions on p. 90, vol. 30.—J. F. and others will find explicit information on the subject of sumac in any good work on botany.—G. C. B. can repair rubber boots by the process described on p. 155, vol. 26.—C. S. & Co. will find directions for bronzing malleable iron castings on p. 203, vol. 29.—C. B. and others can obtain the lenses for the cheap telescope described on p. 7, vol. 30, from any optician.—A. S. will find directions for repairing rubber overshoes on p. 155. vol. 26.—J. H. should address the engineers of the Hoosac tunnel for the information he seeks.—J. W. A. will find a description of nickel plating on pp. 91, vol. 29, and 187, vol. 28.

C. H. F. says: 1. In a self-feeding stove, the pipe runs 8 feet horizontally from the stove, and then some 12 feet perpendicular into the garret, where it runs 20 feet horizontally and enters the chimney. A substance is constantly dripping from this 20 feet of pipe in the garret, and it eats its way through the pipe in a short time. There is no possibility of any water getting into the pipe from the chimney. I send you a few crystals which formed on the perpendicular part of the pipe in the garret where this substance runs down on it. What causes this substance, and what are the crystals composed of? A. Probably some corrosive substance is distilled from the coal, and condenses in the pipe. The specimens sent seem to be sesquioxide of iron. 2. How can the tone of a church steel bell that is cracked be restored? Could it be done in the steeple? The bell is so hard that steel tools will not cut it. A. We scarcely think it can be done. 3. Is there a substance, and if so how is it made, that will take the temper out of steel or soften it, so that it can be drilled without heating? A. We do not know of any. 4. Which will stand the most pressure, a copper or an iron boiler, both of the same size and thickness? A. An iron one.

J. E. W. asks: 1. Why can a gimlet pointed screw be driven more easily with a long screw driver than with a short one? A. On account of the greater leverage that can be obtained by inclining the long screw driver. 2. Can the same screw be driven more easily with a pressure on the screw more than enough to keep the screw driver in place? A. We think not.

F. D. asks: 1. How can I get a good spring temper on steel wire? A. Temper in oil. 2. How can I case harden it? A. With prussiate of potash. 3. If I case harden it, will it make it break more easily? A. We think it will.

F. F. R. asks: 1. Will a common horseshoe magnet, if bent straight, have the same qualities as a compass needle, as to polarity? A. Yes. 2. Would a compass needle lose its power if it were confined so that it could not turn on its pin, a weight being put on the cap of the needle so that it cannot move? If I turn the compass so that the north end of the needle would point south and let it remain for six months, what would be the result? A. Probably it would lose a little of its attractive force. 3. Is there any motor run by a magnet? A. Yes.

C. A. W. says: 1. It seems to me that, in the present state of steam engineering, there ought to be rules for the construction of slide valves that would be generally recognized by builders as giving the best result for average speeds. The diversity of practice seems to be as great as the number of builders, and the theories equal the mechanics in number. I know builders who give so large a compression in some cases as to force the valve from its seat, while others release almost as early as the cut-off, and have practically no compression. I should suppose that the most economical point of cut-off, release, and compression would have been determined approximately, by actual experiment by this time. Is there no work treating on these questions? Auchincloss assumes these points to be determined, and then gives rules for constructing valves accordingly. A. We think the subject is treated in several manuals of the steam engine and locomotives. 2. Are sirups prepared from starch, cotton, wood fiber, etc., by the use of sulphuric acid or other re-agents deleterious? And is there any simple test for detecting deleterious qualities? A. We think not, in general. Probably the simplest test would be with litmus paper.

R. H. says: In a shop heated with exhaust steam, conveyed through pipes made of galvanized iron the heat does not seem to radiate, no matter how much steam is turned on. Why is this? A. Probably the trouble is caused by insufficient radiating surface or too little steam.

W. asks: In estimating the heating surface of a vertical boiler, should the surface of those parts of the tubes be measured which project above the surface of the water, through the steam chest? Is not the heating surface as great in a boiler where the tubes only extend to the surface of the water as in a boiler of same dimensions where the tubes extend to the top of boiler? A. The heating surface is greater where the tubes extend the whole distance.

T. J. McM. asks: How can I divide a given straight line into two parts, so that the square on one of the parts may be double of the square on the other? A. You can solve the question, to any degree of approximation desired, by the following formulas: Let l = length of the line. Lesser part $= l \times \sqrt{2} - l$. Greater part $= 2l - l \times \sqrt{2}$.

T. C. W. asks: 1. Can you give me a recipe for making blackberry wine? A. Cook the berries slightly; let them stand until the next day. Then strain them, add 1 quart of water and 3 pounds of brown sugar to each gallon of the juice. Place the mixture in a cask, cork tightly, and let it stand until the following March, when it can be bottled. 2. Is it a healthy drink or not? A. We think so. 3. Would it not be practical to ring the bells in the different churches by telegraph, providing each church had its own battery, and could not one man ring all the bells in one church? A. Yes. 4. Can I get the different drawings and specifications of all the patent ice elevators? How can I find out how many have been patented? A. Yes. You can only find out the number by a search. 5. Can I have my hydrant so arranged as to force the water out of my cistern into water pipes through the house, without letting any water out of the hydrant into the cistern? A. You can probably do it by putting up a water engine, to be driven by the water from the hydrant. 6. Can you give me a good recipe for hair oil that will not injure the hair? A. Probably castor oil is as good as anything. We cannot answer your other question, as the *data* are insufficient.

J. T. H. asks: Should the propeller be of a greater or less pitch at the center than at the perimeter, to avoid drag? A. There is a great difference of opinion among engineers on this point. Makers of propellers with varying pitch assert that their screws, when in motion, do not shake the vessels so much as equally efficient screws with constant pitch.

J. W. D. E. asks: 1. How many different kinds of fire engines are there in use? A. Hand engines, steam engines, chemical engines. 2. How much fall is usual on canals? A. They are generally level. 3. What is the common width? A. The widths vary greatly in different localities. 4. Is it essential that canals should be walled up? If so, would brick be cheaper than any other material? A. Generally canals require to be walled up, but we do not think that brick is the most suitable material. 5. When will the committee decide between the competitors for the reward offered by the State of New York? A. The time during which competition was allowed has expired.

N. L. T. asks: 1. How can I compute the pressure exerted outward by a ball weighing 1 lb., revolving in a circle the radius of which is 1 foot, at 1 revolution per second? Is there any fixed rule for determining the centrifugal force of a body? A. The centrifugal force of a body =

$$\frac{(\text{Weight in pounds}) \times (\text{velocity in feet per second})^2}{\text{radius} \times 32{\cdot}2}$$

2. Do you know of any book published on the compass and the variations to which the magnetic needle is liable, treating the subject in such a way as to enable a person to acquire the skill and knowledge requisite for an expert surveyor? A. Gillespie's "Treatise on Land Surveying" has considerable information on the subject of the compass.

W. J. B. asks: What is the most reliable work on superheated steam, and where may it be obtained? What is the greatest number of degrees of heat that can be obtained from superheated steam? A. We do not know of any work that will answer your purpose. Steam can be superheated to any degree that the apparatus will stand. It would probably be well for you to consult an experienced engineer about the matter, as in this way you will avoid costly experiments.

T. L. C. asks: 1. What is the greatest perpendicular hight to which the waves on the ocean rise, measuring from bottom of the trough? A. From 30 to 40 feet, we think. 2. What is the distance between them from top to top or center to center? A. About the same as the hight. 3. How far below bottom of trough is the water agitated by the strongest wind and largest waves? A. Probably about 2,000 feet.

M. J. S. says: I have a hollow rectangular vessel, two feet long and four inches square, made of sheet steel, one sixteenth of an inch thick. Can I pour in molten cast iron to make a solid piece, and secure a perfect weld with the steel without deteriorating the quality of the steel? Which is the best method to perform the operation? A. We do not think you can do it.

W. L. asks: Is any injury to be apprehended in firing a boiler with the dust from mixed fabrics whence the wool has been extracted, from greasy rags with oil of vitriol? A. We scarcely think that any injury will result from the use of this material.

G. W. V. G. asks: 1. Will a thermometer indicate the same temperature hanging in the wind that it would if sheltered from the wind, everything else being equal? A. Probably the indication would be lower in the wind. 2. Is the temperature when air is put in motion by a fan or bellows changed? If so, what is the cause? A. We think not, materially.

G. A. E. asks: 1. In the electrical plate machine described on page 402, vol. 28, if the disks are of glass, is it absolutely necessary to the proper working of the machine that the lower disk should be $\frac{1}{8}$ and the upper $\frac{1}{16}$? Or is it only necessary that the lower one should be twice the thickness of the upper? A. Probably the relative thickness is not a matter of great importance. 2. How or where can I get ebonite? A. Ebonite is made by heating india rubber with half its weight of sulphur. You can doubtless obtain it from a rubber factory.

L. W. M. says: We conduct escape steam through our building with tin pipe, for heating purposes. The pipe is not painted inside. Is there any way that we could coat the inside of the pipe without taking it down? We think we could economize part of the escape steam if we could apply some good radiator. A. We scarcely think you can accomplish this.

E. P. C. asks: In Bourne's mode of setting the eccentrics, what is meant by "the center of the eccentrics"? A. It has the same relative position as the center of any circular figure. 2. When a train of cars is going around a bend in the road, do the inside or the outside wheels slip on the track? A. The outer wheels will slip the most, if both have the same diameter.

A. B. D. asks: 1. What will remove black worms from the face? A. Friction with a rough towel has been highly recommended by some of our correspondents. 2. Are the so-called black worms living insects, or merely a secretion? A. We think they are secretions of matter. 3. Are hot air furnaces bad for the health? If so, what is a better and not too expensive way of heating a house. A. This is a matter about which there is a great diversity of opinion. For our own part, we think that hot air furnaces, in which water is constantly evaporated, may be used in well ventilated houses without injury to health.

A. C. E. says: 1. I have a small library of about 400 volumes which I wish to arrange and catalogue. What is a good method for so doing? A. It is a good plan to arrange the catalogue alphabetically, according to the names of the authors of the works. Example: "LLOYD, HUMPHREY. Elementary treatise on the wave theory of light. 2d edition, 1 volume, 8vo. London, 1873. 2. E." The figure 2 refers to the book case, and the letter E to the shelf on which the book may be found. 2. In sharpening a knife or a similar tool, when the grindstone is turning towards you, should you hold the sharp edge of the knife toward you or from you? A. The latter way.

E. E. B. asks: What course of study is necessary for a civil engineer? What books are necessary, and where can they be procured? A. Send to some publisher of scientific works, for his catalogue, in which you will find the different subjects classified. You will see the advertisements of such publishers in the SCIENTIFIC AMERICAN.

A. S. asks: How can I stop the leak in an aquarium? One of the glasses is cracked. A. Probably you can stop the leak by the use of marine glue.

T. E. asks: How can I ascertain the amount of any given element in any given mineral, for instance the lead in galena, or the zinc in blende? A. It can be ascertained approximately by a careful blowpipe analysis.

R. C. G. asks: How can I tin pieces of iron wire? I have tried dipping them in melted tin, but cannot prevent their sticking together, and they are very rough and unevenly coated. A. Probably you will have to arrange the pieces so that they can be dipped separately, and wiped off as soon as removed from the tin bath.

C. D. says: We have a private telegraph. My station would not work; upon seeking for the cause the copper insulated wire (running from the street wire into my cellar) was found corroded at the two ends of the cellar window where it touched the brick wall. Will you inform me of the cause of this corrosion at these two points? A. Gases that corroded the wire might have been given off from some place in the vicinity.

J. M. D. asks: What will be the advantage of inserting a ¾ inch pipe into each end of a cylinder thereby making direct communication from one end to the other? The object of this is to provide for the drainage of the cylinder. A. As we understand the question, the effect will be to increase the back pressure on the piston.

H. F. M. asks: 1. How many feet to the mile are there in a grade of three degrees? A. About 275 feet to a mile, measured on the incline. 2. How can I ascertain the amount of water that a roadside gutter will carry? A. Knowing the construction, you can determine by experiment the velocity, and consequently the amount of water discharged in a given time. 3. How much fall should be given to an open spout, made of two planks nailed together, in a distance of 500 feet so as to carry 30 gallons of water per minute? A. You can use the formula given on p. 48, vol. 29, multiplying the coefficients there given by 0·571. In this way you can find the inclination necessary for a wooden pipe. Then make your trough so that the wet surface is the same as the surface of the pipe. 4. Is there any way to repair the screw on a common auger when it is slightly damaged or worn? A. It can often be done with a file. 5. Is there a way to clean kerosene barrels, so as to make them fit for packing meat in? A. We think they can be cleaned by steaming. 6. What is the best way to wash flannel? A. This is a disputed point. Perhaps the ladies, who know all about such matters, will send us their views.

G. R. E. says: 1. In your article on the initial velocity of projectiles on p. 400, vol. 29, you say that the circuit of the battery of the Bouton instrument can be closed or broken at will by means of a disjunctor. What is that disjunctor composed of, and what is its position? 2. In the description of the Schultz chronoscope, you mention the interrupter, and say it closes and opens the circuit about 500 times per second; can you explain it? A. In these instruments an electro-magnet is employed and the attraction is destroyed by interrupting the connection of the conducting wire with the battery. 3. What will cut off or stop the current of a common horse shoe magnet? A. We do not know of anything that you can use to cut off the attractive force of a permanent magnet.

C. R. asks: In the compound engine, in which the steam does duty twice, what is the ratio between the first and second cylinder? A. From 2·5 to 5. 2. What gain is claimed for this sort of engine? A. Greater facility for a high grade of expansion, and less cooling and reheating of the cylinder during alternate strokes. 3. Is there not a back pressure on the piston of the small cylinder on the return stroke? A. Yes. 4. Is there any way of avoiding this back pressure, and, if it could be obviated, would not the gain be large over the ordinary engine where the steam is used only once? A. Reducing this back pressure reduces the working pressure in the second cylinder.

G. E. W. asks: Is not the curvature of the earth for the first mile nearer six and a half than eight inches? Reckoning diameter eight thousand, and circumference twenty-five thousand, miles, the fall from pole to equator is four thousand miles, of course. Then, as the square of 6,250 miles is to the square of 1 mile, so 4,000 miles are but a small fraction more than 6½ inches. A. The polar diameter of the earth is 41,707,536 feet, or 7899·155 miles; the mean diameter at the equator is 41,847,662 feet, or 7925·694 miles. It is sufficiently accurate, in calculating the curvature of the earth, to regard it as a sphere with a diameter of 41,778,000 feet = 13,926,000 yards = 7912·5 miles. The curvature for any distance, all dimensions being taken in feet, is found by dividing the square of the distance by 41,778,000—or the curvature, in feet, for any distance expressed in miles, is equal to two thirds of the square of this distance. For a distance of 5,280 feet, or one mile, the curvature will be $\frac{(5280)^2}{41,778,000} = (1)^2 \times \frac{2}{3} = 0{\cdot}667$ feet as given in the table. 2. Has a telescope a lifting power, so to speak, as well as a power for enlarging; and, if so, are the two powers equal? A. In general, a correction for refraction (which makes the object appear higher than it really is and thus reduces the curvature) should be applied. This varies with different states of the atmosphere, but its average value may be assumed as one sixth of the curvature, so that the corrected curvature is five sixths of that given by calculation. Hence it appears that the curvature, at a distance of one mile, corrected for refraction is, on an average, $\frac{(5280)^2}{41,778,000} \times \frac{5}{6} = (1)^2 \times \frac{5}{9} = 0{\cdot}556$ feet. 3. From what bases have the earth's circumference and diameter, as these are now measured, been estimated? A. By the measurement of the lengths of a degree of latitude and longitude at different parts of the earth's surface.

R. J. B. R. asks: At what age does a person usually stop growing? A. Some one has recently published the following *data* in regard to the growth of men and women: Average weight of boys at birth, 6½ lbs.; average weight of girls at birth, 6¼ lbs.; average weight of males at 20, 143 lbs.; average weight of females at 20, 120 lbs. Men acquire greatest weight, on an average, at 35, weighing 152 lbs., women, at 50, weighing 128 lbs. Weight of an average man or woman when full growth is attained is about 20 times that at birth.

J. G. asks: Why will a hollow cast iron cylinder sweat on the inside when a flame of illuminating gas is turned into it for heating purposes? Is it because the moisture is contained in the pores of the iron and liberated by heat, or is the gas condensed into water upon coming in contact with the cold surface of the iron? A. The steam formed by the combustion of the gas condenses on striking the cold cylinder.

J. H. asks: What is the best method of painting upon glass, so that the coloring will resist the weather? A. First draw the subject on paper, and fasten it, face downward, by pasting it at the ends, to the glass. Turn the glass over, and paint with a camel's hair pencil, the pigments being mixed with varnish. Let the outlines dry before filling in and shading. The painting may be varnished over.

J. B. N. asks: How can I transfer pictures from paper to glass? A. Coat the glass with a varnish of balsam of fir in turpentine, then press the engraving on smoothly and evenly, being careful to remove all air bubbles. Let it stand for 24 hours, then dampen the back sufficiently to allow the paper to be rubbed off by the forefinger, rubbing it till a mere film is left on the glass, then varnish again.

H. H. asks: How are organ pipes constructed, and are they tuned in the shop or after the organ is set up? Do they ever get out of tune? If so, how are they made right again? A. Organ pipes are made of wood or metal. The wooden pipes are generally nearly square in cross section, varying in size of section according to the length. Metal pipes are of different kinds of pewter, the best being the sort known as spotted metal. Pipes can be tuned before being put in the organ or afterwards. Shortening a tube raises the tone, lengthening it lowers it.

R. H. S. says: By what means can a barometer that has lost a portion of the mercury from the cistern be made to register correctly? A. It would probably be difficult to adjust it without using another barometer, unless the cistern is adjustable.

H. S. asks: 1. How does a chemist earn a living? A. Chemists make analyses, prepare reports of processes, etc. Some of them are professors in educational institutions. 2. Does he ever get rich? A. Good chemists often realize large profits from their profession. 3. What are the best books for a boy to study who wants to learn chemistry, supposing he knows nothing about it? A. "Towne's Elementary Chemistry." price $2.75, will be a good book for you to have, and you will find in it information in regard to your other questions.

J. S. asks: 1. When in a rotary engine there are two or more pistons to but one abutment and steam port, after the second piston has passed the abutment and is receiving steam, does the steam between the first and second piston cause back pressure by expanding and pressing the two pistons apart? A. In general it does. 2. Are the compound brass fishing reels cast or stamped out of sheet brass? A. We believe the cheaper styles are stamped.

W. W. M. asks: How can I cover wire for insulating it? A. A disk having a large hole in the center, and carrying two spools on which the silk is wound, is made to revolve as the wire is drawn through the hole, the ends of the silk being first tied to the wire. By varying the relative speeds of the disk and wire, the silk may be wound on as closely as may be desired.

J. P. L. asks: How can I prepare bronze powder, to be used in a semi-liquid state upon wood? I want it to dry quickly. A. The best way is to coat the wood with glue or drying oil, and dust the bronze powder over it through muslin. But the bronze powder may be mixed with drying oil, and applied with a brush.

D. B. asks: 1. How can I make small portions of yellow and green bronze, and golden ink? A. For golden ink, see p. 102, vol. 30. Yellow ink can be made with a decoction of saffron. Green ink can be made by mixing indigo carmine with picric acid. 2. Do you know of a simple prescription to take tan off the face and hands? A. Cover the skin with cold cream. 3. Which is the better, to study civil engineering theoretically, or to study it by being the assistant of an engineer? A. The latter way. 4. Name some authors who have written on the "True and Beautiful." A. Ruskin, Taine, Goethe, Matthew Arnold, and the majority of the poets. 5. What is the salary of a United States coast surveyor? A. From one hundred to one hundred and twenty-five dollars a month, we believe. 6. What are the predictions of the coming spring? Will it be early? A. Probably it will be late, but this is a mere guess. 7. Whose work on civil engineering do you regard as the best? A. Professor Rankine's.

H. J. B. asks: Is there any kind of oil that will form an explosive gas by forcing air through it? A. Probably naphtha or some other of the hydrocarbons will answer your purpose.

W. asks: Why is it that, in hewing green wood, a spark of fire is often seen down in the wood next to the ax, where there could be no grit? A. The spark is probably due to the friction between the ax and wood.

R. G. asks: Why is it that a large boiler cannot carry as much steam per square inch as a small one? A. The strength of a cylinder, other things being equal, is inversely as the diameter.

E. J. F. asks: 1. Will the magnet be less powerful in attraction under water than otherwise? A. We think not. 2. What is the best method of causing a magnet to retain its full power of attraction? A. Keep weights suspended from the armature. 3. Which is best, magnetite or iron merely magnetized, or is there no difference in the power? A. The latter is best.

T. S. V. says: I am using a 10×20 engine, running at 80 revolutions, with steam at 60 lbs., with a 3 inch exhaust pipe, and I would like to exhaust into the bottom of a tank containing six feet water. How much back pressure will it make on the engine? A. About two and three quarter pounds per square inch.

J. A. B. asks: Would a steam boiler explode with the same noise and throw pieces of the boiler as far if it exploded under hydraulic pressure at 150 pounds to the square inch as it would under the same pressure of steam? A. The explosion would generally be the most violent in the case of steam.

N. L. T. asks: 1. Why can a kettle of boiling water be held on the hand without inconvenience as long as it boils, but as soon as it stops the heat becomes intolerable? A. If such is the fact, it is probably because water in boiling requires so much heat that it is abstracted from surrounding objects. 2. Can heat be transmitted through a vacuum? A. We think so. 3. Why are rifle balls made conical at one end, and flat and sometimes concave at the other? Would they not be more effective if made tapering to both ends, as in that case no vacuum is formed after the ball, the air flowing in behind it instantaneously? A. They are made concave at one end, in order that they may spread, and fill the grooves of the rifle barrel.

O. K. asks: 1. Is the White House at Washington a wood, brick, or stone building? A. It is built of freestone. 2. Has it ever been rebuilt? A. We think not. Why is it called the White House? A. Because it is a white house.

W. B. N. says: A friend claims that, in setting logs for sawing, the eccentric blocks, making two motions for one inch, will not throw the log as hard as setting the log by one motion with the double rack and pinion. There is no back lash in either case, and the log is to be moved the same distance in the same time. I claim that, if there is any difference, it would be in favor of my plan with the double rack and pinion. He is sure that he is right, and will not let any one decide. I ask for your opinion. A. It is difficult to determine which is correct without a practical test with the two devices.—J. E. E., of Pa.

W. M. J. asks: What is the best kind of saw to saw plow beams, wagon fellies, and wagon hounds? How many plow beams are a day's work for one man, cut from plank of the proper thickness for common two horse plows? Is cutting the lumber or logs into plank the proper way to get out plow beams, or would it be better to saw the timber or logs to the shape of beam, and then slit up to the thickness of beams? A. The logs are first sawn into plank to the proper thickness for the beams, and then to a pattern marked with the required shapes. A strongly built jig or band sawing machine is used for sawing the curves or the curved way of the beam. The first cost of a band sawing machine would probably be more than for a jig saw, but it would saw more rapidly. So much depends upon conditions that it is impossible to give an approximate estimate of a fair day's work.—J. E. E. of Pa.

W. J. says: 1. I have a theory that a balloon could be guided at will by attaching to it a conical shaped apparatus, made of light material and hollow, the open and large end to be fastened to one side of the balloon, the other end converging to a point. The theory is based on the principle that the balloon with the above attachment offers less sail-like surface to the wind, and consequently would be enabled to sail against currents of air. What is your opinion? A. We do not think that this arrangement will enable you to do what you propose. 2. Would not perpetual motion be possible if it were not for the law of gravitation? A. Possibly it would. 3. What is your opinion of the following proposition: If perpetual motion is ever invented, will it work by magnetism or attraction of magnetic force? A. No. 4. Has there been anything invented to condense all the steam from a steam engine and return it to the boiler. If so, what is the percentage of waste? A. Yes. There is no waste, if the apparatus is tight. 5. Does the patentee of an invention possess any certificate to show that his invention is patented? A. No. 6. Is there any instrument that will detect the presence of a metal in the earth. A. No.

W. S. C. asks: 1. If the same pressure is brought to bear on every part of the interior of a steam engine and boiler, why are they made of different strengths? For example, the boiler is ¼ inch thick, the live steam pipe is ⅜, and the steam chest and cylinder sometimes one inch and more. A. The strength of a cylinder, other things being equal, increases as its diameter is decreased, consequently small cylinders do not require to be made as thick as large ones. 2. How is it that a steam boiler can pump water into itself? It seems to me that there would be a back pressure on the pump piston head. A. The steam piston is larger than the water piston, so that the pressure per square inch on the water piston is greater than the boiler pressure. 3. If it takes 10 ordinary horses to run a machine at the required space, what sized engine would do the same work? A. An average horse performs about half an engine horse power, when working in a gin or mill, so that an engine of five horse power would generally do the work of 10 horses. 4. Why can a horse pull more when he is hitched directly to the load than he can 100 yards from it by a rope, deducting the weight of rope? A. We are by no means certain that this is a fact.

C. H. W. asks: How is curd soap made? A. By using tallow for the grease and soda for the alkali.

A. B. says: 1. In February last, while plowing a piece of land, I found, at a depth varying from 3 to 6 inches, a large number of honeycombed insect nests. These nests were of various sizes, but, for the most part, varied from 2½ to 3 inches in width, about 4 inches in length, and about 1½ inches thick. These nests are somewhat oval, inclining to flat on the top and bottom, and have quite a number of honeycomb cells, varying generally from six to twenty-four, which contain the cocoon of the insect. These nests are made of clay, somewhat like the dirt dobbers. Can you inform me what bug or insect could have made such a nest, what its habits are, etc.? A. The insect which you describe appears to be a kind of wasp, of which there are two descriptions, the social and the solitary. The solitary wasp sometimes builds its nest in the ground, while the nests of the social insect are sufficiently familiar to us hanging from trees and fences. Consult an encyclopedia, article "wasp." 2. What is the best method of mixing white lead or zinc for painting wood? A. White lead and zinc are mixed with boiled linseed oil to a proper consistence for paint. 3. In vol. 28, No. 26, you published a new specific for rheumatism. It will be valuable to many if you republish it. A. Propylamin is the specific referred to. Wertheim prepares it by the decomposition of narcotine and codeine by alkalies. Dose, 5 drops in a tablespoonful of peppermint water every 2 hours.

C. S. A. asks: If a magnet were made in the shape of a ring, of the ordinary thickness, would not each molecule have polarity in the same directions as the whole magnet? A. In a bar magnet the magnetic power is most intense at the two extremities or poles, the middle portion showing hardly any or no magnetism. A circular disk or ring could be magnetized in the same way, the position of the poles depending upon the manner in which it was magnetized.

G. M. G. asks: Why is it that metronomes, for beating time in music, are not made in this country? A. Make one for yourself by taking a cheap clock movement, and substituting for the pendulum a wire with a sliding weight, Mark the wire with a file at the different points of graduation.

R. J. asks: 1. How can I make phosphate of calcium? A. By phosphate of calcium, we suppose, you mean calcium phosphate or phosphate of lime. The former term and analogous ones we consider both confusing and uncalled for in chemical nomenclature, although some chemists affect them. Phosphate of lime occurs naturally in the mineral apatite, and consists to a considerable extent in bones. In chemistry there are various phosphates of lime, depending upon the amount of base present. To form a basic phosphate, add a solution of basic phosphate of soda to a solution of chloride of calcium. 2. Can you tell me how to dissolve old rubber boots, etc., on a large scale? A. Bisulphide of carbon is a good solvent for india rubber. 3. Which is proper in speaking, to say "I can't" or "I con't"? A. The vowel a in "can't," abbreviation of "cannot," is sometimes pronounced with the a short and flat, and sometimes with the a broad and long, but never, properly, with any sound of o, as in "cont."

R. F. Jr asks: 1. Will you please give a practical method for testing the explosive nature of the several brands of burning oil? A. Oil that will not take fire when a lighted match is held to it may be considered tolerably safe. 2. In a recent number you gave a recipe for a paint dryer, which named gum lac as one of the ingredients. Is there any other name for that article more familiar to the trade? A. We think the name gum lac is applied to all the varieties in the market, namely, stick lac, the crude product, seed lac, in a granulated form, and shellac, which has undergone a purification.

J. V. D. says: After getting up steam on a Monday morning, I went to start my engine when, after about five or six turns, there was a loud report inside of the boiler, which jarred the whole mill. In about two seconds there was another and louder one, and then the boilers went on all right. On the next Monday morning they acted similarly. In the first case, the steam fell from 70 to 30 lbs., and in the second from 40 to 20. What was the cause? A. It may be that the pipes connecting the boilers with the steam drum had been choked with ice or something else, which would account for the accident.

E. S. H. asks: How can I make a safety fuse, to burn at least 5 minutes? A. Soak a plaited cord in a solution of saltpeter.

S. asks: 1. How may I prove meerschaum to show that it is not imitation? A. This is the work of an expert. 2. How may it be made white, after it has become colored? A. We think it can be done by heating.

H. S. asks: If I fill a cask with steam from water at a heat so that the pressure will raise a safety valve weighted to one pound to the square inch, and then allow the steam to condense, what proportion of vacuum will there be in the cask? What proportion of the cask would fill with water by suction caused by the condensation of the steam, if the cask is connected by a suitable pipe with a water in a well at the depth of 24 feet, the pipe being full of water? A. If the steam is condensed, there will be practically a perfect vacuum, and the cask will become filled with water from the well.

W. F. M. B. and N. C. R. ask: Is the law, passed some time between 1866 and 1869, requiring all persons in charge of steam boilers and engines to be examined by commissioners appointed for that purpose, still in force? A. The United States law applies only to engineers of steam vessels. There are local laws in most of the States. It is very questionable in the light of the working of the present United States law whether government regulations affecting all persons in charge of steam boilers would be desirable.

T. H. E. asks: In soldering two pieces of iron together (a pair of gun barrels, for instance), after they have been thoroughly cleaned, tinned, and fastened together with binding wire, and warmed so that a thin sheet of solder applied to the joint will melt, is there anything besides resin that will make the solder flow as it ought, to make a good job? Resin is disagreeable to the workman, besides leaving a dirty, black color on the iron, which is difficult to remove. A. To 2 ounces of muriatic acid, add small pieces of zinc until bubbles cease to rise. Then put in half a teaspoonful of sal ammoniac and 2 ounces of water.

H. E. F. asks: Is vulcanized rubber the same thing as gutta percha? A. No.

G. M. A. asks: Is there a garden gate which opens and closes automatically? A. Such a gate is described on p. 406, vol. 25. 2. Is there any method to cement mica to copper, tin, glass, or another piece of mica? A. The cement described in our answer to R. L., on p. 90, vol. 30, will answer the purpose.

W. L. asks: Is there any chemical that can be applied on glass, tin, or paper, which will be visible only through colored or stained glass? A. We are not aware of the existence of any such substance.

M. H. A. asks: If I take equal parts of block tin and quicksilver and unite them together by heat, could this be used for a polish for cleaning knives, forks, etc.? I propose to use muriatic acid and then apply the tin and quicksilver; would it adhere so that they could be used? Would there be any danger in using such articles? A. Your process might answer for tinning, and you can easily try the experiment, but amalgamated articles would be objectionable for culinary purposes.

M. B. asks: How can I make molds to cast silver, so that the silver will flow well and cast smoothly in casting small articles? A. You can make molds for silver similar to those which are used for fine cast iron castings. For a smooth facing, fine soapstone or plumbago may be used.

A. A. S. asks: Has hydrogen ever been decomposed? A. We have seen no authentic statement to the effect that it has.

A. S. says: An engineer of some experience has been building engines with concave pistons and corresponding convexity of the cylinder heads, taking steam in the center of the pistons by an arrangement of ports cored out of the heads, claiming that he gains a greater effective pressure on the piston by that shape. He states that, on a 4 inch cylinder, he gains 2 square inches. I claim that, no matter what the shape of piston or head, the size of cylinders being equal, the pressure will be the same as in the common engine. A. We think you are right.

W. S. W. asks: How are Japanese scintillettes made? A. Japanese scintillettes consist of pencils of rolled paper, one extremity of which, to the extent of about half the length of the pencil, is filled with a composition which burns with a red flame. It is ignited by holding the fine extremity in the hand, while the other end containing the mixture is held for a moment in a flame. The composition may be made to suit the fancy, the chief ingredients being probably sulphur, meal powder, or chlorate of potash, etc.

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

S. E. W.—Your boiler sediment consists of some saline material. So far as we can judge without a chemical analysis, it is common salt. The water used is apt not only to form scale, but to corrode the iron. The remedy is to distil, and to use the water from the condensed steam as far as practicable.

G. W. P. Jr.—The stones you send are garnets. When very perfect and of a pure color, they are sometimes reckoned among precious stones. Fine specimens are found in Ceylon and Brazil. We do not consider your specimens of any particular value. The garnet is a double silicate of alumina and lime, colored with manganese and iron.

L. T. H. asks: How can I make imitation ivory billiard balls without pressure?—E.E.S. asks: How is moss prepared for finishing wax flowers? Can it be bleached and made to resemble white wax, to be put in white bouquets? How can small monopetalous corollas be made of wax, so that they will have the delicate fragile appearance of natural flowers? With what should the colors be mixed, so that they can be put on the wax as evenly as on paper? How can the bloom and flock be made to adhere to the wax?

COMMUNICATIONS RECEIVED.

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

On the Spider's Web. By J. H. B.

On the Hot Springs of Nevada. By G.A.F.

On the Centralization of Matter. By A. D.

On Ventilation. By A. R. M.

On the Relative Attraction of the Earth and Sun. By A. R. Jr. and by E. W.

Also enquiries from the following:

A. W.—G. A.—S. R.—G. B.—A. P.—J. W. T.—R. J. W—W. H.—E. C. B.—E. N.—A. Th.—D. A. S.

Correspondents in different parts of the country ask: Who makes match-splitting machines? Who makes balanced slide valves for use on locomotives? Who sells a hash machine? Who makes woolen machinery, such as pickers, breaker cards, and finisher cards? Who manufactures balloons? Who makes a machine which prints by touching keys, similar to a piano? Where are machines for making friction matches sold? Who makes movable calks for horseshoes? Who makes broom handle machinery? Who makes ditching machines? Where can machines for pressing coal dust into blocks be obtained? Makers of the above articles will probably promote their interests by advertising, in reply, in the SCIENTIFIC AMERICAN.

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal" which is specially devoted to such enquiries.

[OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

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January 20, 1874,

AND EACH BEARING THAT DATE.

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